



AN OVERVIEW OF THE SPANISH
NETWORK OF BIOSPHERE
RESERVES, 1994

U · N · E · S · C · O

Francisco Segura Castro

Comité Español

MAB

MAB



RESERVA
DE LA BIOSFERA



JUNTA DE ANDALUCIA
Consejería de Medio Ambiente



Consell Insular de Menorca



DIPUTACION GENERAL
DE ARAGÓN

THE BUBIÓN PLAN

THE SPANISH NETWORK OR BIOSPHERE RESERVES

This document is part of a series of projects called the Bubión Plan which has been underway since 1994. This plan gets its name from the alpujarreñan town of Bubión (Granada), in the Sierra Nevada Biosphere Reserve, because it was here that Spanish technicians met in April of 1994 in order to prepare it. The plan is a response to the commitment on behalf of the responsible institutions to provide a backbone for the joint effort of introducing the Spanish reserves at the International Conference on Biosphere Reserves, to take place in Seville in March of 1995 under the auspices of UNESCO.

The Bubión Plan has taken shape in the form of five basic studies, which are presented in three technical reports and a variety of material for dissemination and exhibits.

The Spanish Committee of the MaB program has overseen the coordination of team work since its onset, seeking out support from public and private entities to meet resource demands, requesting technical cooperation from several people and establishing the different work teams.

Documents for dissemination:

- The Spanish Biosphere Reserves. The Territory and its Population: Projects for a Sustainable Future.
- An informational book / A series of posters / Leaflet

Baseline Studies:

- An Overview of the Spanish Network of Biosphere Reserves, 1994.
- The Spanish Network of Biosphere Reserves: Legislation for Planning and Management. Notes on Local Economy.
- Tourism and Sustainable Development.
- Planning and Touristic Development in the Spanish Network.
- Lanzarote, Menorca and Sierra de las Nieves.

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 SECRETARIAT OF STATE FOR THE ENVIRONMENT AND HOUSING



CAM Fundación
Cultural



GOBIERNO DE CANARIAS

Direct technical contributions

(In order of declaration date and alphabetical order of last names)

B.R. Grazalema

- Juan Carlos NEVA. The Grazalema Natural Park
- Staff of the CEDER office at El Bosque.

B.R. Montseny

- Antoni BOMBÍ. Barcelona Provincial Council
- Carles CASTELL. Barcelona Provincial Council*
- Ignaci CASTELLÓ. Barcelona Provincial Council
- Angel MIÑO. Barcelona Provincial Council
- Jordi SOLER. Barcelona Provincial Council

B.R. Doñana

- Jesús CASAS. Doñana National Park
- Javier COBOS. Doñana and Its Surroundings Natural Park

B.R. El Canal y Los Tiles

- Paul M. FERNÁNDEZ. Subcommittee on the Environment. The Autonomous Government of the Canary Islands
- José L. MARTÍN. Subcommittee on the Environment. The Autonomous Government of the Canary Islands

B.R. Cazorla, Segura y Las Villas

- Bernardino CARAVACA. Sierras de Cazorla, Segura y Las Villas Natural Park
- Emilio GONZÁLEZ-CAPITEL. Sierras de Cazorla, Segura y Las Villas Natural Park
- Miguel A. SIMÓN. Sierras de Cazorla, Segura y Las Villas Natural Park

B.R. Marismas del Odiel

- Juan C. RUBIO. Marismas del Odiel Natural Landscape

B.R. Urdaibai

- Antón ARANBURU / Office of Environmental Resources. The Autonomous Basque Government
- Xabier ARANA. Udetxea. Urdaibai Biosphere Reserve
- Iosu de MADARIAGA. Udetxea. Urdaibai Biosphere Reserve

B.R. Sierra Nevada

- Antonio J. HERRERA. Sierra Nevada Natural Park
- Juan RODRÍGUEZ. Sierra Nevada Natural Park
- Technical team of the Sierra Nevada Natural Park

B.R. Manzanares

- José L. GARCÍA. Cuenca Alta del Manzanares Regional Park
- José V. DE LUCIO / The F.G.B. Center for Research in Protected Areas
- Staff of the F.G.B. Center for Research in Protected Areas

B.R. Lanzarote

- Esteban ARMAS. Island Council
- Ana CARRASCO. Island Council
- Leopoldo DÍAZ. Island Council
- Cipriano MARÍN. Lanzarote Biosphere Reserve
- José L. MARTÍN. Subcommittee on the Environment for the Autonomous Government of the Canary Islands.
- Miguel A. MARTÍN. Island Council
- Águedo MARRERO. The Viera y Clavijo Botanical Garden

B.R. Menorca

- Joan JUANEDA. Island Council
- Antoni JUANEDA. Island Council
- Sergi MARÍ. Institut Menorquí d'Estudis
- Guillem ORFILA. Institut Menorquí d'Estudis
- Joan PRETUS. University of Barcelona
- Joan RITA. University of La Palma
- Guillem SIMÓ. Island Council
- Santiago UDAETA. Island Council
- Josep M. VIDAL. Institut Menorquí d'Estudis

Office of the Environment. Regional Government of Andalusia

- María BRIONES. Central services
- Aureliano FERNÁNDEZ. Central services
- Ovidio MERINO. Central services
- Carmen RODRÍGUEZ. Central services
- Manuel ROMERO. Deleg. Province of Málaga.

ICONA Central Services

- Antonio FERNÁNDEZ
- Eduardo RAMÓN (Information about National Parks)

Secretariat of the Spanish Committee of the Program on Man and the Biosphere

- Antonia AGAMA



Consultants:

- Francisco SEGURA: An Overview of the Spanish Network of Biosphere Reserves. 1994.
- C.E.A. Centro D'Estudis Ambientals. Socioeconomic Report on the Network.
Dolors CARRASCAL
Eva GARCÍA
María del Mar ISLA
Frederic XIMENO
- Urban Planning and the Environment. Mediterráneo S.L. Inf. on planning and management
Rocío NAVARRO
José María ROMERO
Daniel SÁNCHEZ
- Reports on sustainable tourism:
— Tenydea S.L.
— Proyectos y Estudios Insulares
Pedro BALLESTEROS
Francisco J. GUTIÉRREZ
Alberto LUENGO
Ceferino MENDARO
Cipriano MARÍN
Giuseppe ORLANDO

Logistics support at meetings of biosphere reserve technicians:

- Division of the Environmental Agency of the Province of Andalusia. (Sierra Nevada BR, Bubión)
- Lanzarote Island Council (Lanzarote B.R.)
- Menorca Island Council (Menorca B.R.)

General coordination:

Cristina HERRERO MOLINO. Executive Secretary of the Spanish Committee of the MaB Program.

AN OVERVIEW OF THE SPANISH NETWORK OF BIOSPHERE RESERVES, 1994

FRANCISCO SEGURA



COMITÉ ESPAÑOL DEL PROGRAMA MAB DE LA UNESCO
de la Comisión Española de Cooperación con la UNESCO

Maps: Jesús Alonso Millán (Animación y Promoción del Medio)
Francisco Segura Castro
Cover Design: Dionisio Ridruejo
Editorial Realization: AURYN, S.L.
Translation: Jennifer Larkin
Collaboration on Translation: Teresa McCaffrey Urkidi

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PRESENTATION

This report is one of the studies carried out by the Spanish Network of Biosphere Reserves in order to take an in-depth look at the work undertaken to date in the Biosphere Reserves in Spain. With this aim, the report describes and analyzes the present status of the Network in terms of the objectives laid out in the Action Plan for Biosphere Reserves. This Action Plan, created in 1984, is expected to be modified at the upcoming International Conference on Biosphere Reserves in Seville and therefore this was considered an opportune moment to review the results of the past ten years.

This report is the second with a similar objective— the first was published under the title “The State of the Biosphere Reserves-1990”—. It represents a second step in the monitoring of the dynamic and continuous development of each of the biosphere reserves in Spain and of the network as a whole.

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1 ABOUT THIS REPORT

Report Scope and Characteristics

This report describes and analyzes the current situation of the Spanish network of reserves with regards to their application of the objectives set out in the Action Plan for Biosphere Reserves. It also points out the key achievements, not only of individual reserves but also of the network as a whole, as related to the development of these objectives. In addition, it offers recommendations and proposals for actions with the aim of improving their effectiveness in fulfilling the same.

The report is based on information as of December, 1994 unless specified otherwise.

Key sources of information used for this report were the following:

- The questionnaire which was completed by each reserve and is found in the appendix,
- First hand information obtained from visits to the Biosphere Reserves,
- Existing documentation at the Secretariat of the Spanish Committee of the Program on Man and the Biosphere.

Due to the time restrictions inherent in finishing this report, it was not always possible to contrast or supplement information with other existing sources, such as the residents of the Spanish reserves and their political representatives or different citizens groups. For this reason, as rich, as objective or as representative of reality as might otherwise be possible.

As can be seen, emphasis is placed on a qualitative and not quantitative analysis. This is due to the great heterogeneity among the reserves in the Spanish network, which makes it difficult and senseless to make certain comparisons. For this same reason, the reserves were often classified into homogeneous groups. The method used was therefore rather subjective though it was probably the most appropriate one given the aforementioned homogeneity and the frequent lack of data on the same aspects of the reserves as a whole.

The Spanish Committee of MaB's report titled «State of the Biosphere Reserves in Spain-1990» has provided a benchmark for the evolution of the biosphere reserves over the last few years. To date, this report had been the only systematic study of the situation of the biosphere reserves in Spain.

In addition to this report, others have been written simultaneously which focus on the different features of the biosphere reserves: their planning and management legislation, their relationship to the local economy, and how they implement sustainable strategies for tourism. For this reason, this report will provide a general analysis rather than focus on these aspects.

Report Structure

The report is organized into the following:

- Part One. This is an introduction which provides an explanation of the biosphere reserves as well as an overall view of the Spanish Network of Biosphere Reserves, pointing out work undertaken to date with the aim of contributing content to the Conference in Seville.
- Part Two. This is an analysis of each of the Biosphere Reserves with regards to their effectiveness in fulfilling the objectives set out in the Action Plan for Biosphere Reserves, with special emphasis, at times in detail, (case studies, highlighted information in Boxes), on the most noteworthy contributions of each reserve. In order to cover most of the items related to reserve management, each of the objectives of the Action Plan are described in full and the description includes those aspects related to each objective with the aim of facilitating an understanding and analysis of the same. Even so, some important aspects of management do not fit any one objective and these were therefore described in different sections. Such was the case with reserve endowment and public use and tourism. Lastly, each objective is accompanied by a series of conclusions and recommendations for action.
- Part Three. This offers a description of the thirteen reserves of the Spanish network and a brief characterization of their physical, biological and socio-economic features. It also includes a description of the situation of each with regards to their effectiveness in fulfilling the Action Plan, together with conclusions and recommendations. The order in which the reserves appear in the report correspond to the order in which they were designated by UNESCO.

2 INTRODUCTION

The MaB Program and the Biosphere Reserves

The Program on Man and the Biosphere, launched in 1971 and promoted by UNESCO, is a world-wide program focusing on the interaction of people and the environment in all the bioclimatic and geographic situations of the biosphere. Its aim is to provide the scientific basis needed to solve the problems of natural resource use and management through research, training and interdisciplinary demonstrations of the same.

The MaB Program currently operates through national committees set up in more than 110 of the 159 countries that are members of UNESCO (as of 1992). The organization that supervises the program, the International Coordinating Council, consists of 30 Nations elected at the UNESCO General Conference. Funding for the MaB Program is charged to UNESCO's ordinary budget.

At its first session in November 1971, the International Coordinating Council defined several themes which were to be part of the established program. When identifying theme number 8, "conservation of natural areas and of the genetic material they contain", it recognized the importance of establishing reserves which were protected and managed in different ways. Thus, the concept of the biosphere reserve was introduced with the intention of creating "a coordinated international network, which would demonstrate the value of conservation and its relationship with development". This concept was innovative and represented an important step in conservationism because it introduced the idea of a network or system and because it combined nature conservation with scientific research, environmental monitoring, environmental training and education, contributions towards development and local participation. At present, the biosphere reserves constitute the only system of protected areas with these characteristics at the intergovernmental level.

The first biosphere reserves were designated in 1976 and the network has grown steadily since. By January 1994, 324 reserves in 82 countries had been designated, thus covering a geographic area of 2,000,000 km².

The criteria for the choice and establishment of biosphere reserves is associated to their three principal functions:

- Conservation. This covers the need to strengthen conservation of biological diversity, genetic resources and ecosystems. For this reason, Biosphere Reserves are often selected in terms of their biodiversity and conservation potential.
- Logistics. According to this objective, a reserve should provide an operational basis and infrastructure for research and monitoring of activities related to environmental education and training, as well as constitute a world-wide network for the active exchange of information.
- Development. This refers to the need to link conservation with local development making it necessary for reserve management to integrate strategies for cooperation with local and regional institutions in planning and management principles.

The philosophy of biosphere reserves with respect to linking conservation with local development can be summed up by the following statement: "In order to ensure the conservation of nature, its inhabitants must be guaranteed a proper standard of living and sufficient educational and cultural levels so that there is no need for them to resort to the destruction of the environment as a means of survival. Moreover, the concept of nature conservation should be an essential and irrevocable component of the objectives and methods of socioeconomic development, for without it, such development is pointless, and ultimately not viable for lack of resources¹."

These functions also correspond to a specific system of zoning for the promotion of the development of each of these. The zoning proposed by the MaB Program would therefore be divided into the following three areas:

- Core area. This is a strictly-protected area compatible with well-defined conservation objectives and is representative of minimally disturbed ecosystems.
- Buffer zone. This area generally surrounds the core area and only allows for those activities compatible with the conservation of the same. Among

¹ INTERNATIONAL COMMISSION OF EXPERTS, *Report on Strategies for a Sustainable Development in Doñana and its Surroundings* (Seville, 1992).

such activities are scientific research, environmental training and education, and those related to recreation and tourism that do not have significant adverse impacts.

- Transition area. This usually surrounds the core area and buffer zone, and allows for the aforementioned activities and, in particular, for those activities that, while harmonious with the sustainability of resources, better fulfil its development objective. Efforts are made to foster cooperation among research workers, management and the local population with the aim of achieving an adequate planning of socioeconomic activities compatible with sustainable development.

Designation of a biosphere reserve is upon the initiative of a nation and of the responsible administrators. The petitioning nation maintains sovereignty but makes a commitment to implement the recommended strategy of the Action Plan for Biosphere Reserves. This Action Plan, which was adopted by the International Coordinating Council of the Program on Man and the Biosphere Reserve, is the document which identifies the nine objectives that specify Biosphere Reserve strategy.

The objectives of the Action Plan are the following:

- International network: to enhance the role of the international network of biosphere reserves in global ecosystem conservation,
- Management: to improve and upgrade the management of biosphere reserves to correspond with their multipurpose objectives,
- Conservation in situ: to promote the conservation of key species and ecosystems in biosphere reserves,
- Research: to promote coordinated research projects on conservation science and ecology within biosphere reserves,
- Monitoring (permanent surveillance): to develop monitoring activities in biosphere reserves in order to provide a basis for scientific research and management activities and contribute to the understanding of environmental change,
- Regional Planning: to enhance the role of the biosphere reserves in regional planning and development,
- Local participation: to promote local participation in the management of biosphere reserves,
- Environmental education and training: to promote environmental education and training related to biosphere reserves and to use the full potential of the reserves for these purposes,
- Information: to fully use the potential of the network to generate and spread knowledge about the conservation and management of the biosphere and to promote the biosphere reserve concept through information and demonstration.

Upon the initiative of the Spanish Committee of MaB, UNESCO designated the first two of the Spanish biosphere reserves on January 22, 1977. These were Grazale-

ma and Ordesa-Viñamala. The following year, Montseny followed suit and by April 1986 a total of ten biosphere reserves had been designated in the country. Several years later, between 1992 and 1993, the latest reserves incorporated into the Spanish network were declared, bringing the total number of reserves to thirteen. These were Manzanares, Lanzarote and Menorca.

The Spanish Network of Biosphere Reserves

The Spanish Network of Biosphere Reserves was established in June, 1992 at the session held at the Ordesa-Viñamala Biosphere Reserve. During the five general sessions that followed, the network was responsible for several projects including the creation of task teams and a considerable number of joint actions which have culminated in the work underway in preparation for the International Conference on Biosphere reserves, to be held in Seville under the auspices of the Spanish Government.

For a better understanding of the most significant contributions to the Spanish Network of Biosphere Reserves, below is a brief summary of the different sessions that have shaped the present situation of the Network and the works carried out.

At the above mentioned session during which the network established itself as task team for what were then ten reserves, the following functions were laid out².

- to exchange experiences, information and publications,
- to promote training activities,
- to provide advice to political decision-makers,
- to strengthen the creation of international relationships,
- to define programs of common action including a joint monitoring program.

Among other actions which took place at this session, the decision was for the Secretariat of the MaB Committee to publish a periodical bulletin which, in addition to including general information on the MaB program has provided a means of communication among the Network reserves. The first two editions of this bulletin came out in 1992 and by December 1994 a total of 9 had been published. Moreover, the coordination efforts undertaken by the Secretariat have decisively contributed to the effectiveness of the work carried out within the Network.

Another of the decisions made was to create a task team to prepare a work plan designed to set up a monitoring program suitable for the biosphere reserves in Spain. A decision was also made to hold monographic Network meetings at least once a year in order to study in detail the different analogous topics of interest among the Spanish reserves.

² SECRETARIAT OF THE SPANISH COMMITTEE OF MAB 1992: *Minutes of the Spanish Biosphere Reserves Meeting in Torla* (Huesca, June 18 and 19, 1992).

Autonomous Regions and Biosphere Reserves



Figure 1. Location and declaration date of the Spanish biosphere reserves

Based on the analysis of the report on "The Status of the Biosphere Reserves in Spain-1990", "Final Recommendations" were prepared during the same session in Huesca. These recommendations are important contributions to the lines of action for implementation in the reserves.

Before the following meeting was held in Grazalema in October 1993, three more reserves had been incorporated into the Spanish Network - Manzanares, Lanzarote and Menorca. Due to the novelty of their structure these last two constituted the most significant contributions to the worldwide network by the Spanish network.

In addition to several other topics dealt with at the meeting in Grazalema, a detailed analysis took place of the existing mechanisms for participation in the Spanish biosphere reserves. The conclusion was reached that it was important to strengthen the same and suggestions were made to this effect. Proposals for projects, apart from those being carried out by the monitoring group at the time, were also made. Among those worthy of pointing out was the need to reflect upon the new profile of the biosphere reserves in view of the anticipated International Conference on Biosphere Reserves in Seville.

But it was not until the meeting in Bubión (Sierra Nevada), in April 1994, that the Network proposed an ambitious work plan directed at shaping the Spanish contribution to the conference in Seville. This was later referred to as the Bubión Plan. This plan, which lays out the work developed by the Network to date, includes the desired objectives while defining the necessary phases for their implementation as well as the different organizations responsible for the same and the functions of each. This work plan was later submitted for consideration by the responsible politicians in order to obtain the economic, technical and human resources necessary for its implementation.

The objectives laid out in the Bubión Plan are the following³:

- Set forth the contributions of the Spanish reserves, not only on an individual basis but also those of the Network as a whole.
- Put together various material that would spread the knowledge of said contributions and direct these at different sectors: public, technical and political,
- Disseminate the achievements and the work of the Spanish Network of reserves in the international atmosphere of MaB at the Conference in Seville, while regarding the actual functioning of the Network as one of the greatest contributions,
- Strengthen Network work procedures,
- Further examine the role of the Spanish Network as a member of the International Network and its pilot role on a global context.

³ SECRETARIAT OF THE SPANISH COMMITTEE OF MaB, *Minutes of the Technical Meeting of Biosphere Reserves* (Bubión, Granada, April 12-14, 1994).

There was an interest and willingness expressed on behalf of the Network to make contributions towards the documents to be submitted for approval at the conference in Seville. Such documents would indicate the future lines to be followed by the biosphere reserves. Examples of these are the anticipated Statute of Biosphere Reserves and the new Action Plan.

During the same meeting in Bubión, the decision was made to undertake several studies to characterize the current situation of the Spanish network by analyzing its workings and structure. The studies that were finally carried or are currently underway are the following:

- A general description of the present situation of the network, indicating recommendations and forms of action (this report).
- Several studies focusing on the development of sustainable development strategies for the Spanish Network of Biosphere Reserves: Legislation on Planning and Management; Biosphere Reserves and Local Economies; Upgrading and Diversification of Tourism Offers in the Spanish Biosphere Reserves; and finally a Guidebook for the New Model of Tourism.

Among other materials being put together for the Conference in Seville (the content of which was decided on during network meetings) are an informational book on the Spanish Network of Biosphere Reserves, an exhibit on the Biosphere Reserves in Spain and an accompanying pamphlet.

After the meeting in Bubión, two more Network meetings were held, one for each of the recently declared biosphere reserves. These were for Lanzarote, in September 1994, and for Menorca, in January 1995. Both meetings were devoted to further analyzing certain aspects of the Bubión Plan, determining and varying content of the different studies and documents, enquiring into the implementation stage of the Plan, etc.

One of the most important anticipated results of the work carried out so far is that it will enable the preparation of an ambitious future work plan for the Network. This plan, which may be called "Strategies for the Spanish Network of Biosphere Reserves", would set out the means to achieve all those proposed objectives while specifying Network functions, designing the mechanisms for participation in other biosphere reserves, establishing indicators of the evolution of reserves worthy of monitoring, etc.

In short, apart from bringing together thirteen reserves, each of which is a significant contribution to the International Network because of its extensive development, the Spanish Network of Biosphere Reserves is important for its joint projects and because it constitutes a remarkable forum not only for debate and further study of the concept of the biosphere reserve but also for the practical implications of the same; which are currently generating many recommendations for action.

3 THE SPANISH NETWORK OF BIOSPHERE RESERVES AND THE OBJECTIVES OR THE 1984 ACTION PLAN

OBJECTIVE 1: INTERNATIONAL NETWORK

Objective one for the 1984 Action Plan for Biosphere Reserves, corresponds to the International Network and is «to enhance the role of the international network of biosphere reserves in global ecosystem conservation». It also points out the importance of including the most characteristic and representative types of ecosystems, the convenience of selecting reserves for their centers of high biodiversity and endemism, and the importance of operating within a network, which when more complete enables the reserve to better satisfy its other objectives. It also recommends identifying gaps in the representation of ecosystems.

In the same way that some of the other objectives of the Action Plan will be analyzed, other aspects related to this objective, in addition to those already mentioned, will be considered, such as the size of reserves, participation of the Spanish Network in other networks and the Spanish Network of Biosphere Reserves itself.

Total Area

The thirteen protected areas that make up the Spanish Network of Biosphere Reserves cover a total of 8,534 km² (1.7% of the entire territory of Spain) with an average individual size of 65,650 ha. This is 30% of the total of protected areas in Spain with 29,045 km² as of June 1994⁴.

There are great differences in size between the largest of the reserves -Cazorla, Segura y las Villas- with 214,300 ha. and the smallest -El Canal y Los Tiles- with only 511 ha. With the exception of the Marismas del Odiel with 7,158 ha., the majority of the Spanish reserves occupy between 22,000 ha. and 85,000 ha.

One of the documents of the Spanish Network of Biosphere Reserves⁵ recommends a minimum size for reserves of approximately 15,000 ha. in order to improve

its effectiveness in satisfying its three principal functions, particularly in terms of providing an impetus for local socioeconomic development. On the other hand, overly large areas occasionally have problems because of the greater amount of resources needed to ensure proper management.

Representativeness of Ecosystems and Human Uses

In 1992 the Spanish Committee of MaB pointed out the importance of giving priority to the applications of new reserves which were examples of biogeographical diversity not yet represented in the Spanish Network⁶. The need was also seen to provide a synthesis of all the biogeographical areas in Spain, «with special emphasis on those areas that, although common in Spain, constitute specific biogeographical contributions on a global level.»

It is clear that to date priority has not been given to covering the majority of the ecosystems in Spain when selecting an area for reserve designation, for there are important redundancies and gaps in this respect. It is worth pointing out that a reserve is no less valuable for representing biogeographical realms which are similar to others. Given the nature of Spain, such diversity and differences are quite marked. Conversely, there are very important gaps in the coverage of some extremely valuable ecosystems and environments which are characteristic of the biogeography of Spain.

To give a brief idea of the above, according to a study undertaken at the Secretariat of the Spanish Committee⁷, the following four environments are those which represent gaps in the Spanish Network of Biosphere Reserves.

- wide barren plains with evergreen trees (of the species *Juniperus thurifera*,
- steppe areas,

⁴ The Spanish Section of the Federation of Natural and National Parks in Europe, *Protected Areas in Spain* (Madrid, 1994).

⁵ Spanish Network of Biosphere Reserves, «Recomendaciones finales sobre el estudio del Estado actual de las Reservas de la Biosfera Españolas», Report 1992.

⁶ Spanish Committee of MaB, *Acta de la reunión n.º 15 del Comité permanente* 1992.

⁷ Heras, F., *Hacia una red representativa de Reservas de la Biosfera en el Estado Español. Avance* (Unpublished report, 1992).

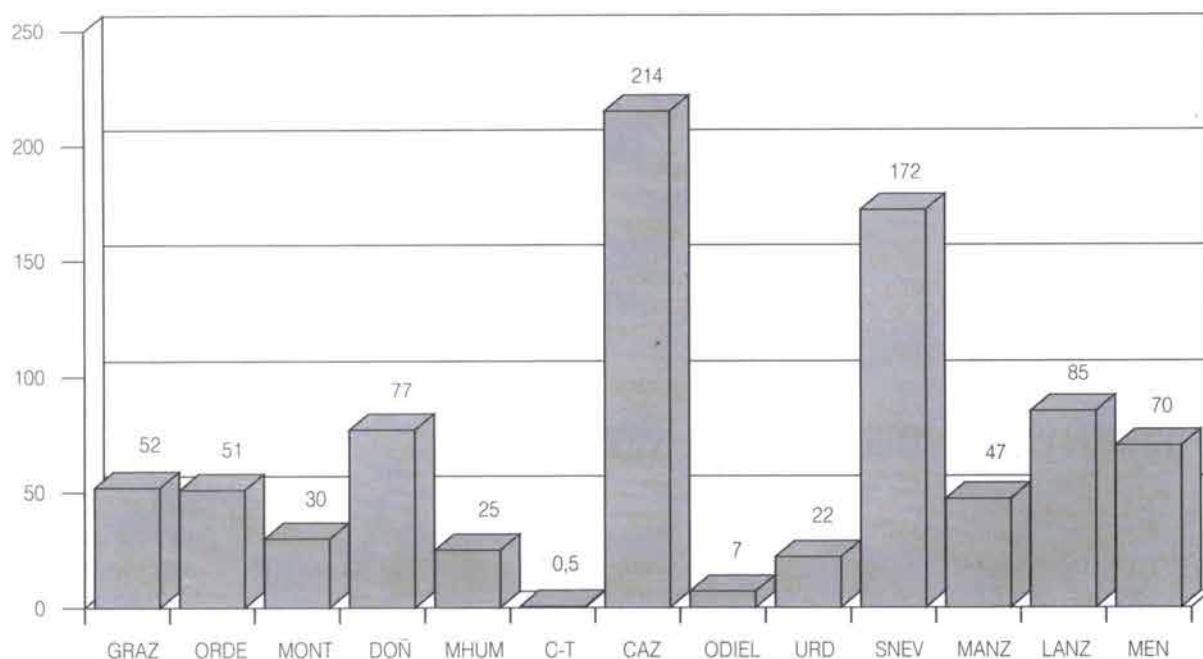


FIGURE 2. Total area in thousands of hectares of the Spanish biosphere reserves.

- the *-dehesas-* (open savanna-like woodlands),
- Atlantic mixed farming systems.

The first two environments are not adequately represented in the Spanish Network of reserves at present. This is in spite of their interest and representativeness of the environmental conditions of Spain as well as of human activities linked to the uses of said environments. The *dehesas* are well-represented in only a few areas of the Manzanares Biosphere Reserve, and the only reserve with examples of Atlantic mixed farming systems is Urdaibai. However, both systems of resource utilization are widely distributed and are important throughout the country as far as nature conservation and the preservation of human land uses associated to their maintenance is concerned.

In addition to these gaps, there are others which are also quite noteworthy. An example of these are urban areas. With the exception of those reserves classified as complex territories, covering complete geographic units (Urdaibai, which is a hydrographic basin, and the entirety of the islands of Menorca and Lanzarote), the remaining reserves in the Spanish Network prefer to focus on fairly undisturbed ecosystems or those with minimal human interaction, and avoid in general, incorporating large urban populations.

In short, there is a need to conduct a systematic survey in order to approach the topic of how far the Spanish Network represents different ecosystems, including a classification of not only undisturbed ecosystems but also of land use patterns compatible with conservation. This is an urgent recommendation given that a considerable part of the traditional land use systems which are of interest because of their non-polluting nature and

compatibility with a high biodiversity, are currently in crisis and under threat due to competition with other uses such as intensive agriculture (which is frequently heavily subsidized).

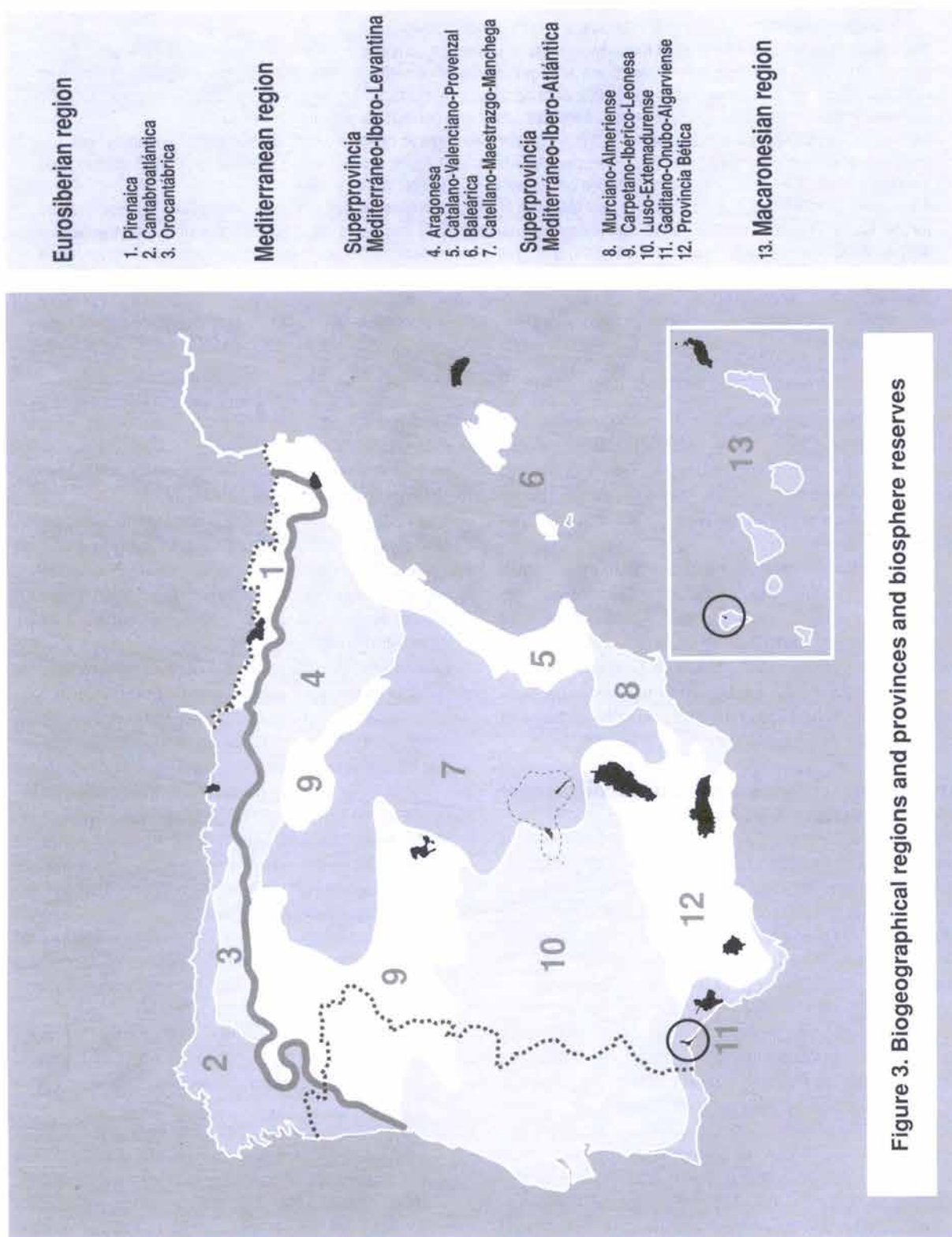
The most widely represented ecosystems in the Spanish Network are those associated to Mediterranean mountain systems. At present the network includes four of these areas (although there are many differences and a great diversity amongst them) and is expected to incorporate yet another - the Sierra de las Nieves, in Malaga. Wetlands are also widely represented, including three reserves which are representative of coastal wetlands, Doñana, Marismas del Odiel and Urdaibai, in addition to another inland wetland area, Mancha Húmeda. On the other hand it would be quite difficult to assess how far the Spanish Network represents human activities since, as mentioned previously, there are no studies to this effect.

Biodiversity and Endemisms

Spain is the country with the highest biodiversity in all of Europe. The majority of the Spanish reserves were designated because of their unique natural features. Thus, as individual reserves and as a network they constitute important sites in as far as their natural environments are concerned and generally coincide with areas of high biodiversity of species and ecosystems and, frequently, with centers of numerous endemisms.

Much data exists to this effect, but some of the most significant examples are as follows: 458 vertebrate species were cited in Doñana; in Sierra Nevada, in addition to a considerable variety of environments ranging from semiarid areas to high mountain ecosystems, there are

Biogeographical provinces and Biosphere Reserves



1. THE INCORPORATION OF LANZAROTE AND MENORCA TO THE SPANISH NETWORK OF BIOSPHERE RESERVES

The Lanzarote and Menorca Biosphere Reserves were approved by the International Coordinating Council at its session in October 1993. Both reserves occupy the entire geographic area of the corresponding islands and thus integrate the whole of interactions and effects between people and the environment. The islands represent not only natural environments but areas of human interaction, ranging from farms to urban communities and industrial parks. It is due to the separation of these markedly natural areas and to the coordination of the complexities of existing uses and activities that Lanzarote and Menorca, along with Urdaibai, are referred to as complex territories.

The importance of the declaration of these two reserves is due not so much to their environmental interest, although in both cases this is very high, but rather to the anticipated model of management. Through the principles of action of biosphere reserves, this is expected to include a comprehensive management of the entire geographic area, with the coordination and integration of all politicians, administrations and concurrent activities of the same.

Both reserves foresee the creation of two baseline legal instruments in order to carry out their ambitious objectives, the founding of a coordinating body for reserve activities which, at the same time, would channel local participation, and the preparation of an Action Plan based on the principles of sustainable development.

The significant potential of the Lanzarote and Menorca Biosphere Reserves has yet to be developed. The key themes for the future, in addition to the above mentioned coordinating body and plans for action, involve obtaining the necessary funds to implement the same. Next to this, and no less important, is the need for deeper discussion about these topics between the administration, scientific and technical groups, the economic sectors involved and the island communities so that the project for a better joint future allows agreements to be made and acts as a catalyst for necessary actions. The importance of such a project requires a strong level of consent and joint efforts to reach the established objectives.

2,000 vascular plant species, amounting to one third the total number of species found in the Iberian Peninsula; in the 300 km² occupied by the Montseny Biosphere Reserve examples are found of holm oak groves, beech groves, cork groves, oak groves, fir forests, chestnut groves, pine forests, etc.

Data on endemisms also indicate that the Spanish Network adequately satisfies the biosphere reserve recommendation of selecting reserves for their centers of high biodiversity and endemisms. For example, there are 26 plant endemisms exclusive of Cazorla, Segura y las Villas. Some of the conservation actions implemented at the biosphere reserves are precisely directed at the protection of endemic species (see Box 9).

The Spanish Network and its Participation in Other Biosphere Reserve Networks

The contribution of the Spanish biosphere reserves is well-known and significant because, as previously mentioned, they operate as a network. Since its creation in 1992, the Spanish Network has carried out several activities which, as a whole, have led to a greater coordination of activities and a strengthening of the Spanish contribution to the concept of the biosphere reserve.

Also noteworthy in this area is the fact that the reserves jointly undertake a large number of activities such as studies and publications. In this sense, the Secretariat of the Committee plays an essential role in coordinating actions. It should be pointed out that not all reserves participate equally in Network activities although the current tendency is towards greater participation.

Other notable contributions within the scope of the Spanish Network of Biosphere Reserves are the incorporation of complex geographical areas not associated

to already-existing protected areas, such as the designation of the islands of Menorca and Lanzarote as biosphere reserves (see Box 1). To this effect, Urdaibai has made significant contributions as well.

Lastly, the Spanish Network's participation in the preparation of the upcoming International Conference on Biosphere Reserves, to be held in Seville in March 1995, is yet another important contribution to the International Network because of the innovative nature of many of its recommendations.

Conversely, participation in other biosphere reserve networks outside of the framework of the Spanish Network is rather limited. For example, the participation of Spanish reserves in the Euromab Network is restricted to the contribution of information to the ACCESS directory, except for Montseny which cooperates with this Network in the monitoring of birds and forest plots.

With respect to said participation in other networks and cooperation with other reserves, the following are noteworthy examples of sporadic actions in which the Spanish reserves have taken part:

- Twinning of the Montseny Biosphere Reserve and the Cévennes reserve in France as well as the cooperation agreement with the Amistad Biosphere Reserve in Costa Rica (see Box 2).
- Participation of the Menorca reserve in the Archipelago Network. Also participating are several universities linked to research on island environments.
- Cooperative actions of the Environmental Agency of Andalusia, which although not always within the framework of the biosphere reserves, constitute an important contribution to cooperation on a global level. These include the following: conser-

vation of tropical forests in Tuxlas, Mexico; protection of populations of flamingos in the Southern Caribbean; application of the Biodiversity Agreement in Uruguay; two projects in Morocco, underway since 1992, on the regeneration of groves of Spanish fir trees and wetlands management, etc.

In short, the current situation is logical considering the Spanish Network of Biosphere Reserves is a fairly new organization and that the majority of efforts are directed at its assertion as a useful structure for the exchange of ideas and experiences. Most definitely, as this process develops, other international links will be established.

In order to improve communications among the Spanish reserves and other sites or documentation centers, it would be very beneficial to have access to a computerized data linkage system which, with a limited set-up and common protocol, would both facilitate and reduce the costs of information exchanges.

Setting up trans-frontier biosphere reserves is a possibility worth looking into and promoting because of what they could contribute to cooperation and coordi-

nation among different nations faced with similar tasks of sustainable management. The Marismas del Odiel and Ordesa-Viñamala reserves could constitute models for such a strategy.

Conclusions with Regard to Objective 1: International Network

The Spanish biosphere reserves together occupy 8,534 km². This amounts to 1.7% of the total geographic area of Spain and 30% of the total of protected areas. Upon initial analysis, some are considered too small to effectively fulfill their basic functions, in particular with regards to development.

There are certain redundancies and gaps in the Spanish Network with regards to covering different biogeographical realms and environments characteristic of Spain, for example, steppe areas and wide barren plains with evergreens. Urban ecosystems are not well-represented in the Network yet at the same time are environments appropriate for pilot management of resources associated to biosphere reserves.

The Spanish Network itself constitutes an important

2. MONTSENY: ITS TWINNING WITH CÉVENNES AND ITS COOPERATION AGREEMENT WITH THE AMISTAD BIOSPHERE RESERVE

The twinning of the biosphere reserves of Montseny and Cévennes (the reserve associated to the National Park located at the southern end of the French Central Massif) was signed in November 1987 with the aim of strengthening cooperation within the framework of the MaB Program and was the first example of such cooperation among biosphere reserves world-wide. For its implementation, a Twinning Committee was set up to coordinate the activities which, basically, have consisted of the exchange of information and experiences, joint action programs as well as providing for the extended stay of technicians, competent municipal authorities and private landowners of each reserve.

Actions are programmed according to three-year work plans. For example, the work plan for the period 1994-96 which is the third to be prepared jointly, proposes the following:

- scientific research: involvement in the world-wide network of receiving catchment basins, conduction of biological inventories, participation in programs of european monitoring, holding of meetings for the scientific committees of both areas, undertaking of studies on the chestnut groves;
- education: student exchanges, adaptation of school educational materials, joint exhibits on humans and animals, etc.;
- information;
- international cooperation: colloquiums, seminars on environmental education, etc.

Upon completion and evaluation of the two previous three-year work plans, the balance is positive for both Montseny and Cévennes. An examination of the work carried out reveals that scientific research has had the most difficulties meeting the initial objectives. This is due to the difficulty in implementing a systematic research program with joint objectives and methods. On the other hand, the reserves have jointly generated many products for dissemination and facilitated numerous exchange activities and meetings.

Carrying out activities under the different work plans calls for the participation of approximately four people per reserve, during more than 100 work days and requires funds in the amount of approximately 1,500,000 ptas./year; and this figure is with several normal operating expenses and actions already covered by individual reserve budgets. In general, there is not doubt that with regards to costs, twinning demands more work than material resources.

For its part, the Administrative Cooperation Agreement between Montseny Biosphere Reserve and La Amistad Biosphere Reserve in Costa Rica, was signed on July 12, 1994. This agreement established the creation of a joint Cooperation Committee to coordinate actions at both sites which are to focus on the exchange of information and experiences. The first three-year Plan has already been prepared.

A final benefit is that brought about by the exchange and sharing of individual experiences and, on the other hand, to facilitate the participation of other biosphere reserves in these networks through cooperation links that Cévennes, Montseny and La Amistad already have established with other sites and reserves. In short, this entails the implementation of one of the purposes of the biosphere reserves and the piloting and practice of a methodology of mutual exchange and use of experiences.

contribution to the concept of biosphere reserves. Among its principle achievements are the development of joint activities, the incorporation of complex geographical areas to the International Network, with the innovative focus that would suppose, and the work taking place in preparation for the upcoming International Conference on Biosphere Reserves to be held in Seville.

Measures which should be taken to promote the situation of the individual biosphere reserves as well as the Spanish Network as a whole, with respect to those themes described in Objective 1 are the following:

- Support extending the smallest reserves, insofar as their sizes condition their effectiveness as biosphere reserves.
- Conduct an analysis and characterization of the ecosystems and uses of interest associated to their

maintenance and exploitation in order to determine the principle gaps in the Network and to be able to establish priorities for the incorporation of new biosphere reserves. This is an urgent recommendation due to the present crisis of many of the uses of the environment to this effect.

- Promote participation amongst the reserves within the framework of the Spanish Network of Biosphere Reserves and extend linkage and cooperation with other networks, both as individual networks and as a worldwide network. Assess the possible interests of creating trans-frontier reserves.
- Establish a computerized information system in order to facilitate and reinforce communications among biosphere reserves.

OBJECTIVE 2: MANAGEMENT

Objective two for the 1994 Action Plan is «to improve and upgrade the management of existing and new biosphere reserves to correspond with their multipurpose objectives.» Other aspects pointed out with regards to reserve management are as follows:

- «the security of the reserves should be assured through legal instruments, legislation or a management framework directly applicable to the biosphere reserve,»
- management should allow for a zoning system which encourages different uses and activities; in the particular case of marine habitats adequate protection must be assured of the adjacent littoral and the catchment basins,
- «the MaB National Committees should review the management of the existing biosphere reserves [...] and recommend implementing measures to improve the standard of management appropriate to the legal, administrative, ecological, cultural and socioeconomic conditions affecting the reserves.»

In terms of these recommendations, the contribution of the Spanish reserves with respect to this objective will be analyzed below. This objective is one of the most important because its application better fulfills the potential of the biosphere reserves. The following aspects will be discussed:

- the association of biosphere reserves with protected areas and the organizations in charge of their management,
- the protection categories for management of protected areas associated to the biosphere reserves,
- the planning of the Spanish Network of Biosphere Reserves, distinguishing between specific and sectorial planning,
- land ownership,
- zoning.

The Association of Biosphere Reserves with Protected Areas and the Organizations in Charge of their Management

Hereinafter, the term «associated protected area» will be used to refer to the different linking possibilities between reserves and their corresponding protected areas, which as seen below, are very varied. Table I defines different categories:

- biosphere reserves associated to more than one protected area (Doñana, Mancha Húmeda),

- reserves coinciding with the delineation of a protected area (Grazalema, Montseny, Cazorla, Segura y Las Villas, Marismas del Odiel, Sierra de Nevada, Manzanares) ⁸,
- a reserve integrated into its associated protected area (El Canal y Los Tiles),
- reserves that only partly coincide with protected areas (Ordesa-Viñamala, Mancha Húmeda),
- and lastly the case of Urdaibai, which as explained in detail in the section on its description, strictly speaking, does not fit the concept of a protected area. The situation of Lanzarote and Menorca is similar, where there are no close links with other protected areas, and the foreseen management model takes priority (see Box 1). Nevertheless, these three reserves are analyzed in Table 1. Seeing a joint analyses is enlightening even if it requires exceptions such as those mentioned above. In this sense, Urdaibai would be included among those reserves that fully coincide with a protected area, whereas Lanzarote and Menorca would be grouped with those associated to several areas.

Management of each biosphere reserves is primarily the responsibility of the nation submitting the proposal for designation, though on a secondary level, administrative responsibility corresponds to the organization that initiated the petition for the same. Due to changes in the Spanish government, in particular the approval of the Constitution in 1978 and the organizing of the country into different Autonomous Regions, some of the biosphere reserves designated early on are faced with ambiguous situations with respect to said responsible organizations.

This is the case for three of the biosphere reserves associated to protected areas declared national parks, where the area corresponding to the parks is managed by the Central Government through the National Institute for Nature Conservation [known by its Spanish initials ICONA] (Ministry of Fisheries, Agriculture and Food,

⁸ Agreements have recently been made to incorporate the territory of several reserves into their associated protected areas. This is the case at Grazalema, Cazorla, Segura y las Villas, Odiel and Sierra Nevada where there were previously considerable differences between the size of the protected areas and the geographic area declared biosphere reserves. Thus, by identifying the biosphere reserve with the area that is being managed homogeneously, there are fewer ambiguities.

Declara- tion date	Biosphere reserve	Declara- tion date	Associated protected areas	% Areas of the RB in PA	% Area of PA in the BR	Managing organization associated protected area
1977	GRAZALEMA	1984/88	Sierra de Grazalema Natural Park	100	100	Environmental Agency, Regional Government of Andalusia
1977	ORDESA-VIÑAMALA	1918/82	Ordesa y Monte Perdido National Park	18	52	Institute for Nature Conservation (ICONA)
1978	MONTSENY	1976/78	Montseny Natural Park	100	100	Barcelona and Girona Regional Councils
1980	DOÑANA	1969/78 1989	Doñana National Park Doñana and its Surroundings Natural Park	65 32	100 45	ICONA Environmental Agency, Regional Government of Andalusia
1980	MANCHA HÚMEDA	1973/80 1979	Tablas de Daimiel National Park Lagunas de Ruidera Natural Park	8 15	100 100	ICONA Regional Government of Castile-La Mancha
1983	EL CANAL Y LOS TILES	1994	Included in the Las Nieves Natural Park	100	10	Government of the Canary Islands
1983	CAZORLA, SEGURA Y LAS VILLAS	1986	Sierra de Cazorla, Segura y Las Villas Natural Park	100	100	Environmental Agency, Regional Government of Andalusia
1983	MARISMAS DEL ODIEL	1984/89	Marismas del Odiel Natural Landscape	100	100	Environmental Agency, Regional Government of Andalusia
1984	URDAIBAI	1989	Urdaibai Biosphere Reserve	100	100	Environmental Office, Basque Regional Government
1986	SIERRA NEVADA	1989	Sierra Nevada Natural Park	100	100	Environmental Agency, Regional Government of Andalusia
1992	MANZANARES	1985/93	Cuenca Alta del Manzanares Regional Park	100	100	Environmental Agency, Regional Government of Madrid
1993	LANZAROTE	1974/81 1994	Timanfaya National Park 2 Natural Parks and 10 more protected areas	Total 42	100	ICONA Government of the Canary Islands
1993	MENORCA	1991/93 1991	Albufera des Grau Natural Park 17 Special Interest Protected Areas	Total 43	100	The Menorca Island Council

NOTES: PA = Protected Area

TABLE 1. Biosphere Reserves in Spain and their associated protected areas

and the rest of the territory falls under the jurisdiction of the Regional Governments: Ordesa-Viñamala in Aragon; Doñana, Andalusia; and Mancha Húmeda, Castile-La Mancha. In neither of these cases

are there effective coordination mechanisms to carry out an integrated management of the entire geographic area declared a biosphere reserve. This situation is not as marked in the Doñana Reserve because the reserve territory not included in the National Park is incorporated into a natural park. In the case of Ordesa-Viñamala or Mancha Húmeda, the Regional Government is not permanently involved in reserve management.

The remaining cases are free from such ambiguity and the organizations responsible for reserve management are the competent managing organizations of the associated protected areas (not always the organization which submits the proposal for its designation as a BR)

which are listed in Table 1. It is worth pointing out again the exceptions of Urdaibai, Lanzarote and Menorca.

Another exception is the case of Timanfaya, the fourth national park within a reserve. The situation for this area is different from the aforementioned cases because, although management of Timanfaya, which only amounts to 6% of the total geographic area of Lanzarote, is the responsibility of ICONA, efforts are made to manage the remaining area according to biosphere reserve criteria. Moreover, under the new Law of Protected Areas of the Canary Islands, national parks are considered part of this network and measures are stipulated for a more effective integration.

The last point worthy of mention is that administrative responsibilities of each organization include budgetary endowments, management of human resources and

associated protected areas or biosphere reserves etc., in line with established terms.

Protection Categories of those Protected Areas Associated to Biosphere Reserves.

To begin with, it is important to mention that there is no legal protection inherent in the designation of an area as a biosphere reserve. Instead the Central Government of Spain provides two possibilities with regards to this. One is that, the area in question can be declared under one of the management categories for protected areas stipulated in both autonomous and national legislation (national park, natural, rural or regional park, natural landscape, natural reserve, etc.). The other is that it can adhere to urban development regulations, in particular with reference to the Law on Land and Urban Planning Regulations of 1975, which establishes measures for the protection of the natural environment in those areas not zoned for building. Both possibilities have been applied for the protection of designated biosphere reserves. Frequently, both of these vias are combined and even national and autonomous regulations are applied to the biosphere reserves themselves. This is described below.

The most frequent protection category among the protected areas associated to biosphere reserves is natu-

ral park. There are six reserves associated to protected areas of this type: Grazalema, Montseny, El Canal y Los Tiles, Cazorla, Segura y Las Villas, Sierra Nevada and Manzanares. In reality, Manzanares adheres to the protection category of the Autonomous Region of Madrid itself, which is regional park, though its objectives coincide with those of the natural parks of the other reserves. On the other hand, the natural park associated to El Canal y Los Tiles has been afforded a more restrictive protection category in that it establishes a stricter protection of space, in comparison with the other natural parks. In all cases, the natural parks were declared based on autonomous laws, except for Montseny, which was declared under legal instruments included in national territorial legislation, and was later reclassified in accordance with autonomous regulations.

In addition to those mentioned above, three other reserves include natural parks. They are Mancha Húmeda, Doñana and Lanzarote. Menorca is expected to join this list shortly. In all cases, the declaration of natural parks is within the domain of the autonomous governments.

It is not surprising that the most popular protection category among those protected areas associated to biosphere reserves is natural park. In the majority of cases, the definition of this management category is very

3. URDAIBAI: INSTITUTIONAL PARTICIPATION IN THE PREPARATION OF THE GOVERNING USE AND MANAGEMENT PLAN

Given that the Governing Use and Management Plan is a complex legal instrument and that it had to be agreed to by several responsible administrations, the task of preparing it was quite difficult. In addition to this, because its main aim was to harmonize environmental aspects with social development in an area of diverse uses and interests it had to be agreed upon fully in order to ensure its subsequent implementation.

A multidisciplinary technical team (judicial, urbanistic, environmental) was responsible for drawing up a first proposal for the Governing Plan which included two possibilities for biosphere reserve management. The first contemplated the creation of a Board of Governors conceived as an autonomous entity and the second was a public company which would have ensured a more dynamic management. Both proposals were subsequently turned down.

The draft for the Governing Plan was explained in detail to the local mayors. After its preliminary approval, it was available to the public for review for two months, one month more than the usual, upon petition of the local population. During this period there were various public presentations, of both a technical and political nature, accompanied by advertising posters, maps, etc. which explained the plan's contents.

After this period, many allegations were made not only by private parties but also by institutions, political parties, unions, etc. An Interinstitutional Committee, of both a scientific and a technical nature (Subcommittee on the Environment and the Biscay Provincial Government), was created to prepare the final version of the Governing Use and Management Plan. This committee incorporated suggestions that had been made and answered allegations on an individual basis.

Soon afterwards, the Board of Managers approved the Governing Use and Management Plan. After several discussions and the creation of yet another mixed committee to consent to its cartography, the Plan was approved by the Government Council on August 30, 1992. As of that moment, it became the instrument agreed upon for biosphere reserve management, in which various administrations assigned by the Basque Regional Government participate. As stated in Article 8, «the competencies of the General Government with regard to the land of the biosphere reserve not zoned for building, shall act in accordance with the provisions contained in the Governing Plan and regulations for development, while fitting their reciprocal responsibilities to meet the obligations of mutual information, collaboration, coordination and respect among the same».

The Governing Use and Management Plan for the Urdaibai Biosphere Reserve is a baseline plan which lays out the guidelines for territorial management. It is to be carried out through Action Plans, Use Plans and the Plan for the Harmonization of Socioeconomic Activities

much in line with the philosophy and objectives of the biosphere reserve in that their purpose is to harmoniously balance the conservation of resources with the development of local communities.

There are four national parks within the Network of reserves which means that those reserves coinciding with national park territory are subject to national legislation. Given that national parks strongly emphasize conservation and thus propose severe restrictions on territorial use, they are more closely linked to the concept of a biosphere reserve core area and in all cases are considered the same.

On the other hand, the protection category of the area associated to the Marismas del Odiel BR, which is natural landscape, falls somewhere between national park and natural park. As per stipulations in autonomous Law 2/89 which reclassified the area, this category permits some uses which are compatible with conservation, without actively promoting the same.

Urdaibai is an exception with regards to the above because it was declared a biosphere reserve under Basque Parliamentary Law.

Four reserves have a considerable percentage of their land under no specific protection status: Ordesa-Viñamala, 82%, Mancha Húmeda, 77%, Lanzarote 58%, and Menorca, 57%. Nevertheless, the latter two have to develop an Action Plan for territorial management according to the principles of sustainable development, in line with the Action Plan for Biosphere Reserves. Each anticipates the creation of a coordinating body for the biosphere reserves, though at present this is not being considered for Ordesa-Viñamala or Mancha Húmeda.

There are areas within the biosphere reserve that do not correspond to one specific management category for protected areas. This is because their primary objectives do include nature conservation. This is the case of the National Game Reserves (Ordesa-Viñamala, Sierra Nevada), the Game Preserve (Cazorla, Segura y Las Villas), and the Game Refuge (Urdaibai).

Finally, several reserves are also subject to various international regulations which are binding for Spain because in one way or another it has adhered to the same. This is the case of the Conference on Wetlands of International Importance (RAMSAR), which has been in force in Spain since 1982, and the Directive 79/409/ CEE, related to the conservation of wild birds, which requires the establishment of Special Bird Protection Areas [known as ZEPA in Spain]. With the exception of Sierra Nevada and Montseny, the other Spanish reserves are designated, either entirely or in part, Special Bird Protection Areas (Urdaibai is currently in this process), and, in addition, Doñana, Mancha Húmeda, Marismas del Odiel, Urdaibai and Manzanares are RAMSAR Convention Sites.

Planning Legislation

General planning, that which is developed according to urban planning and land use regulations, has been ap-

plied to the management of several of the biosphere reserve areas. These situations are listed in chronological order according to their declaration dates as follows.

- Part of the Ordesa-Viñamala reserve is within the scope of the Jacetania Comprehensive Management Plan.
- Montseny, was one of the first reserves to apply the Law of the Land and Urban Regime of 1975 for its declaration as a natural park under its Special Protection Plan. This Special Plan, from 1976 and 1978, is also the first legal instrument on planning to be developed in the Spanish biosphere reserves. Subsequently, with Law 12/1985 on the Protected Areas of Catalonia, Montseny is adapted to these regulations, on an autonomous basis.
- The Executive Plan for the Territorial Coordination of Doñana and Its Surroundings has been in effect since 1988 in an area greater than that which is occupied by the Doñana biosphere reserve, although it has had a limited development. This legal instrument of territorial and urban planning which intends to adhere to the articulation of a model for the physical and economic planning of the area which it is applied to, is also included in the Law on the Land and has been used very little in Spain.
- For the islands declared biosphere reserves, the prevailing legislation is the Territorial Management Plan for the Island of Lanzarote. Menorca is still pending development of legal instruments included in Law 8/1987 on Territorial Management of the Balearic Islands.

In addition to the aforementioned legal instruments there are others which affect the Spanish reserves, especially their transition zones, such as the regional Urban Management Plans, Subsidiary Legislation, and Special Plans for the Physical Medium.

However, after enactment of Law 4/1989 of 27 March, of the Conservation of Protected Areas and of Wild Flora and Fauna, a considerable number of the specific regulations for protected areas prevail over urban planning policies, whose prevalence until then was a decisive factor with serious implications in territorial aspects. Such is the case with the Natural Resources Management Plan, which prevails over any territorial or physical management plan, and the Governing Use and Management Plans which, likewise, prevail over urban planning regulations.

Specific planning is developed for the management of concrete protected areas, normally through national or autonomous legal instruments which establish zoning, delineation of actions, administrative organizations, etc.

Although management plans have been carried out ever since the passing of the Law on Mountains of

Biosphere Reserve

Legal Planning instruments

GRAZALEMA	Use and Protection Plan, 1988.
ORDESA-VIÑAMALA	Annual Management Plans (National Park) La Jacetania Comprehensive Management Plan
MONTSENY	Special Protection (1977-78) and Use and Management Plans
DOÑANA	Executive Plan on Territorial Coordination of Doñana and Its Surroundings, 1988 Sustainable Development Plan for Doñana and Its Surroundings (1993) Governing Use and Management Plan, 1991 (National Park)
MANCHA HÚMEDA	Annual Management Plans (in both the National and Natural Parks)
EL CANAL Y LOS TILES	Pending preparation.
CAZORLA, SEGURA Y LAS VILLAS	Use and Protection Plan, 1988.
MARISMAS DEL ODIEL	Governing Use and Management Plan, 1990.
URDAIBAI	Governing Use and Management Plan, 1992.
SIERRA NEVADA	Natural Resources Management Plan, 1994. Governing Use and Management Plan, 1994.
MANZANARES	Governing Use and Management Plan, 1987.
LANZAROTE	Territorial Management Plan for the Island of Lanzarote, 1991. Governing Use and Management Plan, 1990 (National Park)
MENORCA	Pending development.

TABLA 2. Legal planning instruments (general and specific) for the Spanish biosphere reserves their associated protected areas

4. SIERRA NEVADA: ENVIRONMENTAL CONTROL AND RESTRICTIONS ON A SKI RESORT

As of 1966, Sierra Nevada has been home to a private alpine ski resort, located next to what constitutes the core area of the biosphere reserve. For several years, the ski resort operated without any type of environmental control, which brought about serious environmental impacts, particularly with regard to the urbanization of the area: hotels, apartments and chalets were built with all their inherent problems, and gave rise to the urban center of Pradollano, at an altitude of 2,3000 m.

In 1989 the area was declared a Natural Park. Representatives from the ski resort formed part of the Board of Managers which participated in the preparation of the Natural Resources Management Plan and the Governing Use and Management Plan. The ski station is now public and therefore coordination of actions is less complicated.

The initial objective of the actions was to apply existing regulations to manage and control skiing in a manner compatible with the park and biosphere reserve's objective of conservation by delineating the area of the ski resort and restricting any future growth, regulating its operations and isolating it from maximum protection areas of the park by establishing a protection area or buffer zone. Moreover, other proposals included the monitoring of the hydrographic basins affected by the ski resort and restoring the landscape of disturbed areas.

Several agreements, many of which are included in the recently approved management plans, have been reached in order to implement the above. These agreements prohibit the development of new resorts and restrict skiing to 50% of the skiable area (dividing it in two and declaring the outer part a «protection perimeter» for the impacts of the inner area used for skiing). They also measure the flow of the river and the quality of the water that reaches the resort. Work is underway to restore the landscape of the access road and for the revegetation of the ski slope and, lastly, the Subsidiary Regulations and urban improvement of Pradollano are being reviewed.

The effectiveness of the work that has been undertaken to improve the environment has yet to be determined because of the difficulties that the highland areas present due to their fragility and the difficulties of its regeneration. The public company which oversees the ski resort has a division in charge of environmental recovery and the land zoned for building in Pradollano has restrictions pending. Another important topic is the agreement reached to increase the number of accesses, while trying to maintain a balance between the normal regulations for roads and the conditions established by the reports done by the Environmental Agency of the Regional Government of Andalusia.

Projects and agreements are important examples of management designed to impede the uncontrolled development of existing infrastructure prior to the declaration of the park and biosphere reserve, in order to avoid irreparable damages to the fragile ecosystems of the Sierra Nevada highlands.

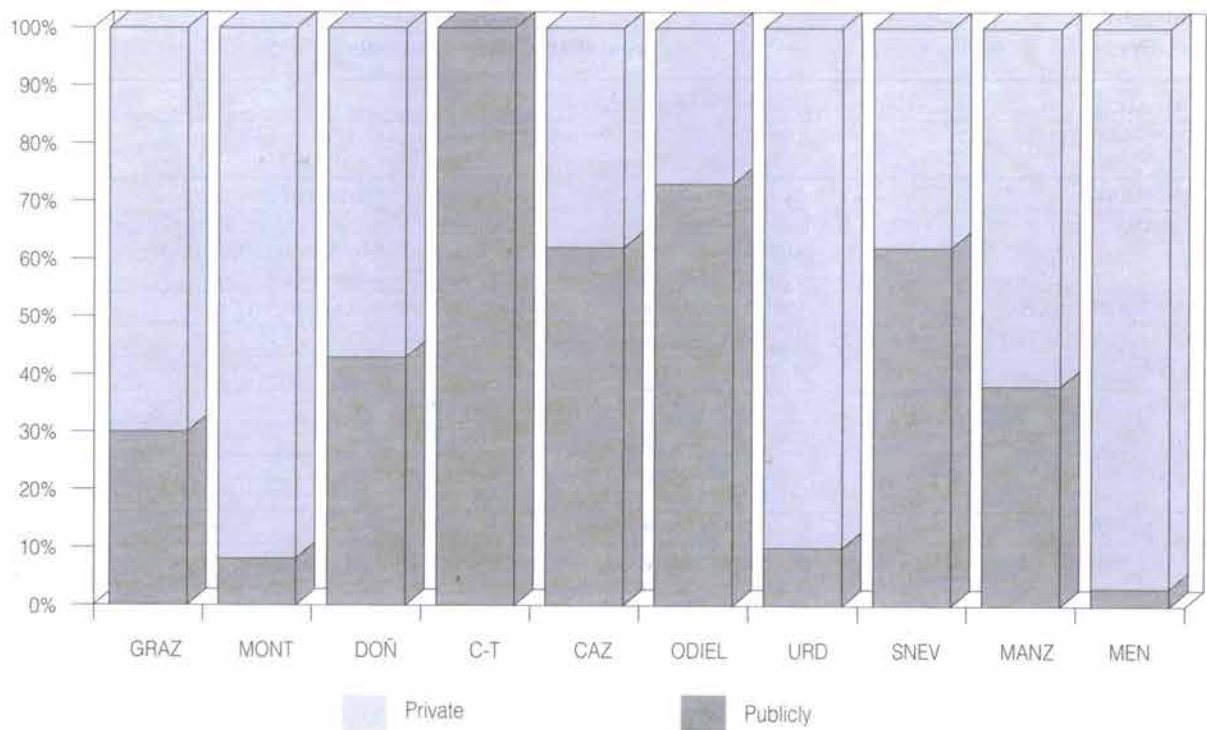


FIGURE 4. Total area of publicly and privately-owned land inside the Spanish reserves

1957, the preparation of Governing Use and Management Plans was included for the first time in Law 15/1975, of Protected Areas. Subsequently, the previously mentioned Law 4/1989 stipulated the creation of these plans for natural parks and natural reserves, as well as the need for a Natural Resources Management Plan prior to park declaration. However, in addition to those mentioned above, the different Autonomous Communities include other types of legal instruments of planning in their legislation.

As per law 5/89, the Governing Use and Management Plan encompasses and heads environmental planning, which identifies the capacities of the land, characterization and zones the area and determines land structure.

For its part, the Governing Use and Management Plan is meant to be the legal instrument of planning for the management of protected areas, regulating their organization and the functions of their advisory and representative bodies.

For those areas that do not have a Governing Use and Management Plan, which is the case for the majority of the Spanish reserves, a Natural Resources Management Plan or a similar legal instrument, usually includes most of the Governing Plan content.

The general situation of the Network reserves with respect to specific planning legislation can be seen in Table 2. The majority of the protected areas coinciding with a biosphere reserve have Governing Use and Management Plans (Grazalema and Cazorla, Segura y Las Villas have the equivalent in the form of Use and Protection Plans and Montseny has a Use and Management

Plan based on the Special Plan). In addition to this, Sierra Nevada is worthy of mention because, in addition, it has a Natural Resources Management Plan. The Urdabai Biosphere Reserve has also had a Governing Use and Management Plan since 1992.

Nevertheless, the situation is not as homogeneous in the rest of the areas, which do not coincide with a biosphere reserve: the Ordesa National Park is pending approval of its Governing Use and Management Plan, and in the meantime is creating Annual Management Plans; this is also true for the National and Natural Parks associated to Mancha Húmeda; the Doñana and Its Surroundings Natural Park is pending approval of its corresponding Natural Resources Management Plan and Governing Use and Management Plan; the Natural Park that includes El Canal y Los Tiles has not developed specific planning legislation either (it was declared in December of 1994); and lastly, of all those protected areas associated to the islands of Lanzarote and Menorca, only the Timanfaya National Park has a Governing Use and Management Plan.

Even so, it is important to mention that specific planning is much better in those protected areas associated to biosphere reserves than in the rest of the National protected areas, of which only 18% have developed legal instruments of planning.

With regards to the preparation and implementation of sectorial conservation and use plans, sectorial planning in the strictest sense has yet to be developed in full in the Spanish Network of reserves, although there are noteworthy exceptions.

BIOSPHERE RESERVE	CORE AREA	BUFFER ZONE	TRANSITION AREA
GRAZALEMA	Reserve area	Extensive use area	Intensive use area
ORDESA-VIÑAMALA	Area of the national Park inside the BR	Undefined	Undefined
MONTSENY	Classified Natural Reserve Area	Natural Reserve Area	Prepark
DOÑANA	National Park	Natural Park within the BR.	
MANCHA HÚMEDA	National Park	Protection area of the National Park	Undefined
EL CANAL Y LOS TILES	The entirety of the BR		
CAZORLA, SEGURA Y LAS VILLAS	Reserve areas	Extensive use areas	Intensive use areas
MARISMAS DEL ODIEL	Reserve areas	Extensive and intensive use areas	
URDAIBAI	Special Protection Areas	Protection Areas	The remainder areas (agricultural, forestry, system, etc.)
SIERRA NEVADA	A Areas	Areas B and C	
MANZANARES	A Areas (Natural Reserve)	B Areas (Regional Agricultural, T areas (Transition) and P areas (subject to Urban Planning)	
LANZAROTE	National Park and other protected areas.	Approx. the remaining of the protected areas.	The remainder of the island.
MENORCA	Future Abufera de Es Grau Natural Park	Remaining Special Areas of Natural Interest	The remainder of the island.

TABLE 3. Zoning systema of the Spanish biosphere reserves and their associates protected areas and their correlation to the zoning system recomended by MaB

The preparation of these sectorial plans are frequently called for in the Governing Use and Management Plans. As seen in Table 2, these are fairly recent, and thus, sectorial plans have not yet been fully developed. The Governing Use and Management Plans usually set out the guidelines for the preparation of sectorial plans, and most of the protected areas associated to the Spanish reserves carry out actions according to these guidelines without having sectorial plans.

For several reasons, it is not surprising that there are sectorial plans that have never been implemented. Two of the main reasons for this are difficulties in coordination among responsible administrators and budgetary shortages.

Land Ownership

The situation in the Spanish Network with regards to land ownership can be seen in Figure 4. The chart does not include those biosphere reserves for which there is no information (Ordesa-Viñamala, Mancha Húmeda and Lanzarote for which there is only data on publicly-owned land within the national park areas. In each case this is greater than 93% of the total area of the park. In several cases, this is only an approximate figure (Doñana, Cazorla, Segura y Las Villas, Sierra Nevada and Menorca).

As seen in the chart, the situation varies from park to park. However, if one compares this data to the total area of the reserves, it can be seen that the two reserves

with the greatest amount of publicly-owned land, El Canal y Los Tiles and Marismas del Odiel, are also the smallest. On the other hand, it is worth pointing out the significant amount of publicly-owned land found within the two largest reserves which are Cazorla, Segura y Las Villas and Sierra Nevada.

On the other hand, Menorca and Montseny are the two reserves with the least amount of publicly-owned land. This leads to considerable complications in their management, especially for land included in maximum protection areas: the conflicts of interest with the landowners are greater where restrictions on land use are more severe. It is not surprising, thus, that both Montseny and Menorca are in the process of acquiring land in these areas in order to increase the amount of land in the public domain. Other reserves have carried out similar actions. For example, the Doñana National Park is currently pending the expropriation of a 9,000 ha. estate worth 3,000 million pesetas and in Manzanares land amounting to approximately 5% of the total area of the reserve has been purchased for the core area over the last few years.

Zoning

The protection regulations and planning legislation of the protected areas associated to reserves always stipulates the establishment of a zoning system to ensure the effective treatment of each of the areas in terms of its characteristics and interest. The Urdaibai, Lanzarote

and Menorca reserves have also established zoning that addresses the different degrees of use permitted in the territory.

For its part, the MaB program identifies three types of areas for each biosphere reserve which are a core area, a buffer zone and a transition area. These were discussed previously in this report.

The situation in terms of the current zoning in relationship to MaB recommendations is shown in Table 3.

The table above, as well as the different regulations which determine the zoning of each of the areas, reveals the following:

- As mentioned before, given that the legislation of national parks coincides with the biosphere reserve requirements for a core area, those reserves which include a national park declare this territory the core area. Regardless of this, national parks have their own zoning system.
- Given the severe restrictions placed on uses, the entire El Canal y Los Tiles reserve is considered a core area.
- In those reserves associated to natural parks where development is a priority, the zoning of the different parks is not always comparable to the recommended zoning for biosphere reserves: there are no ambiguities with regards to the maximum protection areas, but there are differences in those areas considered the buffer zone and transition area. For example, areas whose function is to promote socioeconomic development are frequently incorporated into the buffer zone (i.e. the B areas of Sierra Nevada and Manzanares), and this is not always in line with what has been established by MaB. Actually, it would probably be more appropriate to speak of two or three different levels or degrees of protection, depending on the case, instead of a core area, a buffer zone and a transition area, which do not always correspond well to the reality of these areas.
- The zoning system established in Lanzarote and Menorca applies the same terms and regulation of uses as those recommended by MaB.

Conclusions to Objective 2: Management

Based on the above the following conclusions and recommendations can be made:

- National and autonomous legislation provide sufficient alternatives for addressing the protection,

territorial management and planning of territories occupied by biosphere reserves.

- Coordination among the administrations coinciding in biosphere reserve territory is fundamental. Adequate mechanisms for the effective coordination of activities should be established, particularly in those reserves where management is the responsibility of several administrations. This is usually the case for those biosphere reserves associated to more than one protected area or for those where less than a quarter of the total area the territory, is protected. In these cases, it would be beneficial to have an organization in charge of the coordination of management as well as of the legislation and resources necessary to carry this out.
- The most common protection category of the protected areas associated to biosphere reserves is the natural park which, in general coincides with the philosophy and functions of a biosphere reserve. National parks coincide with the concept of biosphere reserve core areas. The category of natural landscape entails restrictions on the promotion of socioeconomic development of the local populations.
- Despite exceptions of one form or another, there is a high level of planning in the Spanish reserves, especially if compared to the situation of the rest of the protected areas. The majority of the biosphere reserves (or their associated protected areas) have legal instruments of planning which favor the effectiveness of these functions. On the other hand, sectorial planning (resource conservation and use plans) is less developed, though this does not imply that actions are not carried out with similar criteria. Only in the case of Doñana is territorial planning that extends further than the reserve and its area of influence.
- In order to fulfill biosphere reserve functions, there has to be suitable planning legislation which covers the whole of the territory. At present, Ordesa-Viñamala, Mancha Húmeda, Canal y Los Tiles and Menorca do not meet this condition.
- None of the reserves fit the MaB zoning model for a typical reserve. However, it seems more important to consider whether the structure of a biosphere reserve ensures the fulfillment of its basic functions than whether it perfectly fits the management and zoning model, which may or may not be the ideal one for the each situation.

OBJECTIVE 3: *IN SITU* CONSERVATION

Objective 3 of the Action Plan is «to promote the conservation of key species and ecosystems in biosphere reserves.» It emphasizes the importance of having large enough areas to preserve the full genetic potential of species as well as the importance of cooperation and the exchange of information with those institutions dealing with the *ex situ* conservation and the need to initiate pilot projects for conservation management.

In order to describe the contributions of the Spanish Network of Biosphere Reserves, several of the more noteworthy actions carried out in different reserves are listed below. This may shed light on the diversity of actions undertaken, though this list is not meant to offer detailed information on the actions given that this can be found under the description of each of the reserves.

Fauna management plans generally focus on vertebrates and, of these, the different mammal and bird species, as seen below:

- Management plans exist for several species: in Doñana, the lynx, imperial eagle, etc.; in Cazorla, Segura y Las Villas, management of ungulate populations (see Box 5); in Lanzarote, the recovery of the Canarian huobara bustard; in Ordesa-Viñamala, the recovery of the Spanish ibex, etc.
- Plans for the reintroduction of species: the lammergeier in Cazorla, Segura y Las Villas; the mountain goat in Manzanares.
- Plans for breeding in captivity: the white-headed duck and lynx in Doñana; Spanish ibex in Ordesa-Viñamala, etc.
- Actions directed at the protection of various species: installation underground of high tension electrical lines (Doñana and Manzanares); installation of feeding troughs, etc.

The following are those noteworthy activities for the conservation of flora:

- Plan for the Recovery of Threatened Flora in Andalusia, which is underway in several reserves in Andalusia (see Box 6).
- The creation of germ plasm banks: the Botanical Garden of Córdoba for the Andalusian reserves; another in Mallorca for the genetic material of Menorca, etc.
- Various actions for the elimination of allochthonous species (El Canal y Los Tiles, Menorca, etc.).

Another important activity being carried out at the majority of the reserves is the prevention and fighting of forest fires. In those protected areas associated to the

Spanish reserves with large woodland areas, most of the budget assigned to conservation is spent on the management of forest areas with the aim of marking and cleaning firebreaks, constructing water deposits, preventive forestry treatment, purchasing fire extinguishing materials, etc. The fact that most of the budget goes to these actions does not always allow for other preventive forestry treatments, even though they are important for the conservation of the woodlands. In the Montseny reserve, plans for fighting fires are organized with the collaboration and involvement of several towns and villages located inside the reserve.

Supervision and control of compliance with regulations that have been established is important in the protected areas associated to the reserves. This is usually carried out by the park service.

The restoration and regeneration of ecosystems is another set of conservation actions that are gaining in importance. The following are noteworthy actions recently undertaken in the Spanish Network of reserves:

- the restoration of gravel mines and the recovery of autochthonous woodland vegetation in areas reforested with eucalyptus trees, in Marismas del Odiel;
- the restoration of Cantabrian evergreen forests in Urdaibai; hydrological-forestry restoration and erosion control, in Sierra Nevada, as well as the restoration of the natural medium associated with the construction of the infrastructure here; the restoration of woodlands initiated in Montseny after the fire of the summer of 1994;
- restoration of the Gola de la Albufera de Es Grau (the Es Grau Lagoon Channels) which is the core area of the Menorca reserve; etc.

The use and management of several resources, are closely linked to the actions mentioned above. This is essential for all those reserves with significant wetland areas. In Doñana a Hydrological Resources Management Plan for the National Park has recently been passed and even prior to this, other actions, referred to as «solutions», were carried out. In Mancha Húmeda, the Hydrological Regeneration Plan for the Tablas de Daimiel has been in effect for several years now and has managed to insure reasonable water levels in territory belonging to the National Park. In Marismas del Odiel, water pollution has been significantly reduced after implementation of the Industrial Discharge Mitigation Plan. Finally, in Urdaibai, monitoring is underway of the

5. MANAGEMENT OF UNGULATE POPULATIONS IN CAZORLA, SEGURA Y LAS VILLAS

From the creation of the Cazorla National Game Preserve in 1960 until its declaration as a Natural Park, in 1986, game management in these mountains has been directed at increasing the number and population of ungulate species which has included, among other actions, the introduction of both buck and wild Mediterranean sheep.

The increase in the ungulate populations over the last several years has given rise to tough competition among species. Many of the animals are beginning to show symptoms of malnutrition, with an increasing pressure on the surrounding vegetation. An important epizootic sarcoptic mange epidemic has affected the majority of ungulate species since 1987, with serious effects between 1988 and 1990 during which numerous mountain goats died.

In order to assess the situation in detail, as part of an official agreement between the Environmental Agency and the Higher Council on Scientific Research, a Census and Plan for the Reduction of Non-autochthonous Ungulate Species was carried out in October of 1991 with the aim of controlling the number and distribution of the same. Other objectives of this plan are to reduce the risk of epizootic epidemics, to recover the affected vegetal covering, particularly in the areas most degraded and sensitive to an overload of livestock, to recover the mountain goat population which was most affected by the mange epidemic, to genetically improve the remaining populations (deer, buck and wild Mediterranean sheep) and to improve the physiology of said individuals.

The results of the abovementioned census revealed the enormous difference between the existing density of the ungulate population and the ideal density for a Mediterranean mountain habitat with a balance between plant production and herbivore impact. If the four different ungulate species are taken together as a whole, depending on the area, the population ratio is from 8 to 18 individuals per Km², whereas recommended density is 5 to 8 individuals per Km². Thus there is a urgent need to drastically reduce the size of these populations. To do this, the following proposals have been made according to the species:

- Mountain goat; there were between 200 and 250 individuals in 1991; proposals include different measures for their recovery and protection.
- Deer; in 1991 there were 4,000 individuals; this number must be brought down to 3,000.
- Buck; this is an introduced species of which there were 4,700 individuals in 1991; this number must be lowered to 3,000.
- Wild Mediterranean sheep; there were 3,300 individuals of this non-autochthonous species; this number must be reduced to 2,000.

Once the process of reducing these populations is complete, a comprehensive management plan will be developed on the density and structure of ungulate populations.

As part of the same official agreement between the Environmental Agency and the Higher Council on Scientific Research for the Regeneration of the Habitats of Threatened Species in the Cazorla, Segura y Las Villas Natural Park, a Study and Plan for the Reintroduction of Roe Deer was completed, in 1991. To reintroduce this species a prior control of other ungulate species will have to be undertaken, particularly with respect to the exotic species, in order to avoid competition for food. A control of foxes and wild dog will also be necessary. According to the conclusions of the study, the founding population should consist of between 20 to 30 individuals. They would preferably be introduced in Sierra Madrona, in order to more closely match the characteristics of the extinct roe deer populations of Cazorla, Segura y Las Villas.

The actions described illustrate how management and research should be approached jointly in the undertaking of conservation tasks

ecotoxicology of the estuary, together with actions directed at minimizing the discharge of pollutants.

Actions focusing on the conservation and recovery of cultural wealth are much less common. Examples of these are the Plan for the Recovery of the Saltworks in Lanzarote or the subsidies awarded to maintain farming in La Geria which gives rise to one of the most characteristic landscapes on the island. In any case, efforts towards the maintenance of traditional activities and uses in many of the reserves often entail the conservation of the landscape that these same activities have given rise to. There are several examples of this within the Spanish Network. However, those actions will be complex and costly to the degree that there is an increasing imbalance between the current economic situation and what previously conditioned the workings of the rural agro-ecosystems and landscapes.

A significant exchange of information takes place on conservation themes among the reserves and their associated protected areas. This is even greater among those reserves with analogous ecosystems such as Marismas del Odiel and Doñana, or with similar geographic characteristics such as Menorca and Lanzarote. Along the same line there is also close collaboration among research centers, such as those mentioned under the following objective.

Generally speaking, managers have neither jurisdiction over the enactment of actions that influence the conservation of resources in the Spanish reserves (plans for solid waste, dumping, roads, etc.) nor the possibility of coordination with institutions responsible for their implementation. Therefore, there is a significant lack of suitable coordination between the reserves and the different administrations with responsibilities in reserve te-

6. PLAN FOR THE RECOVERY OF THREATENED FLORA IN ANDALUSIA

A study on the areas of botanic interest in Andalusia and the creation of a register of threatened flora species, revealed that in the Autonomous Region of Andalusia there are 75 endangered species and 120 threatened species. Moreover, 60% of the areas of botanic interest are located within the designated protected areas of this region.

In 1992, on the basis of several official agreements made between the Environmental Agency and research centers (The University of Andalusia, The Higher Council on Scientific Research, The Botanical Garden of Córdoba), Recovery Plans were drawn up for each species, and to date 49 of those for species classified as threatened have been completed. These plans include the following measures:

- a detailed study of the biology, reproductive systems and influencing factors of each of the species, as well as a geographic characterization of the plant communities and their present state;
- internal conservation actions, within the habitats themselves, with the aim of restraining the principal threatening factors. Among these the pressure of excessive herbivore grazing, the nitrification of soil, selective harvesting practices and forest fires stand out.

- conservation in situ in the form of several measures: cultivation in plant nurseries, works in botanical gardens and seed banks and the development of multiplication techniques such as in vitro cultivation.

At present, some specific actions are being implemented although the Recovery Plans have not yet been passed; likewise, several general measures have been taken which affect all of the species under study.

Thanks to the approval of a Life project and the renewal of agreements with different participating research entities, there is a proposal for the preparation and implementation of a Recovery Plan for each of the inventoried threatened or endangered species.

A significant part of these actions are being carried out in the Cazorla, Segura and Las Villas, the Sierra Nevada and the Grazalema Biosphere Reserves, given that they contain important numbers of plant endemisms and that they have several amenities which facilitate research and conservation, such as the botanical gardens.

territory. One of the reserves which had implemented a Plan for this purpose was Doñana with its Executive Plan for Territorial Coordination, although it has not proven very effective because it lacks further development. The experiences of other reserves such as Urdaibai, Lanzarote and Menorca, where there is an attempt to attain said coordination among administrations, can act as possible examples and means for action in this direction.

Conclusions to Objective 3: *In Situ* Conservation

The overall situation with regards to the conservation of species and ecosystems in the Spanish biosphere reserves is good. The exception to this is Mancha Húmeda where the natural environment has undergone drastic modifications (the draining of several lagoons and wetlands in the reserve) which only costly plans have been able to mitigate in areas such as the Tablas de Daimiel Natural Park.

Conservation actions focus on the natural environment and the conservation of species and ecosystems,

which is not surprising given the existing links between biosphere reserves and the protected areas spoken of earlier. The conservation of cultural wealth and resources, such as archaeological remains, cultural demonstrations, landscapes, etc., receive markedly less attention. Nevertheless, an increase in actions supporting traditional uses is a step forward in this direction, in addition to the conservation of many landscapes and the cultural elements associated to them.

Plans and actions with reference to the management of animals favor mammals and birds over other taxonomic groups. Plans for the restoration of ecosystems and management of resources have gained importance over the last few years.

A significant amount of resources used in conservation are invested in the prevention of forest fires which, for budgetary reasons, limits other actions.

The wording of this objective in the Action Plan is clearly biased towards the natural environment, and makes no mention of the conservation of cultural wealth.

OBJECTIVE 4: RESEARCH

According to the Action Plan for Biosphere Reserves, this objective is «to promote coordinated research projects on conservation science and ecology within biosphere reserves». This is given high priority within the scope of reserve actions, particularly basic and applied research «to develop the scientific basis for the sustainable use and long-term conservation of these ecosystems». It also points out the value of research «for the development of models to enable the prediction of environmental changes and trends,[...] thus «providing an international framework for comparative research». Other themes which specifically demonstrate the value of research are the restoration of ecosystems and the harmonization of traditional resource utilization with scientific work, to achieve sustainable use of the same.

Research is one of the most fully developed activities in the Spanish Network of reserves although it follows certain trends according to its focus:

- the most frequently dealt with aspects are, primarily, basic research on the physical and biological elements, and secondly, research directed at resource management and conservation. Both aspects are covered by practically all of the reserves, although quantity varies. Thus, the Governing Use and Management Plan for the Doñana National Park, which is probably the most written up protected area in Spain, sets forth as its primary objective the undertaking of «research projects aimed to resolve problems inherent in park management».
- Very different, in terms of the amount of studies and the resources invested, is the applied research directed at socioeconomic aspects, sustainable development and the upgrading of environmental education and the dissemination of information.

In general, most of the reserves, or their associated protected areas, do not set aside substantial sums for research in their budgets. For this reason research is carried out through official agreements with universities and research centers such as the Higher Council on Scientific Research, [known by its Spanish initials CSIC], which participates in projects underway in several reserves. Structured research plans, which lay out priorities in lines of work are not common either. Instead the needs or problems that arise in management are the deciding factors when choosing research topics.

As shown in Table 4, amenities and facilities available for research, conservation or monitoring activities

are not as liable to change as other aspects of the reserves.

The Spanish reserves carry out an exceptional amount of research. In 1991, more than 3,000 studies were done on Doñana, and in 1993, 200 research projects were underway simultaneously in this same area. Moreover, the two documentation centers in the Montseny reserve contain 3,660 documents on either naturalistic aspects or historical and ethnological features of the massif. Another example of related actions are the grants awarded for research studies on the Urdaibai Biosphere Reserve, thus expanding the knowledge of its functioning and dynamics.

Even so, although the situation with respect to awareness of the medium is much better in the biosphere reserves than in the rest of the country, a lot more needs to be learned about the structure of their ecosystems and how they function. This aspect places serious limitations on suitable management practices. Inventories of many of the biotic or abiotic resources present are usually not available, or are inadequate. The following quotation by Jaume Terradas in reference to Montseny which, as mentioned, is one of the reserves with the oldest tradition of research, serves as an example: «in Montseny, which had published a catalogue of 216 spider species in 1986, a study on a small limited plot of holm oaks [...] led to the discovery of 118 new spiders, simply because in addition to traditional floor traps, newer, less traditional ones were used in sampling»⁹.

In four cases, there are research centers linked to the corresponding reserves, all of which are high level although some are more exclusive than others. In Doñana, this is the Biological Station which is dependent on the Higher Council on Scientific Research. Although its main offices are in Seville, it occupies 6,700 ha. in the heart of the National Park. The center associated to Manzanares is mentioned in the box in this chapter as the first research center to do specific research on the management of protected areas. The investigation centers in Lanzarote and Menorca, are La Casa de los Volcanes and the Institut Menorquí d'Estudis, respectively. The existence of other research centers such as those

⁹ Terradas, Jaume «Investigación en Espacios Protegidos» (1992). *Investigación y gestión en Espacios naturales protegidos* (The Fernando González Bernáldez Center for Research on Protected Areas, 1994)

GRAZ MONT DOÑ C-T CAZ ODIEL URD SNEV MANZ LANZ MEN

Air pollution surveillance station		2	X				X				X
Meteorological station	X	X	X	X	X	X	X	X	X	X	X
Hydrological surveillance station	X		X	X		X	X	X		X	
Laboratory	X	X	X	X		X	X		X		X
Library/Documentation centers	X	2	X	X	X		X		X	X	X
Facilities for conferences/meeting		X	X	X	X	X	X		X	X	
Logistics support (all-terrain vehicles, boats)	X	X	X	X	X	X	X	X	X	X	X
Permanent surveillance of lake and river plots		X	X				X				
Idem bentic marine communities							X				
Idem vegetation	X	X	X		X	X		X	X		
Facilities for surveillance of small basins	X		X			X	X				
Research centers			X						X	X	X
Autochthonous plant nursery	X				X				X	X	
Seismological Station		X								X	
Facilities for the storage of biological and environmental collections					X	X			X		X

Data is not available on Mancha Húmeda nor on Ordesa-Viñamala. X = Existence of facility/amenity; N0= Number of facilities.

TABLE 4. Biosphere reserve amenities and facilities directed at research, conservation and monitoring

7. MANZANARES: THE FERNANDO GONZALEZ BERNALDEZ CENTER FOR RESEARCH ON PROTECTED AREAS

The center for Research on Protected Areas is the result of a cooperation agreement made between the Environmental Agency of the Autonomous Government of Madrid and the Interuniversity Department of Ecology of Madrid in 1989. Two years later the center was brought into operations. This center, which was named after the late professor Fernando González Bernáldez who was of its principal promoters, provides a scientific basis and necessary infrastructure for the development of ecological research programs related to the regional park and, therefore, to the biosphere reserve. Its main objective is the production and dissemination of scientific information for the management of protected areas and in particular for the Cuenca Alta del Manzanares Regional Park. To meet this objective several activities in different fields are being carried out: basic and applied research, scientific and technical support in management, the creation of coordination actions for the protected areas, etc.

The most relevant lines of research underway at present are the following:

- Agroecosystems, directed at facilitating conservation and the development of traditional agrarian landscapes.
- Ecology of landscapes and their recreational use. Landscape conservation and its interdependence with the changes in land use of the territory, the impacts caused by recreational activities and the compatibility between recreational use and conservation.
- Aquatic and riparian ecosystems.
- Ecological cartography.
- Conservation networks, where such important aspects as how to maximize the effectiveness of the structure of protected areas and the interrelationship between them, as well as the conservation criteria for selecting areas to protect. As for support in management, the center produces documents that are useful in the planning and management of protected areas in the Autonomous Region of Madrid. An example of this is the draft of the new Governing Use and Management Plan of the Cuenca Alta del Manzanares Regional Park, which includes many of the principles gathered in the Action Plan for Biosphere Reserves.

With regards to training activities, the center offers support for various undergraduate classes, courses on research and management of protected areas for graduate students and training courses for technicians and managers, etc.

Among activities for the coordination of protected areas, the center is currently the headquarters of the Spanish Division of the Federation of Nature and Natural Parks of Europe, whose aim is to facilitate, support and promote both cooperation among protected areas in Spain and communication with other European parks.

In addition to other amenities, the Fernando González Bernáldez Center for Research on Protected Areas has several support facilities such as a library specializing in themes related to research on ecology and the management of natural areas, laboratories and very good computer equipment.

mentioned is very beneficial in that they facilitate the coordination of different lines of research with the needs of management.

It is usually difficult to coordinate research with management because results are obtained more slowly than management demands. One of the ways research is linked to management in the Spanish biosphere reserves is through meetings, exchanges, seminars and conference. There knowledge can be shared, experiences exchanged and gaps detected, while at the same time communication is incremented among different lines of research as well as among research workers and managers. Some of the reserves where meetings like these have been held are as follows: Montseny, scholarly trobadas, or meetings; in Urdaibai, conferences on scientific research of which the last was Environmental Planning of the Territory and Sustainable Development; in Menorca, Conference on Conservation and Development; and in the Comprehensive Management Planning of the Wetlands in the Marismas del Odiel.

Some of the reserves have developed projects under the auspices of the MaB program and a few of the most recent ones are listed below:

- Study of the influx of visitors to Montseny;
- the Cuenca Alta del Manzanares Regional Park Center for Research;
- Meeting on Sustainable Development and Tourism in Menorca;
- Projects prior to a Possible Declaration of a Biosphere Reserve (Lanzarote);
- Comprehensive Management Plan for the towns and villages inside the Natural Park area in Sierra de Nieves.

In the case of Manzanares, Lanzarote and Menorca, their relationship with the MaB program which «took place» through these projects came to an end when they were incorporated into the National Network of Biosphere Reserves. On its part, Sierra de las Nieves will most likely be the fourteenth biosphere reserve in Spain if its petition for the same is approved at the «reunion de las mesa» of the International Coordinating Council of the MaB program. However, the MaB program framework has been used very little to participate in international research projects of projects for the promotion of the same.

Conclusions to Objective 4: Research

Research is one of the most fully developed activities in the Spanish biosphere reserves, despite the shortage of budgetary funds for this. Infrastructure and facilities for carrying out research are gaining importance.

The majority of projects undertaken in the reserves are directed at basic research and at conservation and resource management. Nevertheless, there are many gaps in the understanding of ecosystem structures and how they function. Research that focuses on sustainable development, environmental education and socioeconomics is much less frequent.

Considerable progress has been made in research over the last several years by the Spanish reserves. Several official agreements have been made with universities and research centers and documentation or research centers associated to biosphere reserves have also been. Several actions to facilitate the exchange of information among research and management personnel have also been initiated, the most frequent of which includes organizing meetings and conferences.

OBJECTIVE 5: MONITORING

This objective is defined as Permanent Supervision in the 1984 Action Plan and its purpose is «to develop monitoring activities in biosphere reserves in order to provide a basis for scientific research and management activities and to contribute to the understanding of environmental change.» The Action Plan also points out the value of reserves for the monitoring of biogeochemical cycles, ecological processes and the effects of human use on the biosphere.

The aim of monitoring is, thus, to detect changes in the environment or society and, whenever possible, identify the causes. This way, management's effectiveness can be assessed and corrected when it fails to meet its objectives. Moreover, the only way to detect and analyze global processes and changes, such as global warming, other climate changes or the loss of biodiversity, is by integrating the results obtained in all areas of monitoring on a regional and global level. Hence, there is a need for common methods of analysis.

With regard to monitoring as it is defined above, the Spanish biosphere reserves leave room for improvement. The trend, although there are always exceptions, is to carry out isolated actions which are not always based on established or specific plans and do not always point out the effectiveness of management. Even more frequently, reserves participate in monitoring programs that go beyond their boundaries.

As a reflection of the situation mentioned in the objective on research, monitoring actions are directed more at physical and biological components of the environment, and less at socioeconomics. Therefore, the most frequent monitoring programs and actions in reserves or associated protected areas have to do with vertebrate populations and, to a lesser extent, with plant species.

Some of the most noteworthy monitoring experiences initiated within the Spanish reserves, in addition to those focusing on fauna and flora species, are the following:

- Using satellite images to monitor plant communities and the dynamics of landscape (Montseny). The monitoring of the evolution of vegetation, geomorphology, dumping, polluting discharges, crops, etc. also based on satellite images or georeferenced data, in Marismas del Odiel.
- Through the Dumping Mitigation Plan, also implemented in Marismas del Odiel, the reserve participates in the monitoring and control of dumping

and atmospheric emissions originating from the industries that border the estuary. In Urdaibai, monitoring has been carried out on the ecotoxicology of the estuary since 1993, and a Minimization Plan for Industrial Waste Management was put into effect the same year.

- The Urdaibai reserve is also analyzing the ecological consequences of the changes in land use which have taken place over the last thirty years.
- In Manzanares, permanent plots of pasture sampling have been maintained since 1976, long before it was declared a biosphere reserve or regional park.
- One of the most popular monitoring actions is controlling the number of visitors, and occasionally carrying out studies on their characteristics.
- In Montseny, a Program for the Monitoring and Control of Biological Heritage and Physical-Chemical Parameters has been underway in the biosphere reserve since 1992.

— An observatory for socioenvironmental monitoring is being brought into operation in Menorca with the aim of providing constant data on the physical, biological, socioeconomic and sociocultural state of the island.

In 1991, the Biosphere Reserve Integrated Monitoring Program was established by EuroMaB, a network of European and North American biosphere reserves whose aim is to promote intra-regional cooperation. Its principle objective is to organize a network for integrated ecological monitoring in the EuroMaB biosphere reserves which can later be extended to reserves worldwide and provide the following:

- access for scientists and managers to the physical, biological and sociological information available on other EuroMaB reserves;
- a means for a systematic exchange of scientific data;
- the integrated monitoring of biosphere reserves, with special emphasis on global climate change, biological diversity, ecosystems management and human impact, and environmental sustainability.

To date, the participation of the Spanish reserves in this network has been limited to the contribution of data to the recently published ACCESS directory. This provides the environmental data bases and the scientific infrastructure for research, etc., of 175 biosphere reserves in the 32 EuroMaB countries.

As for the Spanish Network, there is a need for a

8. AN ECOAUDITORY OF THE NATURAL SYSTEMS IN MONTSENY

As early as the beginning of the seventies, the scientific data and work available at that time in Montseny was used for the declaration of its Special Plan. Several of these studies were commissioned specifically for the occasion, and a total of 64 documents were used in drawing up the plan.

From 1977 to the present, during the seventeen years that the Special Plan has been in effect numerous studies, analyses and research projects have been promoted mainly by the park itself, based on commissions and official agreements with universities and other institutions, theses and conferences. Thus, the two park documentation centers have collected 3,660 documents on the features of the Montseny massif. On the other hand, the activities included in the Plan for the Monitoring and Control of Biological Heritage and Physical Chemical Parameters of the Montseny reserve only began in 1992. A large amount of data on the massif has been collected in the three years that the plan has been in effect.

As a result of this, the Montseny Biosphere Reserve is one of the most studied natural systems in Spain. However, an «ecoauditory» based on up to date reports made by experts on the different natural systems is needed in order to determine their state and components¹¹. The objectives are to:

- assess the present understanding of its composition and its workings;
- define the existing gaps in data and the suitable plans of action to overcome these;
- establish, from existing documentation, the evolution of the different systems or elements of the same over the last twenty years, or analyze the gaps in data and the way to gather it in the future;
- analyze the effects of the monitoring plan on the understanding and control of systems and their components, identifying positive aspects and gaps in the program.

The results of this diagnosis or «ecoauditory» will be used for modifying the Park's Special Plan and serve as a basis to improve monitoring actions.

standardized protocol which shows how those reserves contributing information can later benefit from the resulting data bases, even when their technical infrastructure is limited. Another important question which needs to be dealt with is the determination of the threshold of significant parameters so the program is within reach of its potential users.

In addition to direct participation in the ACCESS directory, the Montseny Reserve has initiated, within the scope of BRIM activities, the control of forestry plots to monitor the pollution of European woodlands. This reserve has also been incorporated into the EuroMaB bird monitoring network.

In 1992, a work group was created for Monitoring Programs within the framework of the recently created Spanish Network of Biosphere Reserves. Its aim is to «prepare a work plan to establish a monitoring program that can be applied to other Spanish reserves».¹⁰ Despite recommendations made and conclusions disseminated to the rest of the network, after several sessions the group confirmed the difficulty of establishing a joint monitoring program given the diversity of situations. As a result of this, the group is still at the stage of determining what steps need to be taken.

¹⁰ Secretariat of the Spanish Committee of MaB, «Minutes from the session in Torla» (Huesca, June 18 and 19, 1992).

¹¹ Proposta d'ecoauditoria del sistemes naturals del Parc Natural del Montseny, *Servei de parcs naturals de la diputació de Barcelona* (Barcelona, 1994)

The proposals made by the group distinguish the following two lines with respect to monitoring in the Spanish Network of reserves:

- monitoring the objectives of biosphere reserve management and assessing their effectiveness;
- monitoring different aspects of the environment, in order to detect changes, brought about not only by dynamics of a natural origin but by the effects of human activities.

Conclusions to Objective 5: Monitoring

This biosphere reserve objective is not as developed as others. Most of the work is centered around monitoring the physical and biological mediums. Although the work on these aspects is, in general, deemed insufficient, the most important gaps lie in the area of socioeconomics. For this reason, all kinds of projects related to the assessment and monitoring of the evolution of biosphere reserve components should be promoted.

Noteworthy monitoring activities within the Spanish network are the Dumping Mitigation Plan in Marismas del Odiel and those being initiated in this same reserve and at Montseny through the use of satellite images.

The monitoring group created within the Spanish network has yet to come up with a common strategy. Although there are some exceptions, proposals such as BRIM, the integrated monitoring program for European and North American reserves, have yet to be implemented.

OBJECTIVE 6: REGIONAL PLANNING

The aim of this objective as defined in the Action Plan is «to enhance the role of biosphere reserves in regional planning and development». One of the most valuable features of the reserves is that they offer an ideal way of «integrating conservation with development by building on the knowledge of indigenous peoples about the sustainable management of their ecosystems». Noteworthy amongst recommended activities are those «linking biosphere reserves to major development projects to ensure that these contain appropriate elements of protection and of the sustainable use of local ecosystems». The Action Plan also states that biosphere reserves should have «economic and social benefits for local people, but also have value in demonstrating sustainable development tied to conservation in the wider biogeographical region.»

Undoubtedly, this is one of the objectives which is most emphasized by the majority of the Spanish reserves. This is revealed in the number of comments made at meetings and, as seen below, in the efforts being made by a many of the reserves to meet this objective.

The situation in the Spanish reserves with regards to fostering regional planning and development varies between two extremes: on one end are the restrictions on those uses with negative impacts on conservation and resources and, on the other, the promotion of activities compatible with the conservation of these resources.

Depending on the nature of the biosphere reserves or the associated protected areas, the trend is usually towards one of these two extremes. Thus, except for in their maximum protection areas, national parks tend to promote the development of activities that do not lead to the degradation of existing resources. As previously mentioned, another one of the protection categories present in the network is natural landscape (Marismas del Odiel), which entails a degree of protection somewhere between the two types of parks. The Urdaibai, Lanzarote and Menorca Biosphere Reserves, each of which corresponds to the zoning system to different degrees, also give priority to regional development whenever it is compatible with resource conservation.

As is the case in the country as a whole, serious transformations have taken place in the primary production sectors of the territories occupied by reserves during the last few decades. The trend is towards the abandonment of traditional primary uses and conversion to either intensive agricultural activities, or activities linked to other economic sectors. With regard to

the reserves, this is especially notable in the case of the tertiary sector which is tied to tourism or second homes. To this respect, the work done in the reserve toward analyzing and managing these changes is of particular importance.

Due to this situation, the question arises of how to maintain traditional uses in the biosphere reserves and, therefore, some of their most valuable landscape characteristics, in a society that has changed and that lives and thinks quite differently from the way it did thirty years ago. Faced with the difficulty of maintaining many of these uses when socioeconomic conditions make change possible, it becomes necessary to replace old uses with more simplified ones that maintain the key elements of the land system (for example, the preservation of hedges and thickets, traditional walls and terraces, certain forms of grazing, etc.).

It must not be forgotten that many of these traditional land uses under threat today are magnificent examples of the sustainable utilization of resources. The Spanish biosphere reserves contain numerous examples of these uses, whose diversity is also of considerable cultural wealth.

However, the lack of studies and of a suitable socioeconomic monitoring program make it either difficult to implement these actions, or impossible to assess their effects on the local population. Thus, the development of research which provides methodologies and indicators that allow for the monitoring of the reserve's impact on society and identifies the necessary tools for reacting to undesired effects, is of utmost importance.

The tourism sector is becoming an integral part of the reserves as a way of stimulating local development and the diversification of activities. A large part of the development programs being put into practice in the Spanish reserves are also tied to the heavy influx of visitors, which is on the rise. The management of tourism and its relationship to the local economy is also being developed, through different mechanisms. This will be discussed in the section on public use activities.

Many of the actions directed at the promotion of regional development in the biosphere reserves have been tied to the acquisition of European funds. An example of this is the Sustainable Development Plan for Doñana and Its Surroundings (see Box 10) or the projects and actions linked to the Leader program.

The Leader program is a European Community initiative for rural development which was approved in 1991.

9. THE PROMOTION OFFICES OF THE BIOSPHERE RESERVES IN ANDALUSIA

The planning instruments for the biosphere reserves associated to natural parks managed by the Environmental Agency of the Autonomous Government of Andalusia (Sierra Nevada, Grazalema and Cazorla, Segura y Las Villas), set forth the creation of Promotion Offices. This body is overseen by a Promotion Manager who is also a member of the corresponding Board of Managers.

The key functions of the Promotion Office include monitoring the general socioeconomics of the parks and their areas of influence, as well as undertaking activities to foster socioeconomic development according to a criteria based on the sustainable use of resources. Supporting development takes place through the carrying out of several actions whose aims are as follows:

- assemble external aid for priority projects;
- implement promotion programs; make proposals to the Board of Managers for measures to coordinate government bodies in carrying out said programs;
- study, assess and support business projects that favor development compatible with the conservation of resources; support the production and marketing of local items (future plans include starting up a marketing agency among the promotion offices for natural park products);
- set up a sole information office for the same and provide consultation on filing for authorizations, licenses and concessions granted by the different bodies of the Autonomous Government of Andalusia, for the execution of projects, thus facilitating this process.

Therefore, the Promotion Office should act as a liaison between businesses and the administration on matters of economic development, in coordination with the park administration and its Board of Managers. The proximity to the territory in which it intervenes allows for a deeper understanding of the socioeconomic reality and makes it possible to implement action programs that are both better coordinated and closer to real needs.

Its aim is to establish a system of worldwide integrated subsidies for local groups, within the guidelines of endogenous development which respects rural landscapes and environments. The sectors that are given priority for these investments are rural tourism, support for small and mid-sized companies, the commercialization and appreciation of agricultural products, and technical training and support. Several reserves have been afforded Leader I programs for their territories, such as Grazalema, Sierra Nevada and Menorca.

An increasing number of financial instruments are being created in the heart of the European Union, occasionally for environmental protection and the promotion of a sustainable rural development, but more frequently to compensate the impact that many of the actions sent out of Brussels have. Many examples of this contradiction exist in the Spanish reserves, such as the promotion of European funds for stockbreeders in Cazorla, Segura y Las Villas when the aim is actually to reduce the livestock load in many areas of the reserve, or aid to irrigation, which has led to serious problems in the aquifers in Mancha Húmeda and Doñana. Another example of this is the progressive abandonment of semi-extensive stockbreeding in Manzanares, partly due to the Common Agricultural Policy, etc. Nevertheless, it would be of great interest to analyze all of the financial possibilities for each of the projects to be developed in the biosphere reserves. There are numerous sources of funding given that the reserve philosophy coincides perfectly with what is being fostered by the V Program on Environmental Policy and Actions.

The existence of coordinating organizations for socioeconomic development in the reserves is a useful tool in reaching the goals laid out in this objective. Exam-

ples of this are the Promotion Office in natural parks associated to the reserves in Andalusia (see Box 9) and the Center for Rural Development brought into operations in Menorca for the development of activities tied to the Leader I Program. However, not only is the existence of these organizations important but so is their coordination of the responsible parties and managers of biosphere reserves or protected areas. This ensures that the development being promoted is not contradictory to the maintenance of key resources.

One of the major problems in the reserves, which is even greater when the percentage of privately-owned land is high or the reserve coincides with a protected area under a strict protection category, is finding the mechanisms to compensate local populations for restrictions placed on uses, which, in many cases, is a benefit to the whole society. Law 4/1989 sums up the need for this in Article 18: "With the aim of contributing to the maintenance of protected areas and to compensate the affected populations on a socioeconomic level, its regulations provide for the creation of Areas of Socioeconomic Influence, with specifications on the economics and adequate compensation for the type of restrictions.

One of the mechanisms for compensation chosen has been in the form of priority investments, such as the 60,000 million pesetas to be put to use in the Doñana area for the Sustainable Development Plan. Another of the mechanisms used to compensate and promote regional development has been the granting of subsidies to private parties. In Montseny for example, or to towns and villages in the affected area, such as in the case of the Doñana National Park, which afforded 132 million pesetas to different municipal corporations in the surroundings for the building of public use ameni-

10. A SUSTAINABLE DEVELOPMENT PLAN FOR DOÑANA AND ITS SURROUNDINGS

Planning for the Doñana biosphere reserve and its surroundings has gone through a complicated process, due to existing conflicts in the territory. Some of these conflicts have included strict conservation in some areas, an intensive use of natural resources (especially for the purposes of tourism and agriculture) and the filing of claims for compensation brought about because of the Natural and National Parks restrictions on land uses.

The Autonomous Government of Andalusia put together an International Committee of Experts to analyze the situation of the region. This committee prepared a report in 1992 which clearly revealed the ways to ensure a decent standard of living for the inhabitants of the Doñana area, based on the rational exploitation of its touristic and natural resources. The need for a public investment plan to upgrade infrastructure and better the professional qualifications of the local residents was also pointed out. The report sets forth strategic lines of action for this new development and recommends the implementation of an investment program to equip and improve the situation of the towns and villages in the Doñana area. This report was the predecessor to the current Sustainable Development Plan.

The Sustainable Development Plan for Doñana and Its Surroundings was put into effect at the end of 1993. Of the 60,000 million pesetas to be invested by the year 2000, 75% will come from the European Union, 18% from the Autonomous Region of Andalusia, and the remaining 7% from the Central Government. The plan includes eight programs which, as a whole, address socioeconomic revitalization in the area while respecting the environment. These programs are listed in the order of most significant investment to the least: comprehensive management of water (31% of the total funding), amenities and road infrastructure (25%), agriculture (21%), environment, and promotion of economic activities, training and cultural heritage, tourism and complementary planning and management measures.

Once implemented, these sectorial programs are expected to prove beneficial in the biosphere reserves. The aims of the Comprehensive Management Plan for Water are to protect the aquifer faced with the risk of overexploitation, search for alternative hydrological resources, guarantee water supply to the local populations and a comprehensive clean-up of all of the river basins that flow into Doñana.

In other areas such as infrastructure, the plan is to improve the road network. Some actions have already been initiated, though not always within the Sustainable Development Plan, such as converting the El Rocío-Matalascañas road into two lanes. This has been much discussed amongst conservationists due to the possible impact on lynx populations, despite the anticipated construction of underground passageways). The Agriculture Program intends to maintain agrarian activity in an area the same size as now, but reduce and reorganize the irrigable land and utilize new hydrological resources so as not to depend on groundwater.

The Plan's actions will affect a large geographic area around the biosphere reserve, although the towns and villages owning the most land inside the protected areas are those who will most benefit. It is anticipated that these actions, as a whole, will make it possible to harmonize development with conservation in one of the most valuable natural areas in Spain.

ties. Nevertheless, there is still a need to find more suitable solutions to this problem

As mentioned above, another of the major limitations the reserves face in terms of effectively meeting their objectives or the fulfillment of their functions is due to the difficulty in coordinating actions with the rest of the administrations responsible for regional planning. The lack of coordinating mechanisms, and at times, the conflicts and tensions among institutions with sectorial or territorial authority over the reserves, makes it difficult to carry out effective, coherent and structured actions. To this effect, the importance of the actions underway in Doñana (Box 10), the future undertaking of a Plan for the Harmonization of Socioeconomic activities in Urdabai, and the sustainable development and action plans for both Lanzarote and Menorca, are models as has already been pointed out.

Conclusions with Regard to Objective 6: Regional Planning.

This is one of the most emphasized objectives in documents produced by the Spanish Network of Biosphere Reserves. In terms of its general status and actions carried out recently, the following are worthy of mention:

- The potential for regional development is closely linked to the protection category assigned to the biosphere reserve's associated protected area. This is because certain categories give more priority to restricting uses instead of stimulating them.
- The mechanisms for compensating landowners inside the biosphere reserve for restrictions placed on land uses is one of the most conflictive topics. Some of the solutions for the network include granting subsidies to private parties and making priority investments.
- External sources of funding, particularly from the European Union, are gaining importance (Leader I Program in Grazalema, Sierra Nevada and Menorca; Cohesion Funds and contributions towards the Sustainable Development Plan for Doñana; Life program in Menorca, Ordesa-Viñamala, etc.). In those reserves associated to natural parks in Andalusia, Promotion Offices have been initiated to foster regional development.
- Tourism is the most promoted sector within the biosphere reserves.
- Very little coordination exists among the biosphere reserves and the institutions responsible for re-

gional planning. For this reason coordination among the different administrations should be fostered. The effectiveness of the Sustainable Development Plan for Doñana and Its Surroundings and the future preparation of analogous plans in Menorca

and Lanzarote, together with the anticipated Plan for the Harmonization of Socioeconomic Activities in Urdaibai are important to this effect.

- Still pending is the implementation of a sustainable development theory

OBJECTIVE 7: LOCAL PARTICIPATION

The aim of this objective as defined in the Action Plan for Biosphere Reserves is «to promote local participation in the management of biosphere reserves». It points out that for the «reserves to be successful, it is essential that they be locally acceptable». In order to meet this objective «local people should be encouraged to participate in planning for the management of the area, [...] in scientific research, monitoring, and other activities taking place in the reserve».

Local participation in the Spanish biosphere reserves is generally channeled through different responsible bodies, normally Boards of Managers or Boards of Governors, as seen below:

- There is a Board of Managers in the reserves associated to natural parks in Andalusia (Grazalema, Cazorla, Segura y Las Villas and Sierra Nevada).
- Boards of Governors exist in the national parks associated to the Mancha Húmeda, Ordesa Viñamala and Lanzarote reserves and the Marismas del Odiel (Board of Governors of the Natural Landscape), Manzanares (the Regional Park Board of Governors) and Urdaibai reserves.
- The Doñana reserve has two bodies representing the public which are the Board of Governors of the National Park and the Board of Managers of the Natural Park.
- There are no management bodies to channel local participation in the El Canal y Los Tiles, Lanzarote or Menorca biosphere reserves.

— Local participation in Montseny takes place through two institutions which are the Coordinating Council and the Advisory Committee.

The structure of these organizations is similar in all cases, and their members can be classified into three groups. The first includes government representatives (national, autonomous and local), the second includes representatives from scientific institutions and universities, and the third group contains a mixture of various social collectives interested in the management of the protected area or reserve (nature conservation groups, owners and cultural associations, and hunters and farmers associations, etc.). Representation of this third group on the Board of Managers tends to be greater than usual for Boards of Governors. In Montseny, the Coordinating Council is the equivalent to a group of government representatives, whereas the Advisory Committee includes members from the second and third groups mentioned above.

At present, the statutes for the Board of Governors for Urdaibai and Marismas del Odiel provide for only one representative of the Spanish Committee of MaB.

In Menorca, there has been a proposal to create a Biosphere Reserve Consortium for the coordination of actions which would welcome representatives from the different sectors of the island. Although this has not yet been set up, its corresponding statutes have been provisionally approved. In Lanzarote, there have been two different proposals for the creation of a Biosphere Reserve Council, similar to the consortium in Menorca, but no further steps have been taken.

On the other hand, Urdaibai is currently founding a Cooperation Council in order to address the fact that numerous collectives have no channel of participation.

Several Boards of Governors and Managers also include sectorial commissions that oversee more specific topics (Cazorla, Segura y Las Villas, Grazalema), or are responsible for providing advice for the management of specific areas (Sierra Nevada, the Advisory Committee of the National Game Reserve).

Both the Doñana National Park and the Urdaibai Biosphere Reserve have Permanent Committees which include less members than their Boards of Governors (although they are also members of this body). These committees are of a more flexible and expeditious nature, and are in charge of advising in a non-binding manner on several of the more important actions affecting these areas.

In all of the cases, the existing organizations in charge of local participation do not closely adhere to the Action Plan recommendation of «promoting local participation in biosphere reserve management». Instead they are entities of an advisory nature that do not have management power. To this effect, the administrations of the different reserves and their associated protected areas, try to respect the decisions of these institutions so as not to hinder this process. Nevertheless, there are collectives that request more representation and more say in decision-making and management.

Sometimes, due to the fact that mandatory reports have to be written up or decisions have to be respected, it is not surprising to find a certain degree of ambiguity with regards to the management authority of these participatory bodies, and this is often a source of confusion and conflict.

With some exceptions, the functionality and dynamism of these bodies is actually less significant in prac-

tice, because their functions are limited to provisionally approving legislation on planning, preparing the annual program of activities and annual reports, as well as offering their opinion on several actions taking place in the area. Conflicts are not uncommon because at sessions, opposing interests are often expressed, frequently associated to the conflict between private profits and the public interest.

Another of the objectives of the Board of Governors and Managers is to facilitate the coordination between different administrations that intervene in the area in question, joined with the participation of several social groups concerned with the territory.

The first organization for public participation in the Spanish reserves was the Board of Governors in Doñana National Park which was founded in 1979, one year prior to the declaration of the biosphere reserve. This board has served as a model for the rest of the protected areas.

Despite the fact that local participation is considered one of the key elements in the development of a biosphere strategy, there are very few works or studies with

the aim of promoting it. Several actions have taken place to increase local participation such as starting a Friends of the Biosphere Reserves Association, the anticipated founding of a Council on Cooperation in Urdabai, and the fostering of an association tied to Montseny Park, but none of these are enough to address a topic as difficult and with so many connotations as this one. Very few actions are carried out that are different to those related to the normal functions of the representative bodies.

The general consensus is that in order for local participation to be effective, representatives have to be summoned to meetings for more than consultation, but a valid alternative to this has not yet been found. Motivation to participate is highest when private interests come into play, and this hinders making decisions based on the common good.

Although there is little data to prove this, it appears that very few local residents are aware of the existence of these bodies for local participation in the reserves and their associated protected areas. A study which took place between 1991 and 1992 of the inhabitants of

11. LOCAL PARTICIPATION IN MANAGEMENT PLANNING: MODIFICATION OF THE SPECIAL PLAN FOR MONTSENY

The circumstances effecting the Montseny Natural Park have changed greatly since its creation in 1977. For this reason, it seems like an appropriate to take advantage of 17 years worth of management experience and revise the Special Protection Plan.

Between January and June of 1994, numerous informative and participatory events were held, such as five round tables and the culminating El Montseny i el future [Montseny and the Future] Conference. The Coordinating Committee in charge of the revision of the plan and for the organization of the debates, is made up of representatives of the Coordinating Council and the Advisory Committee (the Park's participation and advisory bodies).

The purpose of the conference was to provide an opportunity to bring together the opinions and concerns of different sectors and to take steps towards reaching agreements on the actions to be undertaken in the biosphere reserve.

An average of 270 people attended each of the organized panel discussions which dealt with different aspects of the Montseny massif:

- the evolution of ecosystems;
- local participation in planning and management;
- amenities, infrastructure and services;
- natural and historical-cultural heritages;
- public use.

A working dossier was given to each of the participants which summarized the main points made by the speakers and the public as well as the communications received so that they could be used in revising the Special Plan.

The panel discussions, held on two days in June, were on the topics of The Role of Protected Areas in Comprehensive Territorial Management and on the Future of Montseny.

After the panel discussions were concluded the revision of the Special Plan was to begin following the strategies listed below:

- review of the documents that make up the prevailing Special Plan (an expository report, a justificatory report, a summary of regulations, a financial report, program of action and maps), making those changes deemed necessary to meet the new socioeconomic reality of the massif;
- the preparation of a new ten-year Action Program (Use and Management Plan), and its consequent budget.

Both of these actions will take into account the contributions made at the debates held in Montseny and the existing studies and documents. After a first proposal for the Special Plan is made, its final approval is expected to follow the normal procedures of public review and final approval by the responsible institutions, and the new plan would be put into effect in mid 1996.

This experience was an attempt at increasing local participation in the biosphere reserves beyond the habitual advisory bodies, at least with regards to its modification of prevailing planning legislation.

the towns and villages inside the natural parks in Andalusia, revealed that 82% of the people knew that the four parks associated to the reserve existed, but only 11,5% knew about the Board of Managers¹².

There have been few studies on the local population's acceptance of the biosphere reserve in question, and even its awareness of it. The following are results from a survey that reveals data to this effect:

- A study in Urdaibai at the end of 1991 (by the Hagina Environmental Education Association) showed that of the 37% of those surveyed that were aware of the biosphere reserve, 84,3% consider it beneficial to the region.
- In a study carried out in Lanzarote two months after its designation as a biosphere reserve in 1993 only 18% of those surveyed were aware of the reserve, however, 55% of these same people considered it beneficial¹³.
- According to a study done in 1993 of the visitors to Montseny, 63% were aware that the area had been declared a biosphere reserve.
- In those parks in Andalusia listed above, three of which coincide completely with reserves and one coinciding only in half of its territory, 91,5% of the residents stated that they had received little information about these parks.

In general, it is not surprising that the managers of protected areas associated to reserves assume that there

is very little local awareness of the reserves. In those biosphere reserves in what have been classified as complex areas, not associated to protected areas, such as Urdaibai, Lanzarote and Menorca, public awareness of the reserves is much greater, although it is not always accompanied by a clear understanding of what the biosphere reserves entail.

Conclusions with Regards to Objective 7: Local Participation

- Local participation in the Spanish network of reserves is generally channeled through advisory bodies of the associated protected areas, Boards of Governors and Boards of Managers. These responsible bodies have not been set up in Canal y Los Tiles, Menorca and Lanzarote, which poses a serious limitation on the effectiveness of these biosphere reserves.
- The organizations for representation and participation are not always as dynamic and as functional as might be desired, and therefore it is important to design strategies to overcome this handicap.
- There are no responsible bodies which allow direct local participation in management, and this the most frequent request on behalf of many social collectives.
- Although local participation is an important theme, very few studies and strategies have been carried out to increase the same.
- In general, according to available data, the local residents are not very informed about the biosphere reserves. There is even less awareness of the organizations that channel local participation.

¹² THE ENVIRONMENTAL AGENCY OF THE REGIONAL GOVERNMENT OF ANDALUSIA, 1992: *Estudio sociológico sobre los parques naturales de Andalucía*. Report.

¹³ MARTIN ROSA, M. A., 1993: *Estudio sociológico en la Isla de Lanzarote*. Report, 1991

OBJECTIVE 8: ENVIRONMENTAL EDUCATION AND TRAINING

The aim of this objective as laid out in the Action Plan is "to promote environmental education and training related to biosphere reserves and to use the full potential of the reserves for this purpose". Among possible functions is to "introduce local people to the idea that protecting the natural areas and sustainable development are to their benefit" and that the biosphere reserves can be used "to make people aware of the international significance of the areas in which they live. The network would also provide ideal conditions for training resource managers and research workers."

All Spanish biosphere reserves are involved in activities related to environmental education and training, and numerous amenities and facilities have been created for this purpose. These can be seen in Table 5. Almost all of the reserves in this list have resources for interpretation, though they do not always meet the de-

mands of the reserve. These resources are the only educational amenities available to the general public (both visitors and local residents). Some reserves provide guides who also cover this function.

It is important to point out that enormous progress has been made over the last several years with regards to the endowment of amenities for environmental education: The 1990 report on the Spanish biosphere reserves¹⁴ speaks of only four nature classrooms, and today there are fourteen (ten not including those reserves which had not yet been designated at the time this report was written); at that same time only three reserves had permanent facilities for interpretation activities, and now these facilities are very widespread.

Many of the amenities and facilities in the reserves are geared to school-age children: nature classrooms, the interpretation centers, etc. Most of the activities and

	GRAZ	MONT	DOÑ	C-T	CAZ	ODIEL	URD	SNEV	MANZ	LANZ	MEN
Reception / information center	2	6	4		2	1	X	4	1	3	X
Interpretation Center	2	2	3	1	1	1	X	1	1	2	
Nature Room	1	3	X		1		X	2	2	1	1
Hostal	1	2			3				1		
Refuge	3				2			5	3		
Campground	5	1			10		2		4		1
Youth camps					13						
Camping area	4		X					5	1		X
Bivouacs								4	6		
Recreational area	3	2	3	1	22	X	X	20	8	X	X
Footpath networks	X	X	X	X	XX	X	X	X	X	X	X
Self-guided / interpretative itineraries		2							X		
Land vehicle routes			X		X					X	
Boating routes			X			X					
Bridleways	X				X						
Guide service	X	X	X		X	X		X		X	
Botanical gardens	X				3			2		X	
Museums	1	X	X		X		X	X		X	X
Handicrafts centers	X				X		X	X		X	
Bars/Rest/Kiosks	XX	XX	XX	1	XX		XX	XX	XX	XX	XX
Pleasure harbour										X	X

Data is not available on Mancha Húmeda nor on Ordesa-viñamala
X = Existence of facility/amenity; XX = large number of facilities; No=Number of facilities

TABLA 5. Biosphere reserve amenities and facilities for public use and environmental education

programs are also directed at this same group from both local and distant communities. The biosphere reserve very often acts as a resource for the implementation of environmental education activities, without interfering with the development of the same.

Not all environmental education and training activities are part of complete and structured plans. Examples of these are the following:

- The ALDEA Environmental Education Program, initiated by the Regional Government of Andalusia in joint collaboration with the Council on Education and Science and the Environmental Council. This includes numerous activities for school-age children in the nature classrooms and other facilities in Cazorla, Segura y Las Villas, Grazalema, Doñana and Sierra Nevada.
- The environmental education program in Montseny, where there are many facilities for this purpose, and which was also the first site in Spain to have a nature classroom.
- The preparation of an Action Plan for Environmental Education has recently begun in Urdaibai. The scarcity of programs directed at the local com-

munity is notable. Some of the few existing examples are the activities which take place within the framework of the program for Vocational Training Centers, which reached its peak between 1987 and 1992 although there are still several in operation. The vocational training centers have symbolized an important effort in environmental training in one of the sectors with the most potential: young people.

Conclusions with Regards to Objective 8: Environmental Education and Training

- Almost every Spanish biosphere reserve is equipped with amenities and facilities to promote activities related to interpretation and environmental education. Some reserves have a noteworthy abundance of related facilities, and many of these have been developed over the last few years.
- There are few actions directed at education and training for the local non-school-age population. Vocational training centers have turned out to be one of the most effective resources, even though at present there are fewer of these than before.
- Comprehensive environmental education plans are not always available and little research takes place in this field. Most biosphere reserves and their facilities are used to carry out training actions.

¹⁴ Spanish Committee of the MaB, *Estado de las Reservas de la Biosfera de España, año 1990* (Madrid, 1990)

OBJECTIVE 9: INFORMATION

This objective is the last of those laid out in the Action Plan for Biosphere Reserves and its aim is «to fully use the potential of the network to generate and spread knowledge about the conservation and management of the biosphere reserve and to promote the biosphere reserve concept through information and demonstration». The generation and dissemination of knowledge is one of the most important purposes of biosphere reserves and distinguishes them from other protected areas. «The exchange of people among biosphere reserves can play a vital role in enabling the sharing of skills and experiences».

Nevertheless this is one of the least developed objectives in the Spanish network of reserves, as seen by the scarce number of actions undertaken with this aim. The following is a short list of the most noteworthy of these:

- In the Menorca reserve actions include the publication of a book and a traveling exhibit taken to all of the island localities under the title «The Menorca Biosphere Reserve», the publication of leaflets, colloquiums, etc.
- Actions carried out in Urdaibai include the publication of a book on the biosphere reserve and a special supplement to a magazine as well as a publicity campaign for the media, the publication of

leaflets and conferences and debates. Another fairly original activity within the Spanish reserves are the courses offered on the Governing Use and Management Plan for managers and administrators.

- In Montseny, in addition to other actions, a traveling exhibit on the biosphere reserves has been prolonged and leaflets and other materials have been published to help spread the biosphere reserve concept.

The dissemination of the biosphere reserve concept and the knowledge of the reserves themselves has not been dealt with aggressively in the rest of the reserves, with practically no mention of the same in published materials or on signposts inside the reserves. Conversely, the tourism industry in both Lanzarote and Menorca have been the first to incorporate the biosphere reserve logo.

Likewise, as surveys in the local participation section of this report have shown, local residents (those who really should receive the information produced) feel they do not receive enough information on the reserves and their associated protected areas. To this effect, it is clear that in order to foster social participation, one of the key points that needs to be developed is informing

12. SUSTAINABLE DEVELOPMENT: A TOPIC FOR SOCIAL DEBATE IN MENORCA

Over the last few years, certain collectives (among which the Institut Menorquí D'Estudis is noteworthy) have proposed taking steps to revalidate the natural and cultural values of Menorca in the eyes of society and local politicians, thus extending the idea of sustainable development. The designation of Menorca as a biosphere reserve is believed to provide a means to meet this goal and to give rise to an extensive social commitment to the environment and the sustainable use of the island's resources.

Along these lines, in addition to the work carried out by groups such as the Balearic Ornithology Group in Menorca or the Institut Menorquí d'Estudis, which has contributed significantly to raising public awareness, two interdisciplinary seminars were held in collaboration with MaB on Conservation and Development (1989) and Sustainable Development and Tourism in Menorca (1990). The conclusions at both of these seminars revealed how similar the desired model of sustainable development for Menorca is to the philosophy of biosphere reserves.

The idea of declaring Menorca a biosphere reserve gave rise to a great deal of political and social debate on the island involving the Island Council, local authorities, financial sectors, social groups and scientists. Differences of focus and interests rose out of the debates, but they did help to instill the idea that the future of Menorca is closely tied to the quality of its natural environment. A social consensus was reached and in the end at a plenary meeting the Island Council unanimously approved the undertaking of the necessary steps for Menorca's designation as a biosphere reserve.

This designation took place in October of 1993, and again there were significant social repercussions. Due to this, the biosphere reserve and sustainable development have become major topics of local political debate, with reasonable agreement as to their theoretical basis.

The international recognition that was a consequence of this declaration has led to the revalidation of the role of science and ecology, not only in society in general but with respect to political decision-making.

the public. Local participation can only take place if information is accessible to the general public and is, at the same time, motivating.

When speaking of public use and tourism, it is worth pointing out that the estimated number of visitors to the reserves in the Spanish network per year exceeds 8,300,000. Many tourists obviously visit the reserves for recreational purposes (such as tourism to the beach in Marismas del Odiel, Urdaibai, Lanzarote and Menorca, or to the ski slopes in Sierra Nevada), but such a large number does give a good idea of the possible consequences that the biosphere reserves have on society. In other words, apart from actions that can be developed for the benefit of the local populations, a common image and message directed at visitors would have a significant effect on the dissemination of the biosphere reserve concept and its principles.

A joint action on the part of all of the reserves would complement the activities carried out with the existing educational and interpretation infrastructure in each of these. For this reason, not having a logo or other common identifying symbols is an important deficiency.

Not only are few actions undertaken, but there is also a significant gap with respect to effective mechanisms for communicating information, both to the local community and to political decision-makers and the rest of society in general.

Nowadays, at a time when it is so common to hear about the need for functional models of sustainable development, one of the distinguishing features of biosphere reserves that they not only emphasize the preparation and implementation of these models but also their dissemination.

Conclusions with Regards to Objective 9: Information

- The estimated number of visitors per year to the biosphere reserves in Spain is over eight million. Although many of these people mainly use the reserves to participate in recreational activities (beach, skiing), they do have the potential to influence one of the most important sectors of society. Faced with such a large number of visitors, common strategies such as a logo and coherent information, could be effective in the near future.
- Important campaigns have been carried out in some of the biosphere reserves to raise awareness about them such as the one recently implemented in Menorca.
- The concept of transmitting knowledge distinguishes biosphere reserves from other protected areas, and this aspect of the reserves should be more fully developed.

OTHER FEATURES OF BIOSPHERE RESERVE MANAGEMENT

Endowment

This section of the report deals with the endowment of the different reserves regarding their budget for investments and the number of workers engaged in each.

As far as the budgets are concerned, judging from the data collected in the study on the State of the Biosphere Reserves in 1990 there has been a general increase in funding. Most of the financial endowment afforded to the biosphere reserves or their associated protected areas, comes from the institutions responsible for their management. Nevertheless, supplementary contributions are made by other sources and these are sometimes rather significant sums. The increase in funding from the European Union, has already been referred to in the section on local development.

The following are some sources of funding: contributions made by the Institute for Nature Conservation to Cazorla, Segura y Las Villas and to Manzanares; resources attained through Cohesion Funds in the Doñana National Park (330 million pesetas in 1994), or the substantial contributions made by the European Union and other national bodies towards the Sustainable Development Plan for Doñana and Its Surroundings; the extraordinary contributions to Sierra Nevada to carry out restoration and nature conservation actions

related to the occasion of the world ski championships which, for 1994, doubled the normal budget; on a different level, several contributions made by municipal corporations, companies, delegations, European institutions, etc., such as in Marismas del Odiel.

Table 6 shows the most up-to-date data for those biosphere reserves where access to investment budgets was available. It also lists the number of permanent employees engaged in management. Only those seven reserves whose total geographic area is associated to one or two protected areas, such as Doñana, are listed. Related data for the remaining reserves was deemed unnecessary for the reasons listed below:

- Less than a fifth of the territory of the Mancha Húmeda and Ordesa-Viñamala reserves is associated to a protected area, and these figures would only distort results,
- El Canal y Los Tiles does not have an itemized budget. Also, its relatively small size (511 ha.) would give it the best area/worker ratio, though the fact is that the only park warden is in charge

of surveillance part time, and the other responsible technicians are in charge of reserve management.

- Lanzarote and Menorca are not included either because in order to estimate endowment of personnel or the budget, it would be impossible to distinguish between normal management of each island and specific reserve management, especially since a body for management coordination has not yet been established nor are there actions plans in either case. For similar reasons, Urdaibai is not included either because, due to its philosophy, the only listing refers to the budget for the Board of Governors. This body acts as the coordinator of the actions of the remaining administrations. The investment budget is the sum of all contributions made by the acting administrations, and this information is not available.

As seen in this table, as a function of total area the budget for Doñana is the most favorable of the reserves in question and, thus, even the reserve ranked second, Sierra Nevada, is way below the average. The Table also shows that the majority of the reserves are ranked similarly, between 4.191 pesetas per hectare at Marismas del Odiel and 9.071 at Sierra Nevada.

It is interesting to see that the most unfavorable budget per area unit ratio, corresponding to the Marismas del Odiel reserve, is inverted if compared to the number of hectares in terms of the number of permanent employees. In this case it is the most advantageous at 596 ha/person. The opposite is true for Sierra Nevada, which is the second reserve in terms of budget per area unit (owing to the aforementioned extraordinary contributions), for it is the area with the worst proportion in terms of hectares per worker: 2,524 ha/person. Except in the two extreme cases, the remaining reserves coinciding with protected areas range between 1,061 and 1,827 ha/person.

The results of this brief analysis would have been quite different if the number of temporary employees or research workers had been taken into account. This is because some reserves have many temporary employees. For example, over 200 research workers are engaged at the Biological Reserve in Doñana.

A comparison of this data to that which is contained in the report on the State of the Biosphere Reserves for

	Permanent employees engaged in management	Total area per worker (Hectare/worker)	Investment budget (in million of pesetas)	Budget per biogeograph ICAL unit (ptas/ha)	Notes
GRAZALEMA	32	1,615	260	5,030	Data from 1992
MONTSENY	26	1,158	269.5	8,947	Data from 1994
DOÑANA	55	1,405	1,843.5	23,861	Data from 1994 (average of the National Park and the Natural Park, as per total area in the BR)
CAZORLA, SEGURA Y LAS VILLAS.	202	1,061	1,300	6,066	Total 1990 budget Data on personnel in 1994
MARISMAS DEL ODIEL	12	596	30	4,191	Data from 1994
SIERRA NEVADA	68	2,524	1,557	9,071	Data from 1994 (includes extraordinary contribution for the World Ski Championship)
MANZANARES	26	1,827	335	7,053	Data from 1994
AVERAGE		1,455	9,174		

TABLA6. Investment budget and personnel in charge of management functions at the Spanish biosphere reserves coinciding with protected areas.

Biosphere reserve	Annual N° of visitors	Notes
GRAZALEMA	19,290	Data from 1992 (visitors to the core area).
ORDESA-VIÑAMALA	600,000	Visitors to the National Park
MONTSENY	1616,800	Data from 1993
DOÑANA	400,000	Estimated number of visitors to the National Park based on figures from the first 9 months of 1994.
MANCHA HÚMEDA	85,150	Data from 1990 on the visitors to the National Park
EL CANAL Y LOS TILES	6,000	Estimate for 1990
CAZORLA, SEGURA Y LAS VILLAS	600,000	
MARISMAS DEL ODIEL	250,000	
URDAIBAI	500,000	Only those visitors to the beach in summer
SIERRA NEVADA	1200,000	Data from 1993
MANZANARES	1000,000	Estimate for 1992
LANZAROTE	1200,000	Data from 1992
MENORCA	820,000	Data from 1991
TOTAL	8297,240	

TABLE 7: Number of visitors per year to the Spanish biosphere reserves

1990 shows the evolution of this situation over the last four years. The average ratio for the six reserves listed in Table 6 (Manzanares had not been declared at that time), was 5,200 pesetas/hectare, with regards to total budgets and not just investment budgets.

This increase in the general budget is a reflection of society's growing interest in areas such as the biosphere reserves.

Public Use and Tourism

This section includes a brief analysis of some aspects of public use that are not tied to environmental education and training which were already discussed in the corresponding objective.

Tourism in the reserves is one of the major resources for local development and, at the same time, one of the biggest problems with respect to conservation for the majority of the areas. Given that the number of visitors to the Spanish biosphere reserves exceeds eight million people (see Table 7), activities related to channeling and regulating the influx of tourists commands priority in management actions. As a result of this effort, numerous amenities and facilities have been created (see Table 5).

Public use in the reserves is characterized as follows:

- Practically all of the reserves have visitor reception and information centers.
- Public use facilities are generally publicly owned, and managed in most cases by small cooperatives awarded concession for flexible periods. Private facilities are more frequent in Montseny, Urdaibai, Menorca and Lanzarote.
- Lanzarote and Menorca do not have, public use facilities typical of protected areas. Instead the facilities are more of a touristic nature. It is worth pointing out the existence of a Network of Tourist Centers in Lanzarote which depends on the Cabildo (the island council) and which are also valuable examples of the harmony between the island's landscape and the buildings it contains.
- In those reserves close to urban communities, such as Montseny and Manzanares, there is a massive influx of visitors on the weekends. Thus, it is not surprising that these same reserves have developed sectorial planning legislation which regulates public use.

4

THE PRESENT STATUS OF THE BIOSPHERE RESERVES IN SPAIN

GRAZALEMA

Location and characterization

At the beginning of 1977 the Grazalema Biosphere Reserve was one of the first two biosphere reserves to be declared in Spain, the other being Ordesa-Viñamal. It initially covered 32,210 ha., but has recently been enlarged to coincide with the current 51,695 ha. that make up the Natural Park. Along its southern edge the BR is contiguous to Los Alcornocales Natural Park whose 170,00 ha. extend towards the south of the Province of Cádiz.

The Sierra de Grazalema is the westernmost massif within the Andalusian Mountain Range. Its calcareous nature has given rise to a karst landscape with abundant gorges and caverns. Rainfall is abundant (with an annual average of over 2,000 mm.) due to its position as the first group of mountains to receive moisture-laden Atlantic winds en route from the Gulf of Cádiz inland. The climate is characterized as Mediterranean, with very warm summers.

There is a considerable botanic richness and diversity in the reserve. Together with cork, holm oak and gall oak groves, the groves of Spanish fir, an endemism of the Serranía de Ronda, are especially noteworthy. The largest concentration of gall oak groves occupies 400 ha. in the northern slope of the Sierra del Pinar and constitutes the center of the biosphere reserve. The majority of plant endemisms represented in the Park are common to other parts of the Serranía de Ronda, with characteristics similar to those of Grazalema.

There is also a high diversity of fauna. Particularly interesting is the presence of forty mammal species, some as significant as the wild goat, deer, fallow deer, otter, mongoose, and large numbers of troglodytic bat (*Myotis schreibersi*) and other chiroptera which make use of existing caverns. Among bird species, birds of prey make up one of the most notorious groups, with the largest colony of griffon vultures in Europe.

Evidence of the ancient presence of humans in these mountains is indicated by the rupestrian paintings in the «Cueva de la Pileta» and abundant Visigothic and Arab remains.

Stock rearing and forestry exploitation are a few of the main utilizations of these mountains, where the steep terrain makes farming difficult. The leather industry, based in Ubrique, also constitutes another important activity. The service sector gains importance in Ronda, which is the largest municipality in the area and whose center is located outside the biosphere reserve.

Planning and Management

The Natural Park was declared as such in 1984 along with the Parque de las Sierras de Cazorla, Segura and Las Villas (the first declared by the Regional Government of Andalusia), and four years later its principal legal instrument for planning was approved. This Use and Protection Plan was the first of the Andalusian Natural Parks Management Plans.

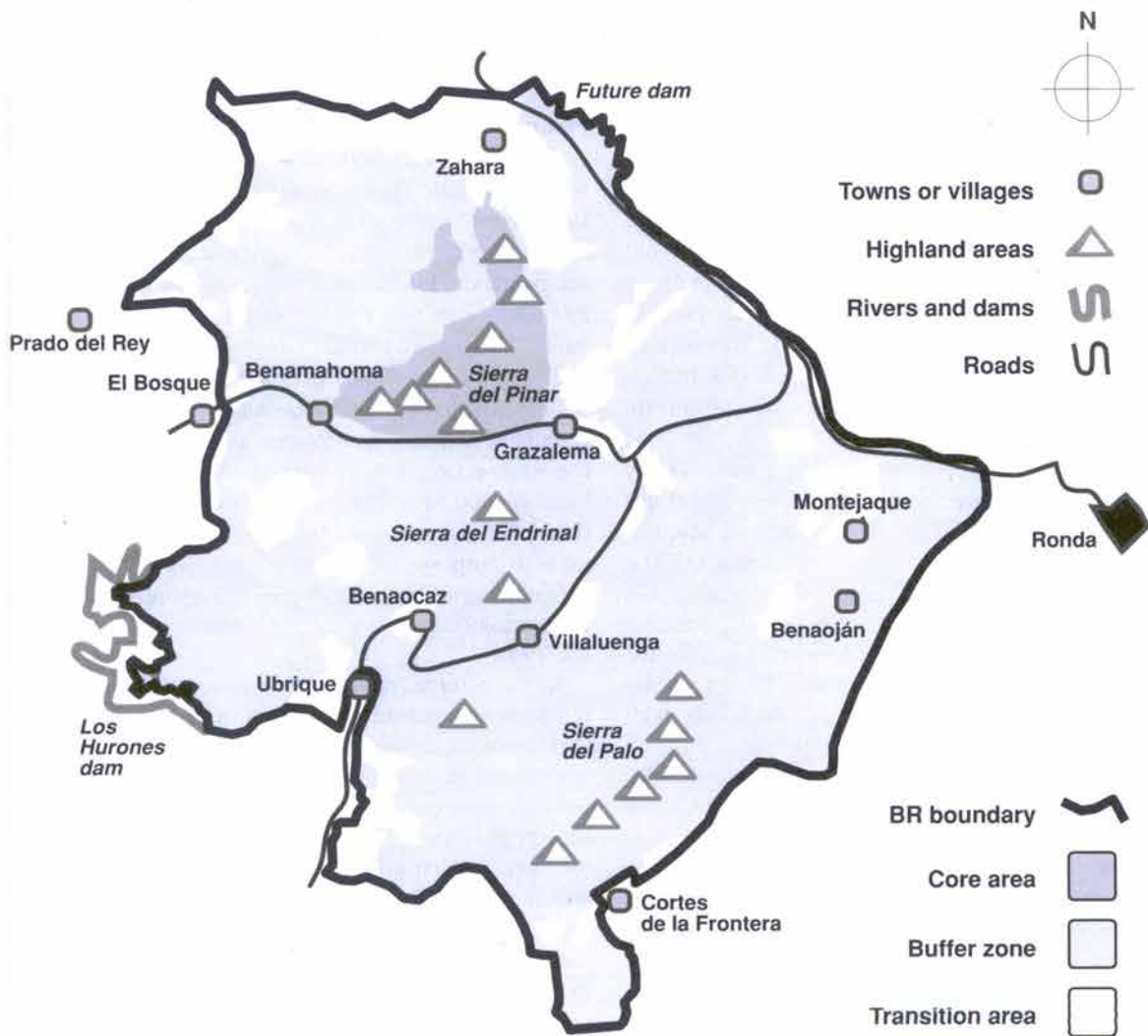
The objectives of this plan are based on three lines of action which are the following: the management of resources, spacial organization, and the stimulation of the socio-economic structure. A promotion office has been created to oversee these areas (see Box 9). The different categories of protection established are comparable to purposes of the biosphere reserves. These are defined, according to the degree of use and transformation permitted as either extensive use areas or intensive use areas.

In the reserve, preference is given to conservation, research and nature interpretation. Primary activities that are compatible with the stability of ecosystems, such as traditional silvo-pastoral uses are permitted in the extensive use areas. Lastly, those areas designated for intensive use are those that are most modified by the same, which are generally of a productive nature and are fostered in order to favor local development.

The majority of towns and villages establish subsidiary planning regulations adapted to the philosophy of the UPP. Those which have not set any are often plagued with conflicts and complaints are frequently filed against the administration.

At present, new Governing Use and Management Plans and Natural Resources Management Plans are

Grazalema



Biosphere reserve

GRAZALEMA

Declaration date		22 January, 1977		
Location (Province)		Biogeographical region/province		
Cádiz y Málaga		Mediterráneo-Ibero-Atlántica/Bética		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
51.695 ha	6,4%	80,8%	12,8%	30,2%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
8.000	14	79.874	Balanced: Primary, secondary and tertiary	
Other designations		Ecological characteristics		
— Special Bird Protection Area		— Mountains, valleys, karst — Mediterranean and Oceanic climates — Holm Oak, Gall oak, and Spanish fir groves		
Conservation interest		Major contributions to RB		
— Habitats, Spanish fir grove, high biodiversity, threatened species		— Pilot strategies for rural development		

Associated protected area

SIERRA DE GRAZALEMA NATURAL PARK

Declaration date	1984 (47.120 ha), extended in 1988	
Institution responsible for management	The Environmental Agency of the Regional Government of Andalusia	
Area	Area of the BR within protected areas	Area of protected areas within the BR
51.695 ha	100%	100%
Protection/Planing legislation		
— Declaration: Decree 316/1984, 18 December — Use and Protection Plan: Decree 340/1988, 27 December		

being prepared in order to incorporate those aspects of the planning of protected areas which have been developed over the last few years, particularly after National Law 4/1989 of 'The Conservation of Protected Areas and Wild Flora and Fauna' and Regional Law 2/198 of 'The Protection of Protected Areas in Andalusia' were passed.

A large part of the activities carried out in *conserva-*

tion are related to the prevention of forest fires: firebreaks, construction of water tanks, forestry maintenance treatments in high risk areas. The urgent need for such projects and the considerable proportion of the budget that goes to these (60% of all investments —amounting to 260 million pesetas— in the Natural Park in 1992) place serious limitations on other necessary activities in the woodland.

Cooperation projects have been carried out with different organizations on several lines of *research* as a way to overcome the budget shortage in this area. Examples of these are studies on ungulate populations in collaboration with the Higher Council of Scientific Research and schemes for the recovery of plant species with the University of Seville. The latter organization compiled a list of 67 plant taxa, which are either endemic to the Park or endangered. This list will be used for future actions within the Plan for the Recovery of Threatened Floral Species (see Box 6).

Other topics of research at present are the following: the influence of the change of conservation use; several projects focusing on the Spanish fir groves - entomofauna, viability of Spanish fir seeds, etc.-, and a hydrogeological study of the Natural Park. Works are also being carried out on the impact of public use activities in the reserve area and on the ecosystem's capacity to withstand different uses.

A program *monitoring* the water quality of the Park's rivers was initiated in 1992 focusing on physical-chemical parameters and indicators of industrial pollutants. Annual controls are carried out and censuses taken on populations of wild goat, fallow deer and several diurnal prey species. As to vegetation, experimental parceling is underway in order to study the effects of experimental clearing of undergrowth.

With regards to its contribution to *development and planning*, the Grazalema Biosphere Reserve has benefitted from Leader I projects in two regions: the Sierra de Cádiz and the Serranía de Ronda. A large number of promotion and aid projects have been transmitted through this program which has led to considerable growth in the area.

Other means of supporting the local community stem from the Rural Development Plan promoted by the Agricultural Council of the Regional Government of Andalusia. These include funds for farms, livestock and for

With regards to the activities directed toward the conservation of fauna, in October of 1994 a **campaign for the restocking of rabbits** was initiated. This took place in conjunction with the Park's Hunting Association with the aim of reestablishing said populations which had considerably diminished due to myxomatosis and viral pneumonia. The release of rabbits, which should be of benefit to all its predators, takes place on reserves of publicly-owned mountain areas, where hunting is prohibited for the duration of the campaign (to end in the Spring of 1995). This experience is an interesting example of cooperation. The local hunters contributed their manpower (constructing hollows, refuges, enclosures and by sowing nutritious plants, etc.), while the Environmental Agency and the Park's Administration were responsible for the acquisition of the rabbits and for their vaccinations.

As part of the **Leader I** Program, 390 million pesetas from EU investments, (of the 800 million initially anticipated) along with 381 million from Regional and National Administrations, are being put to use. This money, together with 1,500 million pesetas of private funding has been directed to several types of projects including the following: studies, education (with particular emphasis on training local development agents in all communities), rural tourism (72% of the total investment), supporting local companies, marketing of agricultural foodstuffs and (the creation of a product image for regional items).

The results of said actions have led to significant global investment in the Park, to an increase in the income of small businesses and to the viability of small local cooperatives which have recently been created, together with the stimulation of social dynamics that such achievements involve. The services sector, particularly tourism, has benefitted more than any other from such actions, whereas other important sectors such as stock rearing, have not benefitted proportionately.

Investments related to the promotion of tourism have followed three lines of actions which are the following: to upgrade the quality of the existing offers, to develop new possibilities and to carry out complementary activities, based always on a criteria which respects the local environment.

reforestation. The Park Administration promotes said reforestation in disused farmland with woodland potential, as well as the maintenance of traditional orchards. In addition, their policy is to assign pastures which provide a protective utilization of said resource.

Participation from the local community is channeled through the Board of Managers which is structured similarly to other Natural Parks in Andalusia and is also of an advisory nature. Within this organization a Permanent Commission exists along with three Technical Commissions which oversee works, research and socioeconomic promotion and development.

Available data shows that, in general, the Natural Park is well-accepted by the local residents who are beginning to see it as more of a means for development rather than a limitation on uses.

Over the last few years, the biosphere reserve has been endowed with facilities and amenities for use in *environmental education and training*. In 1992 the Higueroón de Tavizna Nature Room was established within the framework of the ALDEA Environmental Education program and with the participation of the Council for Education and Science of the Regional Government and the Environmental Agency. Similarly to other biosphere reserves in Spain, many of the educational amenities are geared toward school-age children.

Other resources for environmental education and interpretation include two interpretation centers, and educational materials and itineraries that circulate through-

hout the Park and suggest the different possible ways to familiarize oneself with the surrounding environment.

The amenities and facilities designated for *public use*, together with two information centers and several refuges, campgrounds, camping and recreational areas, although considered scarce by some visitors, constitute fairly reasonable public facilities considering its size and the number of visitors to the Grazalema Reserve. There is no data which indicates the total number of visitors to the biosphere reserve per year, though it is known how many are granted access to reserve areas which require special permission.

Other resources at the biosphere reserve include a recovery center for animals, a botanical garden which is both for public use and for the conservation of endemisms and endangered species; and a plant nursery which produces Spanish fir trees among other species.

As to its investment budget, Grazalema, with 5,030 pesetas/ha., is below the average of all those biosphere reserves which fully coincide with protected areas (see table 6) with an average of 9,174 pts./ha., though the

proportion of total area occupied per permanent employee is slightly above the average, at 1,615 ha./worker.

Perspectives and Conclusions

The Grazalema Biosphere Reserve, which is associated with the oldest Natural Park in Andalusia, is afforded the necessary legal instruments of planning and the conditions to adequately fulfill its objectives as a Biosphere Reserve. Over the last few years, more emphasis has been put on the promotion of local development, in particular utilizing European funds. The results of such actions will be available for evaluation within a few years, though in principle, significant activities are underway in the area.

As was mentioned at the beginning of this section, the Grazalema Biosphere Reserve extends southwardly along Los Alcornocales Natural Park, with which it forms a biogeographical and, in large part, a socio-economic unit. For this reason, it would be worth considering the possibility of extending the BR to incorporate the Natural Park and fully develop in it the philosophy of the biosphere reserves.

ORDESA-VIÑAMALA

Location and Characterization

The Ordesa-Viñamala Biosphere Reserve was the first to be petitioned in Spain back in 1975, though it was actually declared two years later along with Grazalema. Thus, they were the first two Biosphere Reserves in the country.

The BR is located in the trans-Pyrenean territory along 56 km. of the French border. Its total area is 51,396 ha. of which 2,166 previously belonged to the former Ordesa National Park and the rest to the Viñamala National Game Reserve, thus explaining its name. The National Park was extended in 1982 (when the name was changed to the Ordesa y Monte Perdido National Park) to coincide with the eastern region of the Biosphere Reserve. Thus 52% of its current area is located within the reserve.

Ordesa-Viñamala covers very little wooded area. Instead uncultivated, areas without trees are more common. The northeastern terrain forming the Pyrenean axis (granitic batholith and primary metamorphic deposits of the former hercynic massif, while towards the south the calcareous deposits are predominant forming the uncultivated mountains of the inner prepyrenees. Heights range from 3,355 m., at Monte Perdido (the highest calcareous massif in Europe) to 875 m. above sea level. Representative examples of glacial formations are found in the upper areas.

The geographic area of Ordesa-Viñamala is characterized by its complex mosaic of environments and by containing within it a significant representation of the genetic resources of the Pyrenean highlands. Occupying 80% of the total area, the supraforest areas are the most represented. The terrain is uneven because of steep slopes. It endures a harsh climate with temperatures that vary greatly on a seasonal and daily basis and is occupied by fragile highland biocenoses that barely palliate severe erosion.

The area is well-known for its richness in flora, which is due to the aforementioned differences in heights and also to their geological evolution, especially through movements and refuges of flora associated to the last glaciations.

With regards to fauna, there are several noteworthy vertebrate species whose only populations are found here: Spanish ibex (a subspecies of the mountain goat), lammergeier, and the new frog species, *Rana pyrenatica*, which was described in 1993.

The use of grazing lands has traditionally been one of the most important elements of the Ordesa-Viñamala landscape.

There are no residential communities inside the Biosphere Reserve. The eastern region lies within the western half of the Ordesa y Monte Perdido National Park which means it is subject to strict limitations on usage. However, in the western part of the reserve, in the Valle de Tena or Alto Gállego, there is a greater influence of urban settlements and secondary and tertiary production activities such as alpine ski slopes, tourism and construction of second homes.

Planning and Management

Management of the Biosphere Reserve is not homogeneous. On the one hand, National Park management, which is dependant on ICONA, is based on actions appropriate to a protected area. On the other hand, there are no coordinating or management mechanisms for the rest of the territory, which is overseen by the Aragón Regional Council.

The National Game Reserve is protected by Founding Law 37/1966, which establishes a special control of fauna and prohibits hunting the ptarmigan and Spanish ibex, whose presence in large part justified the declaration of the area as a Game Reserve.

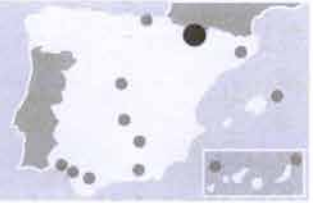
The Annual Management Plan is the National Park's legal instrument on planning. It establishes management objectives and criteria. Its Governing Use and Management Plan is currently awaiting approval by the Board of Managers.

Active *conservation* measures are limited to those carried out inside the National Park, where programs are carried out on the management of the natural medium such as the monitoring of the evolution of grazing land, the protection of fir forests, conservation actions on the lammergeier, and the protection of the Spanish ibex's habitat.

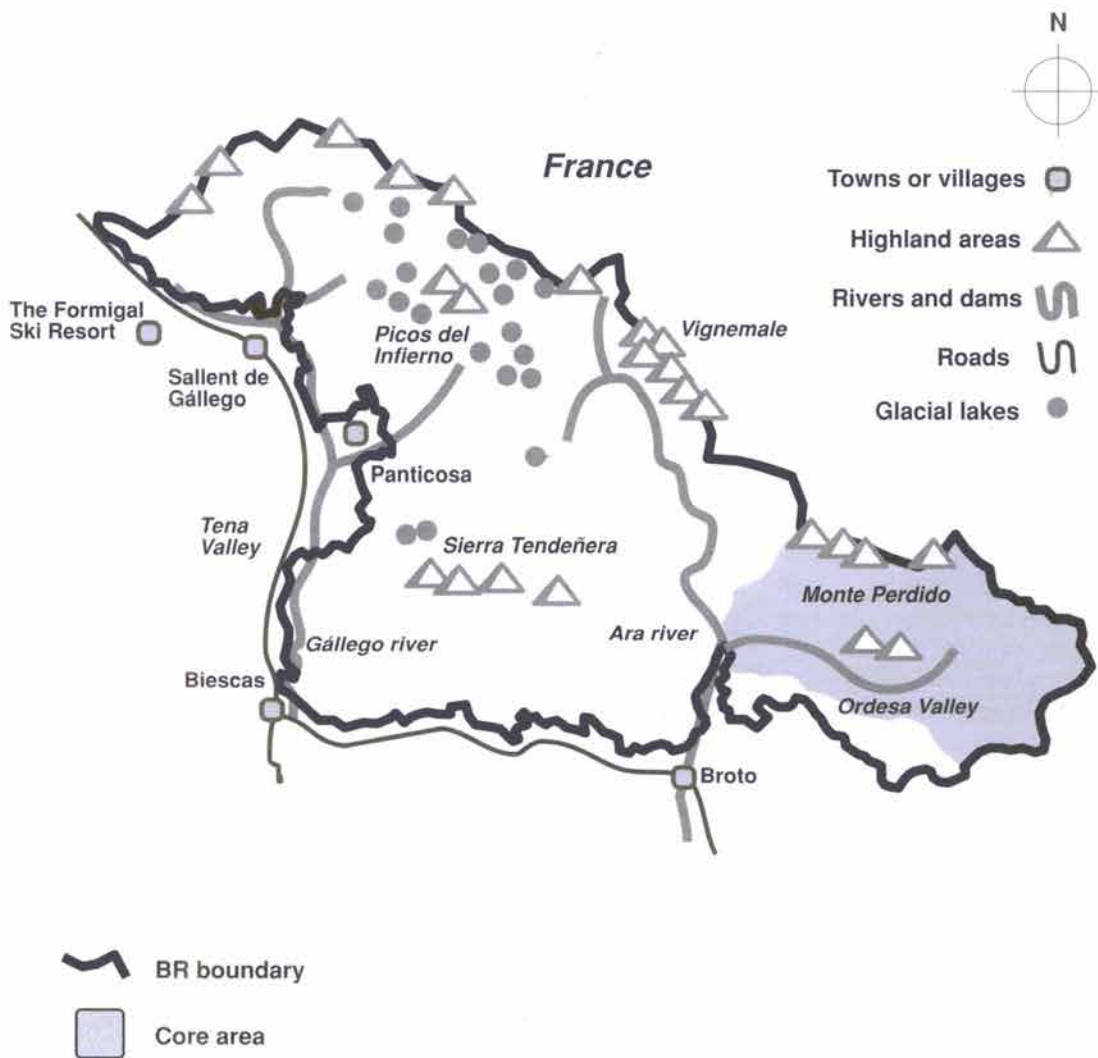
The majority of *research* at Ordesa-Viñamala has been carried out at the Pyrenean Institute of Ecology in Jaca [Instituto Pirenaico de Ecología de Jaca] and the University of Zaragoza.

Several research programs have been undertaken at the National Park. Those geared towards management are noteworthy: vegetation cartography, geomorphology and cartography of the same, several studies on the Pyrenean Spanish ibex, ability to withstand grazing

Ordesa-Viñamala



51.396 ha



Biosphere reserve

ORDESA-VIÑAMALA

Declaration date		22 January, 1977		
Location (Province)		Biogeographical region/province		
Cádiz y Málaga		Mediterráneo-Ibero-Atlántica/Bética		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
51,396	18%			93.7%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
	11	5,861	Agriculture and Services	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Special Bird Protection Area — European Certificate (Council of Europe) — National Game Reserves (1966, 49,230 ha., 96% of the BR, Law 37/1955 31 May) 		<ul style="list-style-type: none"> — High summits, siliceous and calcareous mountains, valleys and steep slopes. Glacial, fluvial and karst relief, glacial lakes — Mediterranean and Continental climates — Highland scrub and pastures, pine forest and beech groves 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Alpine ecosystems — Plant and animal endemisms — Fir forests, rock formations plant communities 		<ul style="list-style-type: none"> — Incorporation of alpine highlands into the Network 		

Associated protected area

ORDESA Y MONTE PERDIDO NATIONAL PARK

Declaration date		1918, with ha. Extended in 1982	
Institution responsible for management		ICONA, The Ministry of Agriculture, Fisheries and Food	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
15,608 ha (also a protected area in the periphery totalling 19,678 ha)	Approx. 18%	Approx. 52%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Declaration: Decree 18 December — Reclassification and extension: Law 52/82, 13 July — Legal basis: Law 4/1989, 27 March, of the Conservation of Protected Areas and Wild Flora and Fauna — Annual management plans 			

Many of the current actions directed at conservation and research focus on the **Spanish ibex**, (*Capra pyrenaica pyrenaica*) whose status, according to the latest available data, is critical: barely a dozen individuals remain in the wild. In addition, there is no evidence that they have reproduced over the last few years, nor do they seem to have benefitted from the protection measures adopted. This situation justified the approval at the end of 1993 of the Plan for the Recovery of the Spanish ibex by the Regional Government of Aragon, which is to be carried out jointly with ICONA. More recently, funds have been obtained through the Life/Spanish ibex project, in which the French Ministry of the Environment and those aforementioned Spanish organizations have participated. The Plan for the Recovery of the Spanish ibex includes the following measures:

- Continue to improve habitat conditions, with regards to ensuring safety and reducing competition with other ungulate species.
- Carry out breeding in captivity, for which there are currently plans to capture wild individuals. In order to enhance the success of reproductive techniques, methods are being used which involve the transferring of embryos (fertilized Spanish ibex ovules are implanted in mountain goats from the Tortosa y Beceite National Game Reserve).
- Reintroduce animals bred in captivity, preferably in the National Park.
- Continue investigation and monitoring of the population as well as activities of dissemination and public awareness.

of high altitude mountain passes, a description of the rural environment in the area of influence, research on possible environmental impacts of various activities in the periphery, etc. Research currently focuses on establishing criterion for the creation of a Governing Use and Management Plan. In spite of the work carried out over the last few years, there are still serious shortcomings. One of these involves a cataloguing of the majority of resources and species.

The Board of Managers set up as a collaborating body for oversees local participation at the National Park. Its duties are of an advisory nature and tasks include the provisional approval of the Governing Plan, annual activities programs and a subsequent report of their results.

Tourism is increasingly important in the Pyrenees. The National Park is channeling efforts to improve public use facilities which would help control and regulate the frequent massive influx of tourists. The number of visitors to the National Park is over 600,000, mainly during July and August. The regular park staff, which consists of eight wardens and three technicians, is enlarged eight-fold during these months.

Perspectives and Conclusions

Planning and management of the Ordesa-Viñamala Biosphere Reserve is limited to that which is carried out in the National Park, representing only 18% of the total

area. Said management corresponds to the idea of a core area, where conservation takes priority over other objectives. It is therefore difficult to assess the contribution of Ordesa-Viñamala to the Spanish Biosphere Reserve Network with regards to several of its functions such as development. Nevertheless, management needs to cover the entire Biosphere Reserve area, via the much needed coordination of administrations; bringing together several administrations could be promoted by the Spanish Committee of the Program on Man and the Biosphere. The aim would be to involve the Aragon General Council, in conjunction with ICONA, in putting into practice the necessary means to manage the Ordesa-Viñamala territory based on criteria characteristic of a biosphere reserve. Only then would it make sense to make other proposals such as readjusting the boundaries of the current reserve so that it coincides with the entirety of the National Park and its protected areas.

Due to the quality of the environment in the area and its interest with regards to conservation and a balanced regional development, as well as to the large amount of protected areas (Ordesa y Monte Perdido National Park, in Spain and the Western Pyrenees National Park and the Neuvieille Natural Reserve in France), the entire territory could be converted into a cooperation site between Spain and France, for which a trans-frontier biosphere reserve would provide the appropriate setting.

MONTSENY

Location and Characterization

In 1978 the Montseny Biosphere Reserve was declared bringing the total number of such reserves in Spain up to three. Its delimitations were made to coincide with the Montseny Natural Park, with an area of 30,120 ha, which had recently been designated a natural park by the Barcelona and Girona Regional Councils. Montseny was also the second protected area declared in Catalonia after the Aiguestortes and Estany de San Maurici National Park.

The Montseny massif is situated on the southern part of the Catalanian Precoastal Mountain Chain. Its geomorphology is largely a result of alpine orogeny. It is separated from other nearby massifs by the large fractures and dislocations caused by such orogeny, thus conditioning its major geomorphological characteristics which include its isolation and considerable altitude (1,713 m.). The majority of the parent rock which makes up the Reserve's substratum is of a siliceous nature.

The climate of Montseny is characterized by its diversity; both Mediterranean and Central European climates co-exist in this relatively small area. Thus, average annual temperatures range from 50 °C to 16 °C and precipitation varies between 700 and 1,000 mm.

Existing vegetation responds to this variability in climate and environments. Plant formations inside the BR range from beech to sclerophyllous forests of holm oak and cork at the bottom of the valley to several phases of deciduous forest and mountain holm oak. Several species are found within the woodland, some of which are more favored by human interaction than others: beech, oak, fir, various pine species, cork and holm oak, etc. The woodland area makes up 91.9% of the Biosphere Reserve, with trees in 76.9% of its total area.

Fauna is classified as Mediterranean in the lowlands. It is associated with the sclerophyllous forest and is of European influence in other environments such as beech groves and shore woodlands.

Stock rearing and forestry activities are characteristically traditional here at Montseny. Because of its proximity to large urban communities such as Barcelona, the services sector and secondary production have become the local economy's greatest strength. The working population engaged in services rose from 24% in 1986 to 39.3% in 1991. Industry has remained stable at approximately 38% of the working population. Strained relations have developed in the area due to the expecta-

tions of a large market created from its proximity to such a large urban population (more than four million inhabitants) and the use and restrictions foreseen in the plans.

The abandonment of primary activities has led to a strong recovery of forest woodland. At present, the woodlands occupy the greatest total area and have a more developed structure and organization that at the time of the BR designation.

Over the last twenty years, Montseny has evolved from a mountain area engaged in activities such as farming, stock rearing, and forestry to a highly-frequented metropolitan park (the Biosphere Reserve with the greatest number of visitors) where the restaurant, entertainment and environmental education services predominate.

Planning and Management

As to its objective with regards to the *international network*, this BR's twinning with the French Biosphere Reserve of Cévennes established in 1987 and the partnership agreement recently signed with the Amistad Biosphere Reserve, in Costa Rica, are particularly noteworthy (see Box 2).

The scarce proportion of publicly-owned land inside the Natural Park, which amounts to 8.4% of its total area, leads to difficulties in management and means that a fair amount of resources are devoted to the acquisition of land, in particular land which is strategic for the establishing of amenities in the periphery of the park such as parking lots in frequently visited spots.

The Special Protection Plan, approved in 1977, is a pioneer in *planning* schemes for natural systems in Catalonia and Spain. It was not only the first legal planning instrument for Spanish Biosphere Reserves but the first protection plan in the country.

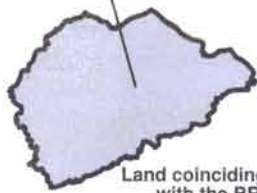
This Special Plan regulates urban planning processes and is part of the Law of the Land and Urban Regulations, which applies the actions it defines through the Natural Park's Action Program (Use and Management Plan). The programs, which are broken down and budgeted annually into subprograms and specific activities, include the following:

- General Objectives of the Special Plan
- Conservation and Physical Treatment of Territory
- Promotion of the Development and Participation in Park Management

Montseny



Montseny Natural Park



Land coinciding with the BR: 100%

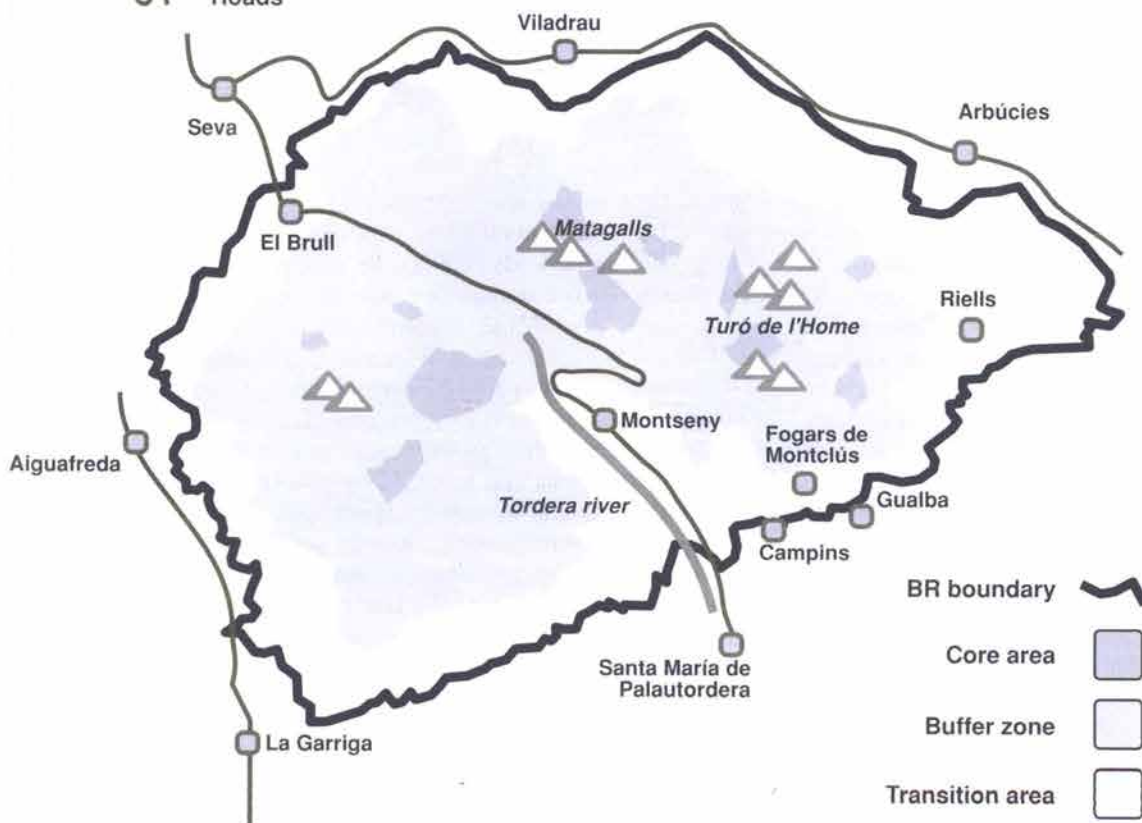
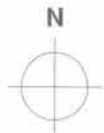
40 km



30.120 ha



- Towns or villages
- Highland areas
- Rivers and dams
- Roads



- BR boundary
- Core area
- Buffer zone
- Transition area

Biosphere reserve

MONTSENY

Declaration date		20 April, 1978		
Location (Province)		Biogeographical region/province		
Barcelona and Girona		Contact between Mediterranean and Eurosiberian		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
30,120 ha	3.2%	54.5%	42.3%	8.4%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
850	18	30,638	Services and Industry	
Other designations		Ecological characteristics		
		<ul style="list-style-type: none"> — Mountains, valleys, karst — Mediterranean and Oceanic climates — Holm Oak, Gall oak, and Spanish fir groves, oak grove, fir forest, chestnut grove, pine grove 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Threatened and endemic species — Fir forests, rock formation plant communities — Proximity to large urban area — Diversity of environments through contact between Mediterranean and Eurosiberian areas 		<ul style="list-style-type: none"> — High degree of development and planning — Twinning with other biosphere reserves 		

Associated protected area

MONTSENY NATURAL PARK

Declaration date		1976-1978 (reassessed in 1985)	
Institution responsible for management		The Barcelona and Girona Provincial Councils	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
30,120 ha	100%	100%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Special Protection Plan of Montseny Natural Park 1977-78 — Law 12/1985, 13 June, on Protected Areas of the Autonomous Government of Catalonia (concerns the Natural Reserve Area) — Decree 105/1987, 20 February, on the Declaration as Natural Park, as per law 12/1985, and on the delegation and management of park to the Barcelona Provincial Council — Decree 328/1992, 14 December, integration in the Areas of Natural Interest Plan 			

- Monitoring of Natural Resources
- Community Use
- Environmental Education
- General Activities and Support Activities

Some of the sectorial proposals for activities laid out in the annual management plan are the following: Forest Fire Prevention and Fire Watch Plan; Information and Surveillance Plan; Monitoring Plan; Environmental Education Program; Cultural and Recreational Program; etc.

With regards to the planning of those towns and villages inside the Biosphere Reserve, these are general plans approved by seven corporations while eleven are governed by subsidiary regulations.

The majority of *conservation* activities carried out can be grouped into the following sections:

- planning surveillance and control (reports, management of controlled hunting, recovery of abandoned dogs, control of urban planning, etc.),
- prevention and restoration plans, of which the fire prevention plan and other restoration projects are particularly noteworthy,
- various activities such as the acquisition of roads, the renting of grazing land, and the delimitation of estates,

Apart from the difficulties inherent to the risk of forest fire, the greatest difficulties with regards to conservation derive from the impact of the large number of visitors to the massif and from the pollution of waterways by some of the restaurant facilities.

Special emphasis is placed on *research* at Montseny. Cooperation agreements have been initiated with several universities (*Universidad de Barcelona, Universidad Autónoma de Barcelona, Instituto Politécnico de Catalunya* [The Polytechnical Institute of Catalonia]) in order to carry out various studies. Two documentation centers are particularly worthy of mention. One is devoted to the natural features of the park and the other to historical and ethnological attributes and both regularly publish catalogs which include all existing documents on Montseny. At present there are 3,660 related works.

Despite the existence of **fire protection plans**, and municipal fire prevention plans, which are fine examples of the rural community's participation in the fight against forest fires, the outskirts of Montseny were affected by a major fire in 1994 which destroyed 6,200 ha., 760 of which are located inside the biosphere reserve. In order to lessen the impact of said fire in the affected areas, a management proposal has been implemented in the small amount of publicly-owned land that was burnt and is being followed by affected land owners with the help of government subsidies. In addition, a plan of the Regional Council is being put into practice for the improved prevention of fires in the future and for the monitoring of the regeneration and colonization of areas affected by the fire.

Throughout its history the BR has hosted a number of conferences and meetings on scientific research and *trobadas* of participating scholars with Montseny as the subject of debate. Such events provide an opportunity to measure the degree of awareness and to exchange information amongst different sectors involved in research and management.

With all the actions carried out to date there are now plans to undertake an Ecoauditory of the Montseny Natural Systems with the aim of determining, now, after years of Park management, the degree of awareness and the environmental situation (see Box 8).

A *Monitoring and Control Plan* for the Physical, Chemical and Biotic Parameters of the Biosphere Reserve has been underway since 1992. This plan involves monitoring plant communities and analyzing the dynamics of the landscape based on satellite images; the monitoring and distribution of nesting birds, game species, vegetation, infested woodlands, the results of regeneration and restoration plans, and of the systematic retrieval of physical-chemical and some socio-economic data. Through links with EuroMaB, other aspects have been added to this proposal such as the monitoring of woodland plots (in order to monitor the effects of pollution on European woodlands). Montseny has also been incorporated into the EuroMab Bird Monitoring Network.

Among those activities which provide support for regional development, the Barcelona Regional Council has granted small subsidies mainly to family farming businesses, forest exploitation programs, tourist businesses and cultural entities.

A considerable amount of research and monitoring is carried out in order to better understand the socio-economic factors of the area. Two studies are underway at present. The first is on the «Evolution of the Labor Force, Economic Activity and Indicators of Income» and the second is on the «Analysis and Assessment of the Effects of the Montseny Natural Park Adjustment Policy for Family Farms».

According to some estimates, the creation of the Montseny Natural Park and its use by the public has generated an increase in revenues four times greater than that from strictly primary production in those towns and villages involved. However, claims are constantly being made by land owners who have been awarded compensation property because of limits placed on usage.

The Park's management and administration is overseen by the Barcelona and Girona Regional Councils, while the *participating* body is the Coordinating Council (established in 1984), of which various political representatives are members, and the Advisory Committee (established in 1989), which involves the different collectives interested in park management. These are farming, forestry, tourism, residents, cultural and recreation associations, scientific entities, conservationists and park technicians.

Similarly to other Reserves, some of the social sectors demand participation in decision-making organizations, particularly nature conservation groups and owner's associations.

At the moment, the administration is promoting the implementation of a "Friends of the Park Association", as a way to channel and provide a foundation for local participation. In addition, with this same aim of involving the local residents in the reserve functions, it is pursuing a policy of establishing agreements with local corporations and different organizations in order to carry out or manage various activities such as amenities, documentation centers, information schemes, fire prevention plans, etc.

In the beginning of 1994, the Conference *Montserrat i el Futur (Montserrat and the Future)* was held with the aim of gathering opinions and recommendations from the different production sectors and members of the community with regards to the future Special Plan for Montseny. It was, therefore, an example of fostering participation; in this case specifically for the creation of the Plan (see Box 11).

Montserrat is one of the Biosphere Reserves with the longest tradition of *environmental education* programs and it is well-equipped with related facilities and amenities. A total of 21,300 students attended the Nature classes in 1993; 3,165 students participated in the educational program "Get to Know Your Natural Parks". Recently, educational activities have been implemented in many of the facilities for public use and weekend courses have been given, etc. In addition, many related publications and support materials exist.

In 1993, 26 employees were assigned to Park management. This makes 1,158 ha. per worker which is 300 ha. below the average of Biosphere Reserves in Spain coinciding with protected areas. In addition, a significant number of workers are linked to public use amenities and are hired on a temporary basis for the prevention of forest fires.

As for Park budgets, endowment has been increased over the last few years from 310 million pesetas in 1991 to 394 million in 1993. Expenditures for investments are set at 8,974 pts/ha. which is very similar to the average of those Biosphere Reserves coinciding with protected areas.

There are numerous *public use* amenities in operation, as well as amenities devoted to educational programs. This is not surprising considering the number of annual visitors to the massif was 1,600,000 in 1993 (20% of the entire population of Catalonia). According to some of the local groups, the benefits the local population receives from the park do not correspond to aid received or resources available to the public.

In addition to park visitors, there are approximately 26,000 second homes in the area. The population at dif-

A cultural action plan called *Viu el parc* (Enjoy Your Park) has just recently been initiated. Thirty six (36) events took place between September and November 1993 with a total audience of 4,800 people. *Viu el parc* involves a complete program of cultural and entertainment activities in several of the towns and villages inside the biosphere reserve which, at times, is directly promoted by the Park administration, such as «Night in the Park», folk music concerts, colloquiums, Park Fair.

ferent times of the year reaches as high as 45,000, thus doubling the normal figure.

Perspectives and Conclusions

Throughout the 17 years of its existence as a Natural Park and Biosphere Reserve, a high level of management and planning has been achieved, with the development of numerous sectorial plans. For Spain, Montseny is a pioneer reserve in several aspects such as the aforementioned twinning of BR's or in the development of amenities for environmental education. Research has also been quite notable.

The greatest challenge facing the Biosphere Reserve is to control the large number of visitors while protecting the local conditions, and to adequately channel local expectations regarding development. The imminent reform of the Special Protection Plan will offer the possibility of harmonizing these and other interests related to the management of Montseny.

During 1993 a survey was carried out on those visitors to Montseny and its results revealed the following.

- An estimated 1,616,800 people visit Montseny annually. 1,096,800 on weekends and 520,000 during the week.
- The average length of stay is one day. Frequency is high: 55% return 9 times throughout the year (with a prior itinerary in mind) and 19% are one-time visitors.
- 98% are aware that Montseny is a natural park and 68% know it has been declared a Biosphere Reserve.
- The most popular form of transportation to the park is via private car, with family.
- Services and amenities were given a positive evaluation: only the number of posted itineraries were judged inadequate.
- The quality of the Park environment (woodland, air, water, landscape, visitor density) were also considered good (all indicators above 70%).

DOÑANA

Location and Characterization

This Biosphere Reserve was declared by the International Coordinating Council in 1980 at the same time as the Mancha Húmeda. The National Park had previously been extended to 50,720 ha., as per Law 91/1978 of 28 December in the Doñana Judicial System. This also included the establishment of five protected areas, whose geographical area amounts to 26,540 ha. The 77,260 ha. of the Biosphere Reserve were made to coincide with the National Park and its protected areas.

Several years later, in 1989, the Regional Government of Andalusia declared the Doñana Natural Park and included two of the protected areas of the Natural Park, thus making them Biosphere Reserve areas. These were the East and North fringes of the park, covering 24,500 ha. Thus, the entire National Park is located within the Biosphere Reserve and occupies 65.6% of its total area, while the area included in the Natural Park amounts to 31.7% of the Reserve. The remaining 2.7% corresponds to protected areas of the National Park which have not been incorporated into the Natural Park.

In 1963, prior to its designation as a National Park, 6,749 ha. were purchased with National and International funds. As of 1964, this property has been the Reserve for the Doñana Biological Station which is dependent on the Higher Council for Scientific Research. It became the center of the National Park which was later declared in 1969.

Doñana is located on the southeast Atlantic coast of the Iberian Peninsula next to the mouth of the Guadalquivir River. The key territorial units present are the following: coastal plains, which include static and migrating dunes; the Guadalquivir and Guadiamar estuary, with continental marshes; and the coastal beach. Characteristic vegetation is associated to each environment. In the preserves (sandy coastal plains) «white mountain areas» (with a predominance of rockrose, thyme and rosemary) and «black mountain areas» (where the dark color of heather abounds) are worth mentioning; in the marshes there is an abundance of holophytic species and an even greater abundance of hygrophytic species, such as the sea club-rush in the depressed areas with seasonal flooding. The area corresponding to the Natural Park presents woodlands, in particular pine forests and eucalyptus groves. With regards to flora, more than 800 vascular plant species have been cited in Doñana. Annual rainfall averages 600 mm., and the climate is characterized as Mediterranean tempered by Atlantic influence.

Doñana gains even greater importance because of the many designations afforded to it. In addition to its designation as a National Park, a Natural Park and a Biosphere Reserve, it received the European Certificate, it is a RAMSAR Convention Site, a Special Bird Protection Area [ZEPA in Spanish], and in December 1994 it was declared a World Heritage Area by UNESCO.

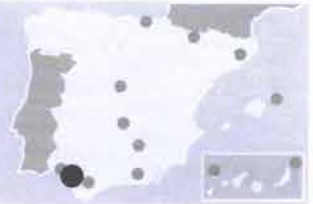
Secular management of Doñana was geared in favor of big and small game hunting, which has conditioned the preservation of scrub and woodland. The importance of fauna is great at Doñana: 361 bird species, 119 of which habitually reproduce, 29 mammals, 19 reptiles, 12 amphibians and, not counting those present in the estuary, 7 fish species have been sighted. Many of these species are very rare in Europe, such as the Moorish turtle, lynx, squacco heron, little bittern, purple gallinule and crested coot. Doñana is important not only for its diversity of fauna but for the abundance of common species which make use of the area. For example, 400,000 anatidae and coots winter in the area during a normal year. Lastly, the Biosphere Reserve constitutes an important migratory passageway: an estimated 6,000,000 birds nest at Doñana at some point in their annual migration route¹⁵.

Factors limiting human occupation in the region have traditionally been, the hostility of the marshes (malaria, occasional flooding) and the scarce fertility of the sandy soil. Nevertheless, the marshes, which initially occupied 250,00 ha. have been reduced at the same time as technological advances enable them to be transformed into rice fields and, subsequently, to be drained and desalinized. The cultivation of sandy terrain as per the Almonte-Marismas Plan and supported by FAO (which contemplates the transformation into croplands of a large part of the Biosphere Reserve), together with the onset of a large tourist resort on the coast in Matalascañas in 1968, have been the greatest threats to what is now a protected area.

The final result of the aforementioned has been the channeling and regulating of rivers, the draining of marshes, the cultivation of sandy terrain with heavy use

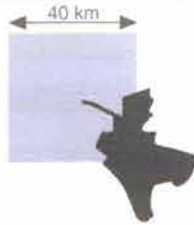
¹⁵ GARCÍA NOVO, F. and other, *Report on the State of the Doñana Biosphere Reserve*, MaB Committee, (Madrid, 1994)

Doñana

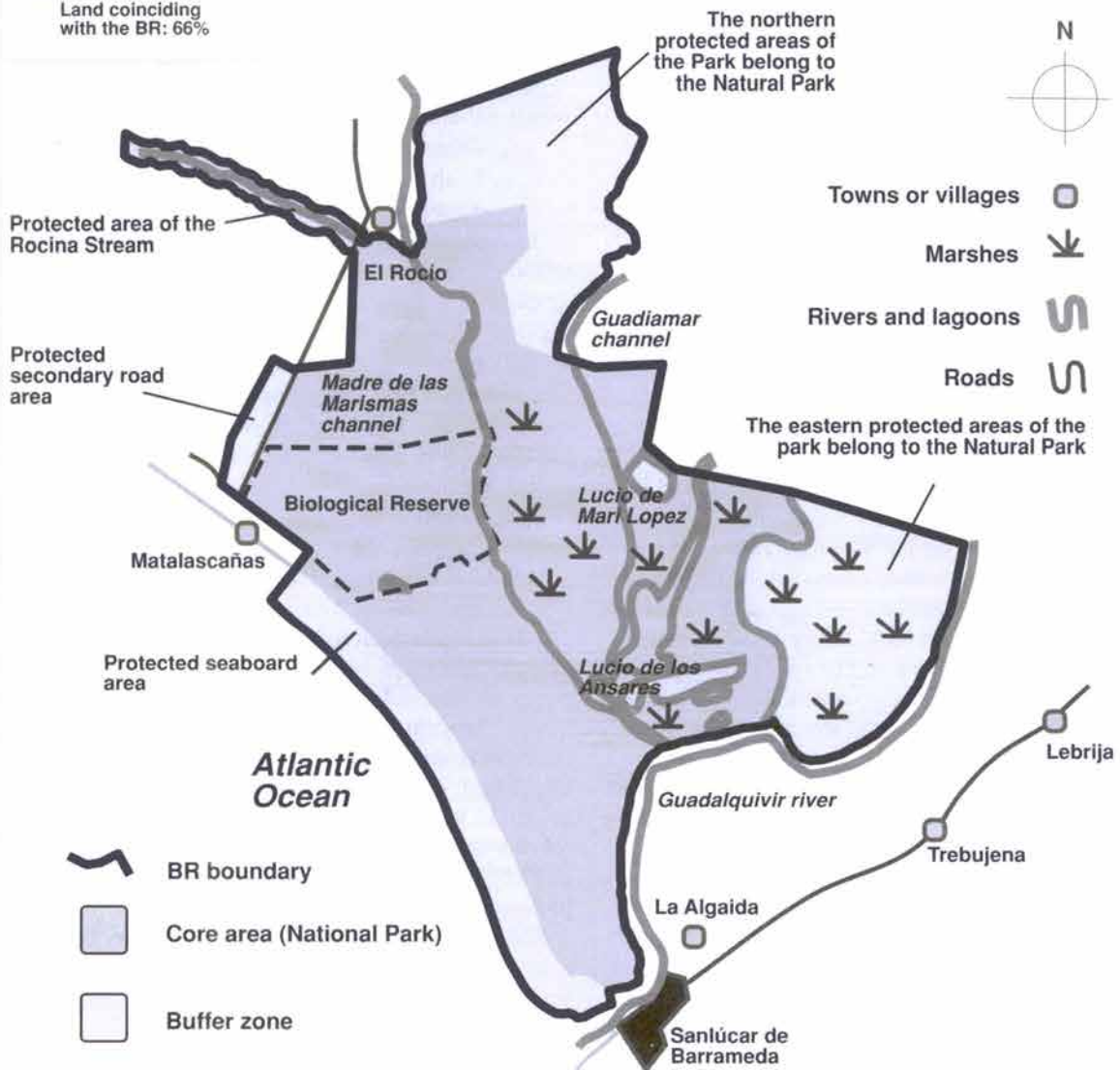


□ Natural Park
Land coinciding with the BR: 32%

■ National Park
Land coinciding with the BR: 66%



77.260 ha



Biosphere reserve

DOÑANA

Declaration date		30 November 1980		
Location (Province)		Biogeographical region/province		
Huelva and Seville		Mediterráneo-Ibero-Atlántica/Gaditano-Onubo-Algarviense		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
77,260 ha	65.6%	34.4%		42%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
149 (In the N P)	4	39,148	Balanced (Agric., Industry and Constr., Services)	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Biological Reserve (1964, 6,794 ha) — RAMSAR Convention Site — European Certificate (Council of Europe) — Special Bird Protection Area — World Heritage Area (1994) 		<ul style="list-style-type: none"> — Lagoon systems and coastal marshes, fixed and fluctuating dunes — Mediterranean-Maritime Climate — Sand vegetation, Stone pine forests, mediterranean scrub and cork <i>debesas</i> 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Threatened species — Well-preserved wetlands rich in avifauna 		<ul style="list-style-type: none"> — Conservation experience in a conflictive environment with a dynamic and changing natural medium — Experience in sustainable development in the surroundings 		

of pesticides and fertilizers, an important growth in industry in the outskirts (the Huelva-Sevilla-Jerez-Cádiz triangle) and severe pressure from visitors to the coast during the summer. Doñana persists as an island of Nature, constituting the most important wetlands in southern Europe, in an environment which is becoming more and more altered. The constant loss of complementary areas around Doñana represents the division, impoverishment and breaking up of the territory.

Although the marshes frequently are not modified, there are changes in their hydrological regimes: they are far from rivers, which in turn have been controlled and from which water has been withdrawn, which means that marsh flooding is limited to direct precipitation and discharges from small emissaries. Plans, referred to as 'solutions', were elaborated in order to make up for this shortage and these have facilitated the flooding of the marshes in winter but have brought about other changes and the need for subsequent interventions. To this effect, a Hydrological Resources Plan has recently been approved in the National Park.

In addition to their natural richness, the Biosphere Reserve and its surroundings are characterized by the great amount of conflicts and opposing interests asso-

ciated to them. The local communities have continued to make claims and demands, at times provoked by the administration itself, though not always realistic ones. For example, between 1981 and 1990 employment rose to 49%, and average annual income increased to 71% between 1981 and 1986. On the other hand, the educational level is unsatisfactory, and it therefore hinders possible developments related to activities that require better qualifications: in 1986, 63% of the population lacked formal schooling and only 8% had reached the high school level or above¹⁶.

The administration has maintained a contradictory and uncoordinated policy over the past twenty years in the same geographic area, thus pursuing opposing goals and investing significant sums in them: the conservation of the area and at the same time its drastic transformation, either for agricultural purposes (Almonte-Marismas Plan) or with the aim of mass tourist developments (the residential developments along the coast). There are numerous points of conflict: construction of the Ro-

¹⁶ THE INTERNATIONAL COMMITTEE OF EXPERTS, *Report on Sustainable Socioeconomic Development Strategies for the Doñana Area*. Seville, 1992

Associated Protected Area

DOÑANA NATIONAL PARK

Declaration date

1969: 34,625 ha. Extended in 1978 to 50,720 ha

Institution responsible for management

ICONA, The Ministry of Agriculture, Fisheries and Food

Area	Area of the BR within protected areas	Area of protected areas within the BR
50.720 ha	65.6%	100%

Protection/Planning legislation

- Declaration: Decree 2412/69, 16 October
- Reclassification and extension: Law 91/1978, 28 December, Doñana Legal System
- Legal Basis: Law 4/1989, 27 March, of the Conservation of Protected Areas and Wild Flora and Fauna
- Governing Use and Management Plan, Royal Decree 1772/91, 16 December

Associated Protected Area

DOÑANA NATIONAL PARK

Declaration date

1989

Institution responsible for management

The Environmental Agency of the Regional Government of Andalusia

Area	Area of the BR within protected areas	Area of protected areas within the BR
54,250 ha	31.7%	45.2%

Protection/Planning legislation

- Creation: Law 2/1989, 18 Julio
- Executive Plan for Territorial Coordination, for Doñana and Its Surroundings, 1988
- Sustainable Development Plan for Doñana and Its Surroundings, 1993

cio-Matalascañas motorway, waste purification at the Matalascañas Residential Development, illegal settlements at the beach, the invasion of all-terrain vehicles, the Costa Doñana and Dunas de Almonte development projects, construction at the El Asperillo Campgrounds, the El Race Residential Development, the Almonte-Marismas Plan, the exploitation of aquifer 27, poaching, crab selling and fishing, transformation of the Isla Mayor in aquiculture, the death toll of birds due to botulism (especially between 1973 and 1986), agricultural exploitations in the surroundings, etc.

The aforementioned has been the cause of serious national and international concern which has led to the lodging of complaints at the EC level and finally to the Letter Summoning the Spanish Government, in 1991. As a result of this situation, the Regional Government of Andalusia created an International Committee of Experts, who issued a Report which was later the basis for

the ambitious Sustainable Development Plan for the Doñana Area (see Box 10). This plan was initiated at the end of 1993 in order to harmonize the economic development necessary for improving the material conditions of life of a large part of the population with the conservation of nature.

Planning and Management

Management of the Biosphere Reserve is complex due to the numerous existing interests therein, the dispersion of responsibilities, the excess of legal instruments for planning and, also the lack of a coordinating body. ICONA oversees management inside the National Park while the Regional Government of Andalusia is in charge of the Natural Park. The Guadalquivir Hydrographic Confederation is responsible for ground and surface waters, the Puerto Autónomo de Sevilla is the authority responsible for shipping in the Guadalquivir river and

The Almonte-Marismas Agrarian Transformation Plan, based on joint studies between the Spanish Government and FAO and optimistic estimates of the hydrological resources available, contemplates the cultivation of 46,000 ha. of land in different areas of Doñana and its surroundings. In 1974, 25,000 ha. were made irrigable requiring the installation a broad network of drainage canals and avenues, the drilling of more than 500 wells, ditches and drainpipes for the desalinization, the channeling of surface waters, the leveling off of waterways, etc. As a consequence of the serious drought that took place between 1979 and 1983, and the extraction of water, the marshes are drying up in many areas and irrigable land is being reduced. In 1990 crops were grown on only 50% of this transformed land and many of the tenant farmers went into debt. However, in 1993 the area of irrigable land was extended to 15,000 ha., in part due to certain crises in other sectors, such as in tourism.

National Defense is responsible for maritime signals. Many other aspects are under national authority as is stipulated in the Law of Coasts.

There are no urban populations inside the Biosphere Reserve. The only resident population includes park staff.

Planning and management regulations for the Biosphere Reserve and its surroundings are part of long and complex process and will therefore be analyzed chronologically¹⁷. Several situations that have conditioned the different actions have been put in parenthesis.

- In 1962, the WWF purchased 6,794 ha. of land which it transferred to the National government for the creation of the Doñana Biological Station (the previous year the Costa de Huelva project for the promotion of tourism was approved).
- In 1969 the Doñana National Park was declared with 34,625 ha. (the Matalascañas tourist enclave was also being promoted; in 1971 the Almonte-Marismas was declared irrigable land with an expected coverage of 30,000 ha.).
- In 1978, the size of the National Park was extended (50,720 ha. and 26,540 ha. of the protected area).
- In 1980, the Doñana Biosphere Reserve was designated.
- In 1984, on behalf of the Regional Government of Andalusia, the drafting of the Executive Plan for Territorial Coordination at Doñana was initiated. This constituted a legal instrument for regional and urban planning to which secular plans and

public and private activities would be subject. Another plan had previously been created by what was then the Ministry of Public Works and Urban Planning but it was never put into practice.

- In 1988, the Executive Plan for Territorial Coordination at Doñana was approved but barely developed (the death of birds from botulism, the irrigation crisis, and the debate on Costa-Doñana).
- In 1989, the Doñana Natural Park was declared (54,250 ha.)
- In 1991, due to much social strain and international concern, the Regional Government of Andalusia created the International Committee of Experts.
- In 1992, the new Governing Use and Management Plan for the National Park was approved (the Report of the International Committee of Experts was published which advised against the Costa-Doñana project and instead proposed a Sustainable Development Plan, which would depend in large part on European Community funds).
- In 1993, the European Union admitted the Sustainable Development Plan for the Doñana Area and this was put into practice. The Plan closely adheres to the recommendations made in the Report of the International Committee of Experts (An agreement was reached with the promoters of the Costa-Doñana project for the exchange of land and, thus, guaranteed the conservation of the coast).

Both the Sustainable Development Plan and the International Committee's Report are adapted to the geographic area previously established by the Executive Plan for Territorial Coordination, which affects an extensive area of land around the Biosphere Reserve (3,000 km²).

In short, the National Park has a Governing Use and Management Plan; the Natural Park is awaiting approval of its Management of Natural Resources Plan as well of its Governing Use and Management Plan; and both protected areas have been affected by the 1988 Executive Plan for Territorial Coordination and the Sustainable Development Plan currently underway. The core area of the Biosphere Reserve shall be put on the same level as the National Park and the remaining areas, included mostly in the Natural Park, are to be considered the buffer area.

Those most noteworthy features of the Governing Use and Management plan of the National Park are the need to develop public use of the same, the management of resources (in particular endangered species and hydrological resources) and conservation related research. Questions such as regional development play a less significant role. An important outstanding problem is the need to control livestock use because of related repercussions on the ecosystems and the social conflict it has generated in the surroundings.

The originality and dynamic nature of the ecosystems

¹⁷ Based in part on the article 'Sustainable Development for the Doñana Area', published in 'Medio Ambiente', N.º 21, May 1994, periodical of the Environmental Agency of the Regional Government of Andalusia.

in Doñana make management directed at conservation difficult, thus breaking with the traditional concept of actions. For this reason many novel solutions have been adopted with regards to conservation and hypothesis in research which are both enriching and pioneering models in many respects.

In the National Park, the Governing Use and Management Plan mandates the elaboration of special plans for the management of various species and ecosystems. Plans and actions which have been initiated are the following:

- Management Plan for Lynx, which has been underway since 1988 and for which a center for breeding in captivity has been created;
- Imperial Eagle Plan, underway since 1983 (which has included the underground installation of high tension electrical lines);
- Hydrological Resources Management Plan, approved by the Board of Governors at the end of 1994 (included as one of the priorities of the new Governing Use and Management Plan which states that «the objective of management is to maintain “un régimen hídrico” as similar as possible to that which existed before such severe transformation processes took place on the Guadalquivir marshes»);
- Regulations for apiculture and shellfishing;
- Reduction in the number of buck and deer; as well as the recommendation to reduce the wild boar population;
- Programs for the breeding in captivity of some of the threatened species (white-headed duck, lynx, etc.).

Other actions being promoted are the purchasing-expropriation of estates in order to increase public proprietorship which amounts to 64% of the National Park. Here 9,000 ha. are presently awaiting expropriation at the cost of 3,000 million pesetas (double the Park's annual budget).

For its part the Doñana Natural Park is also carrying out several actions, with special emphasis on the forestry treatment of eucalyptus plantations and pine forests and plans for fire prevention.

Some emphasis is also placed on the maintenance of traditional resource utilization. For example, the Governing Use and Management Plan of the National Park stipulates the regulation of charcoal making, apiculture, small cockle collection and pine cone collection, fishing and extensive stock rearing.

One of the most important conservation problems of the Biosphere Reserve are several threats to nature such as the Almonte-Matalascañas road which causes the death of many vertebrates, especially lynxes, the area of crops within the forest area and the marshes (wells, fencing, phytotoxic chemicals, sections of polluted streams, poachers, hunters and crab sellers.

Research takes place mainly in the Biological Reser-

Doñana has a long tradition of scientific research going back to the fifties, before it was declared a Biosphere Reserve. For example, by the middle of 1993, 200 research projects were simultaneously underway. In addition, bibliography on Doñana is abundant, with approximately 3,000 publications in 1991. It is probably the most researched protected area in Spain.

ve, which depends on the Higher Council for Scientific Research (The Ministry of Education and Science) and to which significant sums of the budget and both human and material resources is devoted. Many of the studies and research are applied to conservation: the Governing Use and Management Plan of the National Park establishes as a major aim the fostering of «research projects directed at resolving management related problems of the Park». One of the major deficiencies at present is the lack of research on hydrological resources.

Several MaB projects have also been carried out in the area occupied by the Biosphere Reserve, such as the Ecology of the Doñana Biosphere Reserve and Transformations on the Southeast Coast of Spain.

With regards to monitoring, although there is no plan which is specifically for the monitoring of biological resources in the National Park, actions are carried out to this effect. Water plays a major role in the maintenance of the present conditions of Doñana. For this reason, with the recently approved Hydrological Resources Management Plan, the evolution of the groundwater level, circulating waterways, water quality, etc. will be controlled on a monthly basis.

Given the abundance of research taking place in the geographic area of the Biosphere Reserve, knowledge on the evolution of ecosystems and species in the Park is no doubt up to date.

In reference to the Biosphere Reserve's contribution to *regional development and planning* its participation in achieving economic development in the local communities has not been one of the priorities of the work carried out. This is due not only to the nature of its management, which is very inclined towards conservation, but to the nature of the land, which is of outstanding natural value. Nevertheless, although the Biosphere Reserve has not played a direct role in promoting regional development, it has played a decisive indirect role in the same: due to the natural interest of Doñana and the international attention it has received in the area of conservation, important sums devoted to the promotion of regional development have been afforded. An example of this is the Sustainable Development Plan which, with 75% financing from the European Union, amounts to an investment of 60,000 million pesetas until the year 2000.

Direct actions on behalf of the National Park in 1994

The Board of Governors of the National Park was created as per Law 91/1978, and since its initiation in 1978 it has directed management, established objectives, obtained the necessary administrative means and has channeled claims, protests and requests. This model has been extended to the remaining protected areas in Spain. This Board of Managers is the first body devoted to local participation in the Spanish Network of Biosphere Reserves.

included the granting of subsidies to the surrounding towns and villages in the amount of 132 million pesetas. Almost all subsidies were awarded to projects for the creation of centers and amenities for public use.

In short, upon application of the Sustainable Development Plan, the Biosphere Reserve constitutes the main object of conservation within a much larger geographic area; although promotion can take place within the BR in regards to traditional systems and educational and tourism related uses which are compatible to conservation.

Similarly to the other protected areas associated with Biosphere Reserves, local participation is channeled through the Board of Governors in the National Park and through the Board of Managers in the Natural Park.

As mentioned before, there have been many social conflicts in the area and some town councils with part of their municipal districts within the National or Natural Park feel that compensation is insufficient. This attitude is expected to change upon proper implementation of the Sustainable Development Plan.

Among actions geared toward environmental education and training, informational visits for the general public and schools take place in the National Park as part of the program «Doñana and its Surroundings». The program «A Day at Doñana» is currently being reorganized. In addition to the well-known itineraries in all-terrain vehicles, river trips from Sanlúcar de Barrameda are now available. Also underway since 1993 are programs which make guides available to the general public in Information Centers and on Walking tours. Because of its flat topography and the intense dynamic nature of the ecosystems, interpretation plays an important role at Doñana and for this reason guides are a key to understanding the natural environment.

The Natural Park is carrying out a program called «Schools in Doñana» which is part of the Environmental Education Program of the Regional Government of Andalusia.

An important network of information points and interpretation centers has been set up in the Biosphere Reserve. One of the interpretation centers is jointly managed by the National Park and the Natural Park and is one of the few examples of coordination and partnership among administrations.

Of the educational activities directed at the general public, the basic training courses which took place in the National Park in 1992 for the inhabitants of Almonte on how to carry out public use activities are worthy of mention.

Calculation of the *endowment* of the Doñana Biosphere Reserve with regards to the number of permanent workers was based on the criteria of how many were engaged in Park management in each of the areas included in the Biosphere Reserve (100% of the National Park and 45% of the Natural Park). The ratio is 1,045 ha./employee, which is almost identical to the average of those Biosphere Reserves coinciding with protected areas. If research workers or temporary employees had been included, the ratio would have been 6 times greater which gives an idea of its proportional importance, especially in the National Park.

Using the same criteria for budgetary investments, in 1994 the Doñana Biosphere Reserves had the highest budget per hectare ratio of all Biosphere Reserves in Spain coinciding with protected spaces: 23,861 pts/ha., which is equivalent to 260% of the average of these same protected areas. This is due largely to the significant investments being made by the different organizations which are responsible for Park management (ICONA and the Environment Council of Andalusia) and to the acquisition of European funds (Council of Europe, Cohesion Funds, etc.).

Endowment in infrastructure at the Biosphere Reserve is a reflection of its eminently scientific use and its devotion to conservation, although there are also a large number of amenities and facilities for educational purposes and for public use in general. The National Park has two information centers and three interpretation centers, in addition to the interpretation center it shares with the Natural Park.

The criteria established in the Governing Use and Management Plan of the National Park for the development of public use are based on keeping pressure inside the Park to a minimum, thus setting up infrastructure in the periphery of the Park, diversifying free-access visits and placing special emphasis on the public use demands in the surroundings. This way tourism is only permitted in a relatively small part of the National Park in those areas classified as Moderate Use Areas (devoted to interpretation related activities or traditional transit such as the Race pilgrimage) and those classified as Restricted Use Areas (small areas in the vicinity of public use centers where pedestrian transit is permitted).

An estimated 400,000 people visited the Doñana National Park in 1994. Management of these visitors to the National Park is adequate but scarce, despite the serious efforts made over the last few years. The shortage of activities and itineraries means that these do not meet the existing demands. It is important to bear in mind that of the total number of people that visited the Park centers, much fewer were actually able to go inside the Park be-

cause of access limitations. To this effect, coordinating public use activities and integrating them into the Natural Park is recommended.

A network of itineraries has been created in the Natural Park, determining their degree of transit for each season. There is still little public demand since the area is not well-known. At present, efforts are being made towards setting up recreational areas and other facilities.

On the other hand, two important tourist centers have developed over the last twenty years at the edges of the Biosphere Reserve. These are Matalascañas, with lodging for 65,000, and El Rance, with 20,000. Maximum occupancy occurs, as is to be expected, during the summer. These enclaves are a continuous source of problems for the Biosphere Reserve because of a lack of control and insufficient infrastructure. The number of visitors to Matalascañas during a weekend can reach up to 70,000 with some 3,000 permanent residents. Problems are centered around poaching, the use of all-terrain vehicles, waste water, consumption of water from wells next to the National Park, garbage and rubble heaps, etc.

Perspectives and Conclusions

The Biosphere Reserve is remarkable no doubt due to the quality of its natural environment: the conservation of extremely important and scarce ecosystems, a passageway and breeding area for numerous wildlife species, etc.; and also due to the efforts of applying sustainable

development strategies in such an environment which is so conflictive because of the number of opposing interests.

Territorial planning is the key to the preservation of this area's potential. The Executive Plan for Territorial Coordination could have been the appropriate legal instrument for the region if it had been put into practice with all its consequences. Currently, the Sustainable Development Plan, together with its inherent financial contribution, may help achieve development in balance with the natural resources.

It seems clear that the present conservation actions of the Biosphere Reserve will soon need to include the protection of the Almonte-Marismas aquifer, maintaining its traditional discharges, its hydrological regime and water quality. In addition, with respect to the conservation of protected species, the possibility of exchanging populations with those of the surroundings is necessary. Advanced agriculture which has been promoted in the region is the worst alternative for both of the aforementioned aims. Nevertheless, the Hydrological Resources Plan of the National Park and the search for other alternative sources of water within the framework of the Sustainable Development Plan should contribute to the improvement of this situation.

The coordination of the different administrations involved in Doñana is another imperative need. At present there are no channels for coordination between the National Park and the Natural Park which are the two protected areas included in the Biosphere Reserve.

MANCHA HÚMEDA

Location and Characterization

The Mancha Húmeda Biosphere Reserve is located in the interior of the great Manchegan plains and covers a series of semi-permanent flood plains scattered throughout Ciudad Real, western Albacete and southern Toledo and Cuenca. It was declared a biosphere reserve in 1980, together with Doñana, and encompasses 25,000 hectares with imprecise boundaries which correspond to the maximum extension of the wetlands during the rainy season at the time the reserve was designated. However, studies from 1980 state that the Manchegan wetlands cover less than 10,000 hectares.

In other words, Mancha Húmeda was declared a biosphere reserve with multiple nuclei, whose protection areas included the wetlands, and yet an even larger area corresponded to the transition area. The biosphere reserve includes the Tablas de Daimiel National Park (1,928 ha.), its protection area (5,410 ha), the Lagunas de Ruidera Natural Park (83,772 ha.) and a long list of wetlands which were included in the original proposal for the declaration of the biosphere reserve but have since then disappeared (Navazueta, in Cuenca; the Albuera Lagoon, in Ciudad Real; Acequión Lagoon, in Albacete, etc.).

The reserve territory is a slightly undulating plateau of distinctively steppe nature, full of horizontal tertiary deposits. Most of the wetlands and flood plains of the region are formed by water rising from the underground aquifer, in depressions in the terrain, together with several sources of surface water. In addition to the endorreic lagoons, the waterways are another important feature of the wetlands.

The main rivers that cleave through the region, the Guadiana, Cigüela, Riansares, Záncara and the Córcoles, are characterized by their extremely irregular hydrological regimes. Orographically, the region where the reserve is located is delineated to the west by the last foothills of the Toledo mountains (Sierra de la Calderina and Sierra de Malagón), to the south by the Sierra de Calatrava and to the southeast and east by the Campo de Montiel high plateau.

The biosphere reserve rises to an altitude of between 600 to 700 m. above sea level. Continental climate characterizes the region, with vast differences in temperatures. Maximum temperatures reach as high as 40 degrees and may drop to as low as 15 degrees below zero. Rainfall averages approximately 400 mm. a year.

The most typical vegetation of the lagoons are marl-

pits and coarse straw formations: tall grass formations which take root in the bottom of the lagoon and emerge vertically from the water; anea, reed and rush are the most abundant of these. The Tablas del Daimiel National Park contains one of the largest great fen sedge (*Cladium mariscus*) formations in Western Europe.

With regards to fauna, the birds associated to the wetlands are particularly noteworthy, including fine examples of anatidae and limicolae.

The key land uses in the area are agriculture, dry farming and irrigable farming, which makes use of wells, grazing, and to a lesser extent, tourism.

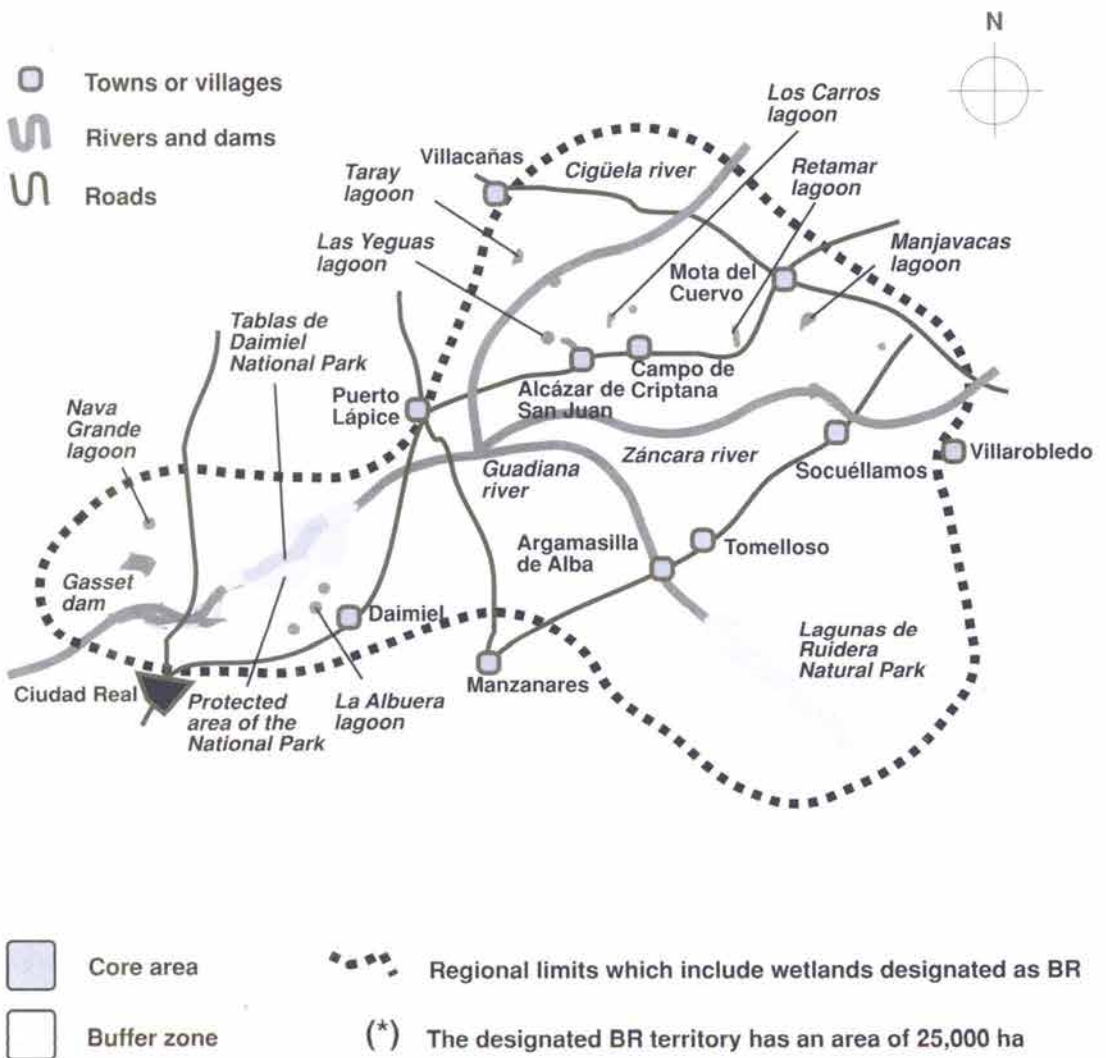
Wetlands in La Mancha have gone from occupying 22,000 ha. in 1974 to 8,640 ha. in 1980¹⁸. The situation is similar today, in part due to the policies fostering irrigation and to the lack of coordination in actions. Thus, in the area occupied by the biosphere reserve, greater amounts of water are being extracted from wells than the aquifer can supply, and the average groundwater level has decreased an average of one meter per year since 1974.

The reason for this is not totally unrelated to the policies which support irrigation, frequently for crops which require a lot of water such as corn (more than half the amount of the extractions of water which took place between 1984 and 1987 were directed at these crops and after Spain's incorporation into the EEC, the Spanish Government had to take responsibility of these surpluses).

The overexploitation of the aquifer has led to drastic changes in ecosystems dynamics. For example, in 1984 the Tablas del Daimiel ceased to act as a spillway for the aquifer and was converted into a drain that loses water through filtration. The flow of ground water has changed or has stopped in many areas. Many wetlands have dried up and, since 1989, the Guadiana River no longer rises from the renown Ojos del Guadiana, which is now being converted into a corn field, but rather from the national park, thanks to the external contributions of water. Additionally, utilizing irrigable lands without adequate techniques and, on occasion, employing water with a high salt content, are leading to a strong salinization of the land, and thus have caused

¹⁸ NAREDO, J.M., GASCO, J.M. «Enjuiciamiento Económico de la gestión de los humedales. El caso de las Tablas de Daimiel» en *Magazine of Regional Studies*, n.º 26, p.p. 71-110, Universidad de Andalucía, 1990.

Mancha Húmeda



Biosphere reserve

MANCHA HÚMEDA

Declaration date		30 November, 1980		
Location (Province)		Biogeographical region/province		
Albacete, Ciudad Real, Cuenca and Toledo		Medit./Interprovincial Cast.-Maestrazgo-Manchega and Luso-Extrem.		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
25,00 ha	7.7%	21.6%	70.7%	98.3% (in the core area)
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — RAMSAR — Special Bird Protection Area 		<ul style="list-style-type: none"> — Plains, hills and lagoons and wetlands on tertiary materials — Mediterranean-Continental Climate — Oak groves, heliophytes, halophytes and rock formation vegetation 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Threatened species — Wetlands with wintering birds — Possible rational use of hydrological resources 		<ul style="list-style-type: none"> — Incorporation of inner penninsular wetlands into the Network 		

the abandonment of many areas that were once irrigated.

In 1987, in view of the obvious degradation of protected wetlands, the hydrogeological unit known as System 23 was declared overexploited. Further extractions were prohibited and the Hydrological Regeneration Plan for the Tablas de Daimiel was implemented. Despite this, even with pumping frozen at 1987 levels and renewable resources, the water levels fall more than one meter in an average year. For this reason, transferring water from the Tajo-Segura waterway to the Cigüela and Riansares rivers, or building dams and pumping water against the current have meant that the national park is once again covered in water, and this allows for better conservation of the area, though at great costs and without a lasting solution. Given the current features of the Tablas del Daimiel, its hydrological function consists of refilling the aquifer to allow for pumping in the center of the area. Moreover, water quality here is significantly worse than when the site served as a spillway, and this is due to the numerous unpurified discharges into the waterways.

At present, the incentive policy for irrigation has changed tendencies and, for the time-being, is promoting its abandonment through contributions on behalf of the European Union and the Central and Autonomous governments. These amount to up to 60,000 pesetas per hectare a year for those farmers who take up dry farming methods again. Distribution of this aid began in 1993 but there are no specific plans for the recovery of ecosystems.

In short, it should be made clear that in only a few years in the territory occupied by the biosphere reserve, an important part of the natural capital which productivity and sustainability were based on has dissipated. Some of the economic and ecological damage which are a result of this management model are the following¹⁹:

- Loss in the quality and quantity of surface and ground water.
- Loss of the aquifers as regulators of the quantity and quality of the water in the hydrographic basin, because, once drained these never regain their original permeability, etc.
- Loss of wetlands, and the consequent negative ef-

¹⁹ Based on NAREDO, J.M. and GASCO, J.M., cited work.

Associated protected area

TABLAS DE DAIMIEL NATIONAL PARK

Declaration date	1973. Reclassified in 1980	
Institution responsible for management	ICONA, The Ministry of Agriculture, Fisheries and Food	
Area	Area of the BR within protected areas	Area of protected areas within the BR
1,928 ha.	7,7%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — Declaration: Decree 19874/73/ 28 June — Reclassification: law 25/30, 3 May — Legal Basis: Law 4/1989, 27 Marcha, on the Conservation of Protected Areas and Wild Flora and Fauna — Annual Management Plan 		

Associated protected area

LAGUNAS DE RUIDERA PARK

Declaration date	1979	
Institution responsible for management	The Regional Government of Castile-La Mancha	
Area	Area of the BR within protected areas	Area of protected areas within the BR
3,772 ha	15,1%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — National Natural Interest Site: Order 10-31-1993 — Decree 95/1988 of the Regional Government of Castile-La Mancha 		

fects on the flora, fauna, climate, landscape, recreational and scientific value, etc.

- Loss of peat bogs, because these were burned after they were drained, have lost their capacity to regulate water and can no longer be extracted for fertilizing purposes.
- Financial losses due to the added surplus of agricultural production which has been paid for by the Spanish Government with subsidies and privileged loans used to make the land irrigable. Subsequently, there have been additional financial losses in the form of economic incentives for the abandonment of irrigation methods.
- Loss of fertile soil due to salinization and loss of organic material.
- Loss owing to the carrying out and maintenance of increasingly expensive public works which are directed at mitigating the above damages.

Planning and Management

Management of the territory is the responsibility of the National Institute for Nature Conservation [ICONA] in the National Park area, and of the Regional Governments of Castile-La Mancha in the rest of the biosphere reserve, including the Lagunas de Ruidera Natural Park.

None of the protected areas have legal instruments of planning apart from the annual Management Plans. Although an Executive Plan for Territorial Coordination was anticipated, this has not yet been prepared.

Most of the management activities in the national park are devoted to *conservation*, such as controlling pollutant discharges, the elimination of invading plants, restoration of vegetation, etc. However, those actions which require the greatest amount of resources are those directed at regenerating the wetlands, within the framework of the previously mentioned Hydrological Regeneration Plan for the Tablas del Daimiel.

Activities in *research and monitoring* focus on the physical-chemical parameters of the lagoons, the control of plant and fauna populations and the monitoring of the effectiveness of the hydrological regeneration plan.

Public use amenities are limited. The national park has one visitor reception center and several itineraries and observatories.

For its part, the Lagunas de Ruidera, which were declared a natural park in 1979, are pending the creation of a Use and Management Plan to help limit and regulate some of the major problems, such as uncontrolled urban growth (with houses built on the edges of several lagoons), massive extractions of water in the proximity (aquifer 24), pollutant discharges, and a significant human impact during vacation periods. The recent implementation of a Plan for the Recovery of Wetlands, is expected to improve the situation.

Perspectives and Conclusions

The Mancha Húmeda Biosphere Reserve is similar to the Ordesa-Viñamala reserve in that only a small part of

their territory's management is directed at the conservation of natural values (Las Tablas del Daimiel National Park, 7.7% of its total area, and the Lagunas de Ruidera, 15%). The remaining sites are neither well-defined nor benefit from management in line with the biosphere reserves. In other words, the biosphere reserve has apparently had no repercussions or influence on management in the territory. There has been a significant loss of resources because of the lack of comprehensive management based on the understanding of managed resources and one which follows a criteria of sustainable development and productivity.

The recommended actions therefore include overcoming the ambiguities found in the territory, redefining the boundaries of the biosphere reserve, and in management, coordinating actions between different responsible authorities. The objective would be to guarantee the conservation of a large region which is of important ecological value by reorienting the utilization of resources toward viable economic, social and environmental activities.

EL CANAL Y LOS TILES

Location and Characterization

With its 511 ha, the El Canal y Los Tiles Biosphere Reserve is the smallest in Spain. It was located in 1983 and is located in the Northeast of the Island of La Palma, on the basaltic slopes which descend from the other side of the Caldera de Taburiente Natural Park. It was the first of the International Network of Biosphere Reserves in a macaronesian biogeographical region. The Biosphere Reserve has been part of the Nieves Natural Park since its approval by the Canarian Law of Protected Areas in 1994.

The BR is located within the San Andrés y Sauces municipal district. Heights above sea level range from 250m. at *La Tomada* to 1,400 m. at *Cruz de Vázquez* with an average gradient of 20%. It occupies almost all of the Tiles o del Agua ravine basin and its headwaters. Steep slopes and a narrow river bed give rise to a coneshaped relief, where volcanic materials are intersected by breakwaters and thus make for a very impressive landscape which is erosive and winding.

The climate is mild and very wet with abundant rainfall and little sun. Dense fog is frequent in the ravine because of its orientation towards the incoming moisture-laden winds which are subsequently trapped within. This gives rise to greater amounts of water than the average rainfall of 1,000 mm. per year produces. With regards to vegetation there is a predominance of *Laurisilva macaronesica*. This is a type of evergreen forest of a subtropical nature associated with wet mesoclimates with a high diversity of species, and in particular, among woodland species, the laurel-like trees. Characteristic of this species is the *Til*, *Ocotea foetens*, after which the Biosphere Reserve is named. In the upper areas of the ravine, *laurisilva* grows among formations of canarian pine, which become more dominant as the

The relic-like nature of the **laurisilva forests** is due to its disappearance in many places on earth. This process began towards the end of the Tertiary Age when the climate underwent a pronounced cooling before glaciation. This change in climate produced a latitudinal shifting southward of plant formations which were then relegated to points where they survived in wet and mild climates. This was the case with perimediterranean *laurisilva* and Macaronesian Archipelago, in particular in the Canary and Madeira Islands.

altitude increases. El Canal y Los Tiles boasts of one of the best preserved examples of *laurisilva* in all the Canary Islands as well as a significant representation of many of the islands' endemisms.

Similarly to the rest of the Canary Islands, the diversity of fauna is low although endemisms are high. The greatest number of endemisms are found among insects. Remarkable among the vertebrates is the buzzard (*Buteo insularum*) and white tailed pigeon and Bolle's pigeon, which are endemic to the islands and associated to *Laurisilva* and *Fringilla coelebs palmae* and *Parus caeruleus palmensis* which are endemic subspecies of the island of La Palma. Two of the most abundant mammals, the rabbit and black rat, were introduced. The area was also declared a Special Bird Protection Area [known by its Spanish initials ZEPA].

There are no residents or human settlements within the Biosphere Reserve. The ravine's main source of water is seized at the headwaters and channeled by communities that use irrigation, particularly at banana plantations. This means that there is no water in the river most of the time which causes problems in the biotic communities present therein. In addition to water catchment canals and galleries, there is also a small still water dam.

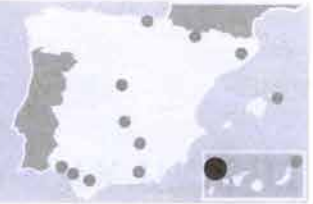
Planning and Management

As is the case with the majority of the reserves in Spain, the participation of El Canal y Los Tiles in activities of the Biosphere Reserve Network is limited to its relationship with the Spanish Committee of MaB and to its participation in Network meetings. It has also had sporadic contact with the Cévennes Biosphere Reserve in France.

The El Canal y Los Tiles Biosphere Reserve lacks regulations on *management and planning*. Although it should have a Governing Use and Management Plan based on prevailing legislation, the recently created Natural Park which it has formed part of has not developed any regulations to the effect either.

The regulations providing for the declaration of this Biosphere Reserve were based on the Resolution of the National Institute for Nature Conservation [known by its Spanish initials ICONA], which establishes Special Standards for the Protection of the Monte El Canal y Los Tiles (November 16, 1982). This resolution declared the Monte El Canal y Los Tiles a Biosphere Reserve and "permanently prohibited exploitation of any of its natu-

El Canal y Los Tiles

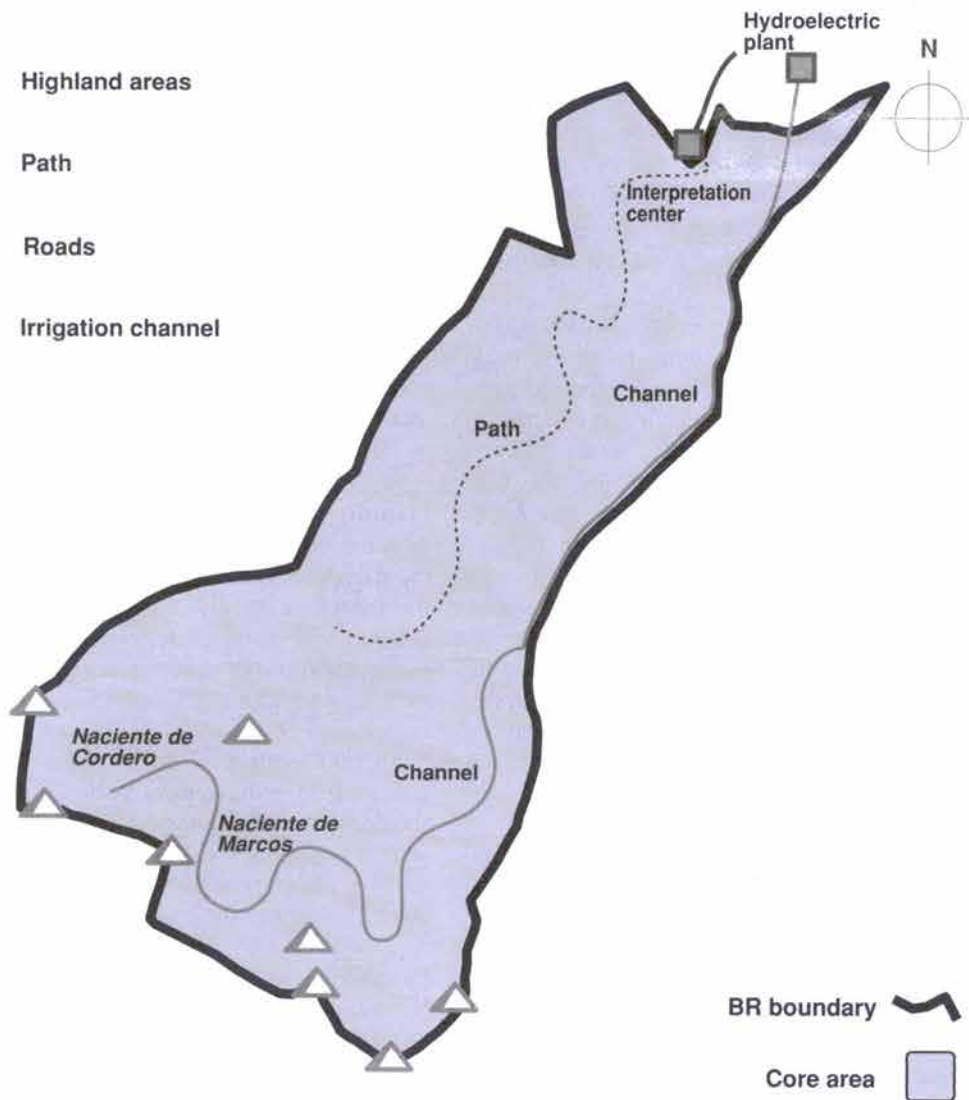


511 ha



Canary Islands

-  Highland areas
-  Path
-  Roads
-  Irrigation channel



Biosphere reserve

EL CANAL Y LOS TILES

Declaration date		21 April, 1983		
Location (Province)		Biogeographical region/province		
Santa Cruz de Tenerife (Island of La Palma)		Macaronesian		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
511 ha	100			100%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
	1	4,978	Agriculture and Services	
Other designations		Ecological characteristics		
— Special Bird Protection Area		— Basaltic ravines with steep slopes, peaks — Temperate Subtropical climate — Laurel-likeleaved forests, pine forests		
Conservation interest		Major contributions to RB		
— Threatened species, laurel-likeleaved forests		— Incorporation of macaronesian laurel-likeleaved forests into the Network		

Associated protected area

LAS NIEVES NATURAL PARK

Declaration date		1994	
Institution responsible for management		Subcommittee on the Environment (Council on Terr. Plan of the Gov CI)	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
5,094 ha	100%	10%	
Protection/Planing legislation			
— Declaration: Law 12/1994, 19 December, on Protected Areas in the Canary Islands (Official Bulletin of the Govt. of the Canary Islands, No. 157, 12-24-1994)			

ral resources with the object of economic profit. The only permissible activities are those management activities necessary for the conservation and improvement of habitats and species and for the restoration of areas or communities which have been degraded or have disappeared due to unnatural causes. In other words, it established strict regulations which totally limited the scope of actions.

Prior to 1977 when ICONA acquired this property, it was used for forestry, hydraulic and livestock purposes. ICONA later transferred the El Canal y Los Tiles estate to the Government of the Canary Islands who, through the Council on Territorial Policy, is presently in charge of management of the Biosphere Reserve.

Despite the lack of planning regulations, in large part what has allowed the Biosphere Reserve to remain in

its present state is the fact that it is entirely publicly-owned land.

As specified in the description of the Lanzarote Biosphere Reserve, the new Law of Protected Areas in the Canary Islands, requires the drafting of Natural Resource Management Plans and the formation of Boards of Governors on an island level, in order to control management of the declared protected areas. Once developed, both the above regulations and the anticipated Board of Governors will affect the El Canal y Los Tiles reserve.

As for *conservation*, the conditions of the geographic area of the Biosphere Reserve are generally favorable. There have been very few modifications and this is no doubt linked to the aforementioned strict limitations on uses and to the inaccessibility of most sites. With regards to more active conservation measures, in 1984 actions were initiated for the restoration of autochthonous vegetation and the elimination of introduced flora, particularly in the laurisilva area. At present there is no data on its effectiveness. Plans for the elimination of domesticated goats and the control of rodents have also been carried out.

Research inside the Biosphere Reserve is coordinated with the La Laguna University, in particular the Botany Department, and is based on several lines of work. Research projects related to bird species (almost completed) and cryptogamic flora of the Biosphere Reserve have been underway since 1988.

The lack of a biophysical cataloguing is another important factor. All available data on the Biosphere Reserve is extrapolated from the rest of the island territory and therefore detailed information on the existing natural resources of the reserve does not exist.

Contributions to *regional planning and development* are not very effective because of its relatively small size and the prevailing restrictions on uses.

Another of its limitations as a Biosphere Reserve, no doubt related to the absence of legal instruments on planning and management, is that there are no mechanisms or channels for local *participation* in management.

After the interpretation center was brought into operations in the summer of 1994, some actions related to *environmental education* were developed, although these were limited and lacked a structured action plan.

Contrary to other reserves in Spain, the El Canal y Los Tiles does identify itself as a Biosphere Reserve on existing signposts and documentation, although little information has been disseminated about the Biosphere Reserve and it has not been publicized much.

Surveillance of the ravine is the responsibility of the only park warden on staff who also controls other sites and is entrusted with additional tasks. There are also two technicians in the Vicecouncil on Environment who, on a part-time basis, are engaged in matters related to the Biosphere Reserve.

Of the existing infrastructure and facilities, those most worthy of pointing out are associated to the El Canal y Los Tiles Biosphere Reserve Center for Research and Interpretation. The center is equipped with an interpretation area, laboratory, a small meteorological station, a library along with lodgings for research workers and an auditorium for school children. However, due to the lack of personnel, unless prior notice is given, the center is usually closed.

There is a small recreational area and a restaurant in the lower part of the Biosphere Reserve. Existing paths are not designed for use within the setting of a protected area and are not signposted.

The most serious environmental problems stem from the hydraulic infrastructure (a dam, a small hydroelectric station and a water catchment tunnel) and particularly from those problems caused by withdrawing water from its natural course.

Visitors to the Biosphere Reserve are your typical nature-seeking hiker or excursionist or local daytripper. Although there is no existing data on the influx of tourism, it is estimated that the number of visitors is high, that there is no one favored season nor are there any serious conservation problems associated with the visitors, despite the difficulties inherent in handling large numbers of people with such a considerable lack of means.

Perspectives and Conclusions

The Council on Territorial Policy has been working on extending the Biosphere Reserve for some time now because, as pointed out above, it is too small to adequately fulfill its objectives and functions as a Biosphere Reserve. For this reason several meetings have been held with mayors and representatives from the towns and villages in the North of the island and an agreement has recently been reached on what the new delimitation would be once approved by the Spanish Committee on MaB and UNESCO. The proposal includes those municipal councils in the north of the island that, once informed, have asked to be included, with hopes that the rest, still reticent, will do so in the future.

In general, said reticence is due to the fact that many do not know what a Biosphere Reserve really is. Instead they concentrate on the limitations that would be placed on uses because of it, which is probably the case for the residents at El Canal y Los Tiles. Thus, undoubtedly there is still much work to be done before the idea of a Biosphere Reserve is made clear and the understanding of the communities involved is achieved.

The proposal to extend the territory of the El Canal y Los Tiles Biosphere Reserve, together with the development of legislation on planning appropriate to its objectives and an increase in material and human resources required to undertake necessary actions, are the mechanisms which would enable this Biosphere Reserve to acquire its full potential in an area where natural and community resources are gradually diminishing.

CAZORLA, SEGURA Y LAS VILLAS

Location and characterization

The Cazorla, Segura and Las Villas Biosphere Reserve was designated in 1983 and covering an area of 190,000 ha. At present it coincides with the Protected Natural Area to which it is associated: The Sierras de Cazorla, Segura and Las Villas Natural Park, which was later declared in 1986 by the Regional Government of Andalusia and extends over an area of 214,300 ha., making it the largest Protected Area in Spain and one of the largest in all of Europe.

The calcareous mountain alignments that form part of the BR form a NE-SW chain located in the northeast of the Jaén Province. Landscape relief is uneven with abundant crags and steep cuts because of the intertwining of several mountain systems. Several important rivers, such as the Guadalquivir, Segura, Guadiana Menor and Guadalimar, find their source here. Maximum height above sea level exceeds 2,000 m., and the minimum does not reach 400 m.

The climate varies according to the area but is characterized as Mediterranean-Continental, with warm, dry summers and cold winters. Rainfall averages between 500 mm. in the lowlands and 1,600-2,000 mm. at the summit.

The mountain range bestows a magnificent woodland plant covering, with emphasis on masses of *Pinus nigra nigra* and *Pinus salzmanni*, this latter being of considerable ecological interest. These two species occupy most of the area, alternating with plantations of Aleppo pine and cluster pine (*Pinus pinaster*). There are also extensive areas of highland olive groves which are both characteristic of the area and fully integrated with respect to physiognomy and use.

The outstanding physical conditions of the area have allowed for a rich abundance of flora with 26 endemisms exclusive to the BR. The Mountains also contain a broad diversity of fauna with particular emphasis on ungulate populations such as the wild goat, deer, Mediterranean wild sheep (*Ovis musimon*) and fallow deer (these last two having been introduced), in some cases with important effects on the population, which create control problems. There are also notable bird populations, in particular birds of prey (26 species). Among these, the griffon vulture stands out in number. Also noteworthy is the presence of an exclusive reptile species: the Valverde Lizard.

The natural park, and by extension, the biosphere reserve, are home to several urban communities. Their to-

tal population of 20,000 matches that of the beginning of the century, having fallen 50% between 1950 and 1980 in the area now occupied by the BR.

The means of livelihood have traditionally been based on products and subproducts of forestry, hunting, cattle raising and traditional agriculture. Other less important activities include beekeeping and handicrafts. In addition to these resources, more recently are the derivatives of the important influx of tourism to the mountains which have encouraged the establishment of local commerce and operations.

Management and Planning

A number of legal instruments of *protection, management, and planning* have been afforded to the Cazorla, Segura and Las Villas Biosphere Reserve. Thus, the Natural Park, whose administration and management is dependent on the Environmental Agency of the Regional Government of Andalusia, was declared within three years after the Biosphere Reserve and two years later its Use and Protection Plan was approved. The principal objectives of this plan are the management of resources, spatial organization and the stimulation of the socioeconomic structure. It is in the advanced stages of application.

Of the proposals included in the Use and Protection Plan for its preparation and development, the Livestock Use Plan has been completed and the Forestry and Public Use Plan is currently being executed. Also in the development stage is a Conservation Plan, which is directed more to the restoration of degraded habitats and to the overall conservation of all natural resources. In addition, although the remaining plans have yet to be drawn up, several actions adhering to the criteria laid out in the UPP, are being carried out.

Another task recently initiated is the management of the different mountain systems inside the Park. This plan is progressive and includes schemes adapted to each area which, due to the size of the territory, is more reasonable than a Comprehensive Management Plan.

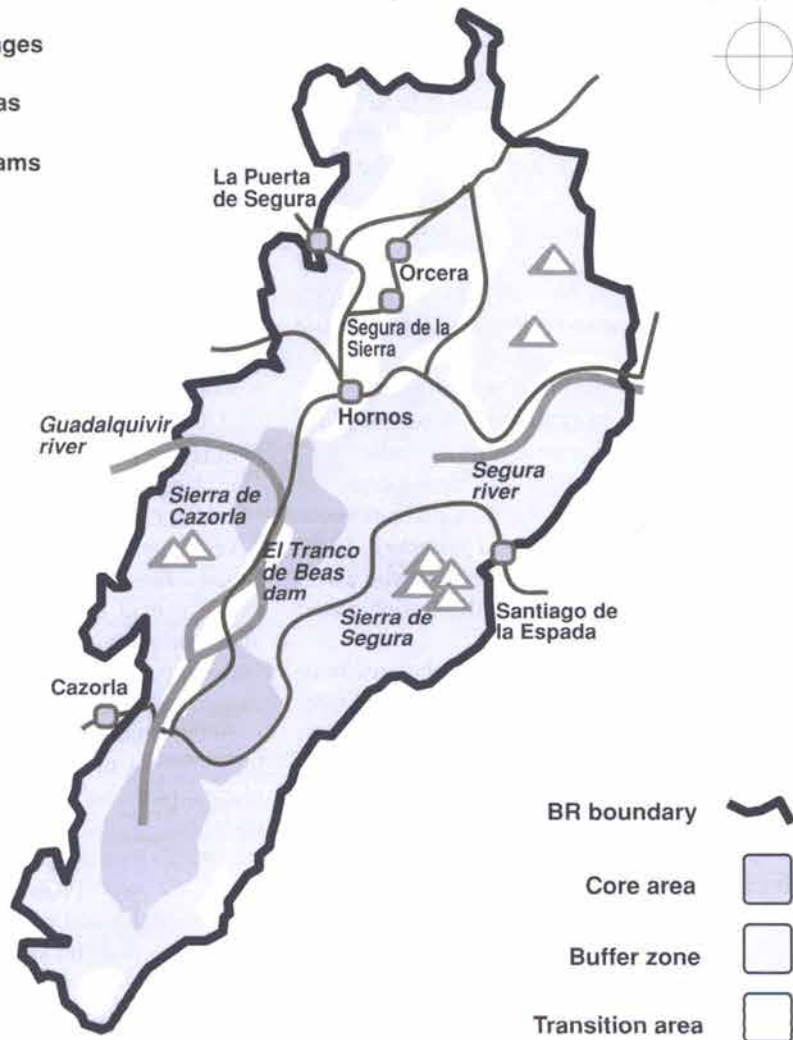
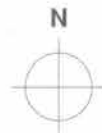
Among those programs underway for the *conservation* of species and ecosystems, in addition to those linked to the prevention of forest fires, the following are of particular interest:

- reintroduction of the lammergeyer, a program initiated in 1989 and which is, at present, in the stage of obtaining reproductive individuals, after preliminary studies which justify the viability of said project.

Cazorla, Segura y Las Villas



- Towns or villages
- Highland areas
- Rivers and dams
- Roads



Biosphere reserve

CAZORLA, SEGURA Y LAS VILLAS

Declaration date		21 April, 1983		
Location (Province)		Biogeographical region/province		
Jaén		Mediterráneo-Ibero-Atlántica/Bética		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
214,300 ha	9.3%	76.4%	14.3%	61%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
19,815	23	87,744	Agriculture and Services	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Special Bird Protection Area (1988, the entire Natural Park) — National Game Preserve (1960, 70.000 ha) 		<ul style="list-style-type: none"> — Limestone, ravines, reservoirs — Mediterranean and continental climates — Pinewood, shore vegetation 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — High biodiversity and centers of endemisms — Largest protected area in Spain — Forest and aquatic habitats 		<ul style="list-style-type: none"> — Experience in management and reintroduction of species — Experience in rural development compatible with natural resources 		

Associated protected area

THE SIERRAS DE CAZORLA, SEGURA Y LAS VILLAS NATURAL PARK

Declaration date		1986	
Institution responsible for management		The Environmental Agency of the Regional Government of Andalusia	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
214,300 ha	100%	100%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Declaration Decree as The Cazorla-Segura National Game Preserve, 21 July, 1960, with Law and Regulations for hunting — Designation as Natural Park: Decree 10/1986, 5 February — Use and Protection Plan, 44/88, 27 December — Regulations of the Board of Managers: Resolution of 12 June, 1987 — Revision of the Board of Managers: Decree 282/88, 27 September 			

- reintroduction of the roe deer, a program initiated in 1989, and for which populations of possible competitors are being controlled before moving on to the actual reintroduction stage.
- restoration of cynegetic ungulate populations, initiated in 1988 after the sarcoptic scabies epidemic that affected populations of wild goat (see Box 5).

Other projects underway are those related to the protection of birds of prey (census, monitoring, protection from high tension electrical lines, feeding troughs) and those with the aim of confirming the presence of lynx.

As per the guidelines established in the Livestock Use Plan, one of the experimental projects related to techniques of species and ecosystems management is the construction of premises for hydroponic crops of fodder which is underway in order to compensate for the reduction of pasturelands, as proposed by the Livestock Grazing Critical Load Study.

Though there is no *research* center specifically associated to the park, nor does much research take place within the park itself, a great deal of work is being performed in this field. Research undertaken is channeled through several work lines at the Center for Scientific Study and Research and at several universities, who periodically send reports as well their publications to the park.

As for the BR's contribution to *regional planning and development*, the Natural Park's Use and Protection Plan anticipates this point and establishes a zoning system which favors those activities promoting socioeconomic development in the sites established as Intensive Use Areas, while limiting action in Extensive Use Areas and excluding the same in Reserve areas.

Similarly to other Natural Parks in Andalusia associated to the BR, many of the actions promoting socio-economic development are channeled through the Promotion Office, for which a Promotion Plan exists (see Box 9).

Regional planning is full of difficulties in an area as extensive as this BR, especially due to the lack of coordinating mechanisms between the different sectorial authorities with competence in the area. EU subsidies for livestock are a perfect example of this. These are subsidies granted to highland farmers which foster the increase in the number of stock by awarding subsidies as per head of cattle (which is incompatible with the conservation needs of the park if the current high number of stock is taken into account). New cattle raisers with other primary sources of income also hinder support for those local cattle raisers whose only means of livelihood derive from said activity).

Local participation is channeled mainly through the Park's Board of Managers which is organized into the following commissions: services and infrastructure; research; conservation; education; and artistic-historic heritage. Although the function of this Board is of an advisory rather than managerial nature, the Park administra-

Some of the activities being carried out in order to foster a **regional development** compatible with the conservation of natural resources in the area are the following:

- Stock raising. The management of livestock as per the stock raising study, the upgrading of the Segureña sheep and the promotion of Agricultural Transformation Associations, with the aim of obtaining a higher degree of transformation of commercialized items.
- Agriculture. Actions focus on olive oil while promoting the strategy of "appellation d'origine" and the production of organic olive oil.
- Forestry. Exploitation rights have been granted to the inhabitants of those towns and villages within the park, and a cooperative is being formed in order to reopen a sawmill.
- Tourism. Support is being given to those cooperatives managing the public facilities in the park and to small businesses. In addition, funds are being channeled for the restoration of small, abandoned villages made up of 8 to 10 dwellings, which could constitute an important infrastructure for green tourism.

tion bases its criteria on assuming agreements made in order to ensure Park operations.

Although there are no studies to the effect, there is very little awareness that the Biosphere Reserve exists. This is not true for the Natural Park which, though severely criticized at its onset, is more and more accepted as time goes by: in 1992, 92% of the population of those towns and villages inside the Park knew of its existence and 75% believed it beneficial to the region.

The most common complaint from these municipalities is in regards to the scarcity of returns received, and on behalf of the general public, complaints arise from the limits put on estates or farms.

Noteworthy amongst actions carried out in the area of environmental education are those actions undertaken at the Nature Classroom, and the implementation of the ALDEA program on environmental education in conjunction with the Educational Counsel. At present, there are no vocational training centers dedicated to environmental training within the BR, though up until recently there were three which carried out an important role in training the local community. Members of the Park Staff itself have also attended different in-house training courses since 1991.

Similarly to other reserves, there are no signposts which indicate that the area has been designated a Biosphere Reserve, though some of the books, materials and pamphlets published do make mention of this.

The Cazorla, Segura and Las Villas Biosphere Reserve, in accordance with its size, has many available resources with regards to amenities, infrastructure and personnel. Thanks to the number of permanent staff

members, the ratio of managing personnel to the area occupied by the BR is 1,061 ha./person. This is almost 400 ha. less than the average at those biosphere reserves coinciding with protected areas. However, the BR's investment budget per area unit is below the average of this same group of reserves.

Technical and financial support for the Park derive, for the most part, from the Environmental Agency of the Regional Government of Andalusia, which is the organization that oversees its management. However, there are also agreements with ICONA and other infrastructure projects exist which are funded by other organizations of the Regional Government.

Due to the large number of visitors, amenities and facilities for public use abound in the Park: (10 campgrounds, 22 recreational areas, 13 youth camps, 2 refuges, 3 hostels, the "Torre del Vinagre" center for interpretation, information and museum, 2 information centers, 3 botanical gardens, 1 game reserve). Many of these are supervised by young cooperative members from the local communities who have been granted the concessions for each facility.

The entire infrastructure for public use has helped direct the influx of tourists, thus minimizing their impact. Nevertheless, due to the same, attempts at speculation are taking place within the Biosphere Reserve.

The periods of maximum tourism are during Easter Week (approx. 30,000) and in the summer (close to 210,000) with an annual total of approximately 600,000 visitors. Contrary to the majority of biosphere reserves in Spain, this figure has diminished since 1990. It was during this year that the number of visitors reached its peak with close to 1 million people. Despite the growing importance of the tourism industry, this aspect has less of an effect on the Park's economy than do farming and forestry activities.

Such an influx of visitors is due not only to the beauty of the landscape and the quality of the natural medium, but also to other significant cultural resources such as four villages which are declared Artistic-Heritage, defense structures which are fine representations of both Arab and XV-XVIII C. architecture and vestiges of Roman civilization.

The major impacts confronting Cazorla, Segura and Las Villas are those deriving from urban development, grazing, forest fires, unmanaged dump sites, and surface water pollution.

Perspectives and Conclusions

The Cazorla, Segura and Las Villas Biosphere Reserve is noteworthy for its biological richness as well as for the preservation of many examples of local traditions linked to the olive groves and to forestry and livestock use.

Regulations which govern this Biosphere Reserve allow for the effective carrying out of functions and the fulfillment of objectives, although there are activities, such as monitoring, which would benefit from further development. With regards to management and conservation, new actions criteria directed at restoring degraded habitats and at the overall conservation of all natural resources have been established.

Among the most important areas of concern for this protected area at present are the following: regulation of the severe pressure of livestock; the need to decrease the population of cynegetic ungulates in order to better the status of said species and ecosystems; complete management planning for tourism related uses, in particular for the massive influx of visitors during the high season (the imminent Use and Protection Plan will be very useful for this); and continued promotion of local development while regulating possible speculative actions linked to the promotion of tourism.

MARISMAS DEL ODIEL

Location and Characterization

The Marismas del Odiel were declared a Biosphere Reserve in 1983 and one year later became the second area in the country declared Natural Landscape (the first being the Macizo de Pedraforca in Barcelona in 1982). This management category of protection is part of the Law of Protected Areas of 1975, and although it is not included under National Law 4/1989 on the Conservation of Protected Areas, it is the most common form of protection among protected areas in the country.

The Marismas de Odiel are located in the southwest corner of the Iberian Peninsula, on the left bank of the mouth of the Odiel river. They are made up of series of islands with several navigable channels running through them. The climate is tempered by the ocean and average rainfall is slightly over 500 mm.

Marshes are very dynamic environments, where sedimentation and erosion bring about rapid changes in the geology and geomorphology, tidal movements being one of the most determining factors. Such an environment gives rise to a considerable diversity of permanent habitats which provide the setting for a variety of vegetation and wildlife.

The key ecosystems within the biosphere reserve are salt marshes, beaches and dunes, coastal forests, woodland plantations and traditional salt works. Biological diversity is high in the BR, with more than 300 bird species. Found here is the largest European colony of spoonbill and the most important concentration of wintering black-necked grebe, etc., along with significant numbers of many other species. It is perhaps the second richest wetland area in Spain with regards to bird species although it is somewhat overshadowed by Doñana which is the most important and in the vicinity.

At present, several productive uses represent the harmonious development taking place within the biosphere reserve. These are:

- the traditional salt works which are both a good example of sustainable resource utilization compatible with the preservation of exploited natural resources and of considerable cultural interest;
- fishing and shellfishing from the estuary which, with proper regulations, would enable the sustainable utilization of a great many species;
- extensive aquiculture, in natural bogs;
- extensive stock rearing, with livestock adapted to halophytes and gramineae;

- traditional utilization of the forest, such as for pine cones, firewood, honey, etc.;
- with the appropriate planning, other activities could also be added to this list such as exploitation of the beach as a tourist site or as an area for nautical or land sports.

Also inside the Biosphere Reserve are industrial salt mines with an annual production of 200,000 tons of salt.

The leading socioeconomic development of the area is linked to the service sector, in large part due to tourism and the concentration of government workers in the city of Huelva, and from industry deriving from the construction of the industrial complex in Huelva during the seventies. The rapid growth of bedroom communities in the vicinity of the biosphere reserve is a hindrance towards conservation.

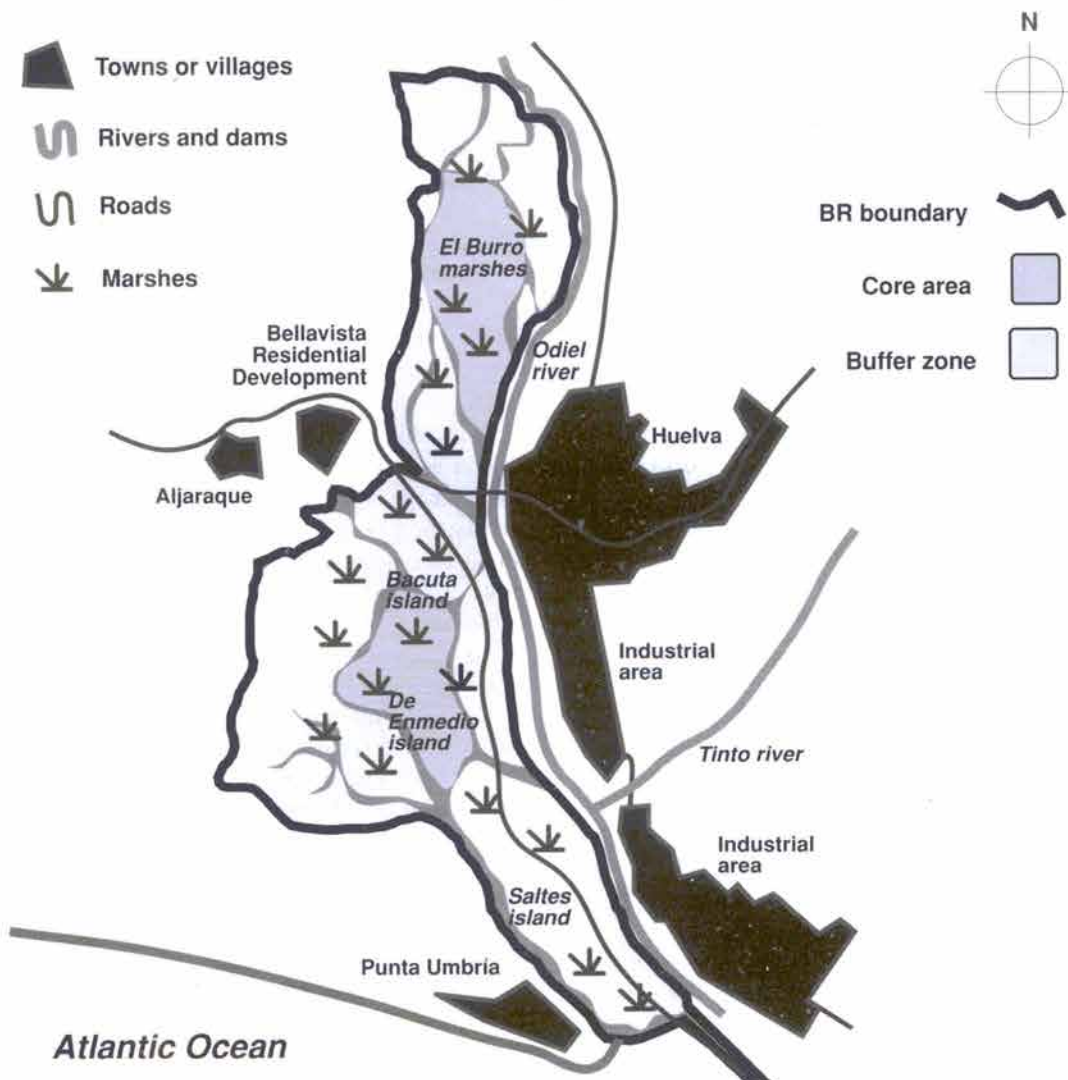
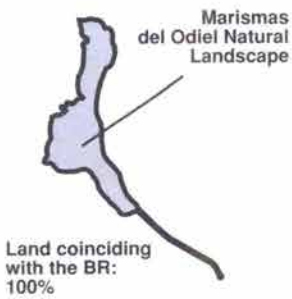
Factories within the industrial complex of Huelva were responsible for quite some time for much of the air pollution and water pollution of the estuary. These emissions and discharges have been significantly reduced thanks to the Mitigation Plan implemented by the Huelva chemical industry and the Environment Agency (according to data supplied by the former, acid discharges to the river diminished 94.4% between 1987 and 1993). In addition, environmental control in Huelva culminated with a series of surveillance points on industrial discharge, water quality, emissions and air quality in the setting of the Center for Research and Environmental Decisionmaking. Some of these surveillance points are fitted with instantaneous data transmission equipment.

The construction of the sand dam in the Port of Huelva has been the work which has most transformed the estuary. Undertaken to protect the mouth of the port against coastal sediment flows, it has brought about the deterioration of extensive areas of the salt marshes and modifications in their dynamics. Equally, industrial traffic towards the Port has also increased.

Planning and management

The Marismas del Odiel Reserve has participated in numerous international programs, in conjunction with other natural areas and biosphere reserves and has currently prepared a joint program for the exchange of experiences on comprehensive management in wetlands within the framework of the European OUVERTURE program with the Ria Formosa Natural Park in Portugal, and the Volga river delta, in Russia.

Marismas del Odiel



Biosphere reserve

MARISMAS DEL ODIEL

Declaration date		21 Abril, 1983		
Location (Province)		Biogeographical region/province		
Huelva		Mediterráneo-Ibero-Atlántica/Gaditano-Onubo-Algarviense		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
7,158 ha	15%	85%		72.5%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
10	4	171,130	Services (55%) and Industry (28%)	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Special Bird Protection Area — RAMSAR Convention Site 		<ul style="list-style-type: none"> — Tidal marshes, beaches, islands, estuaries, dunes — Mediterranean and Maritime climates — Rushes, halophytic vegetation, juniper groves 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Threatened species — Wetlands rich in bird species — Traditional salt works in exploitation 		<ul style="list-style-type: none"> — Comprehensive management in the vicinity of industrial parks and urban populations, with monitoring of pollutants 		

Associated protected area

THE MARISMAS DEL ODIEL NATURAL LANDSCAPE

Declaration date		1984	
Institution responsible for management		The Environmental Agency of the Regional Government of Andalusia	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
7,158	100%	100%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Declaration: Law 12/84, 19 October — Reclassification: Law 2/1989, 18 July, Inventory of Protected Areas in Andalusia — Governing Use and Management Plan: Decree 169/1990, 5 June 			

The degree of planning and protection in the Marismas del Odiel Biosphere Reserve is high, given it was declared by Law in 1984, and reclassified under Law 2/1989, which specifies that the territory of natural landscape and reserves are classified as special protection lands that cannot be urbanized. Under the management category of Natural Landscape, relatively small sites

whose natural beauty is worthy of special protection are covered. In general, specific traditional activities are permitted and so are those of a scientific or educational nature and those related to public use, provided they do not pose a threat to the environments which are meant to be protected. In other words, protection is more rigid than in a Natural Park, where there is a greater

fostering of socioeconomic growth whenever it is compatible with the preservation of resources.

Additionally the Special Plan for the Physical Medium of the Province of Huelva (which, as specified in Law 1/1989, shall be supplementary to specific provisions on the protection of the different inventoried natural areas) as well as municipal planning, General Plan for Urban Planning in Huelva and Subsidiary Regulations in the other three municipalities within the Biosphere Reserve. The Park Administration has participated during periods of public information and in the preparation of different urbanistic plans and city regulations with the aim of resolving the discord between the conservation of the area and local expectations of urban development in the surroundings.

In 1990, the Governing Use and Management Plan was approved. It sets out the objectives with regards to conservation, research and resources management.

The Governing Use and Management Plan establishes a zoning for the Natural Landscape and defines extensive use areas and intensive use areas. The latter correspond to the site occupied by the industrial salt works, the area where the road passes through the islands, and the sand dam.

The Governing Use and Management Plan points out the need to carry out sectorial planning through the preparation of a series of theme Plans and it provides guidelines for the creation of such. Although actions have been carried out within the scope of all those recommended plans, those best implemented have been the Management Plan for Fishing and Shellfishing (a very problematic sector where proposals carried out have had few implications), Tourism-Recreation Plan, Forestry Plan and the Public Use Plan (drawn up and applied, though not always published as an official regulation). Other proposals of the Governing Use and Management Plan such as the livestock and salt works exploitation plan, have not been drawn up since these are sectors that are not particularly conflictive or problematic.

One of the biggest problems in management and planning of the biosphere reserve is the number of administrations with competence in different areas, particularly the beach and intertidal sites. Seventy-two percent (72%) of the land inside the natural landscape is publicly-owned, although concessions for salt work exploitations, within the public domain of state-owned property, occupy close to 27% of the total area.

The majority of actions carried out have been in the field of *conservation*, given the characteristics of the biosphere reserve as well as the importance it has given to the recovery of ecosystems and to actions for the protection of bird fauna, the most relevant to the Natural Landscape. Actions geared to the latter include the creation of an artificial dune and designation for protection of breeding colonies of little tern and kentish plover at the beach, the setting up of nests for storks as

well as structures to reduce the risk of shock and electrocution by high tension electrical lines, and the creation of breeding colonies for flamingos.

Given that the Natural Landscape was chosen as a pilot site for experimentation in the Comprehensive Management of Coastal and Mediterranean Wetlands, information is frequently exchanged among the Doñana National Park and its Biological Station (with whom they share many points of interest), the Ria Formosa Natural Park (Portugal) and the XI Directorate-General of the European Union.

Research activities carried out are directly related to the above-mentioned conservation actions. In addition to baseline research projects in geology, geomorphology, sedimentology, plant ecology, productivity, evolution of bird populations, etc. the assessment of water resources of the Natural Landscape, an educational research project at the beach site, and a utilization plan for the jetty are the most noteworthy of those recently carried out.

Among other outstanding actions are the launching of a detailed mapping project and the monitoring of the evolution of principal resources and elements of the Biosphere Reserve (vegetation, geomorphology, discharges and dispersion of pollutants, evolution of extra-early crops in the surroundings, etc.) with thematic maps which make use of satellite images with georeferenced data, within the guidelines of the Environmental Information System of Andalusia [Spanish initials SINAMBRA] which will become an important tool in the future administration of the natural landscape.

The University of Huelva, the University of Seville and the Doñana Biological Station are among those research centers that cooperate with the Biosphere Reserve.

Through the Dumping Mitigation Plan, the Natural Landscape participates in the *monitoring* and control of industrial dumping and emissions in the estuary, and through the Center for Research and Environmental Decisionmaking it has immediate access to data on discharges, emissions and water quality.

As of 1990, monitoring and control of the nesting and reproductive success of several birds (spoonbill, grey heron and purple heron, egret, common stork, little tern, kentish plover has taken place. On a more innovative note, census and monitoring of species has been carried out with microlights, in order to avoid problems caused by visiting nesting colonies, and coded, colored rings have been used in the ringing process to control bird species from a distance.

Given that its key fields of activities are directed at conservation and because of its relatively small size (making it difficult to foster socioeconomic growth in the surrounding area) the Biosphere Reserve has played but a minor role in the field of local planning and development. Activities have focused on controlling different uses which could have adverse effects on the Natural

Some of the actions directed at the **restoration of ecosystems** at the Marismas del Odiel are the following:

- Restoration of disused gravel quarries, converting these into fresh water lagoons with replanted vegetation along their shores.
- Recovery of several seasonal lagoons containing eucalyptus which had dried up after members of a local vocational training center had carried out tree-felling activities.
- Restoration of woodland ecosystems (cork groves, stone pine forests, carob trees and mediterranean scrub) by uprooting eucalyptus trees and subsequent plantation and regular preservation works. Since 1991, over 400 ha. have been the object of similar works.
- Experimental parcelling plantations to recover marshes covered by material dredged up from the river.

Landscape conservation rather than on the promotion of alternative activities.

Although a Tourism Plan which lays out possible development in this field has already been prepared, it has yet to be implemented. Efforts have also been made to regulate the public use of beaches, the site revealed to have the greatest influx of visitors after a study was made but, due to the previously mentioned division of responsibilities among administrations, these plans have been difficult to put into practice.

In another area, the Natural Landscape maintains a partnership with GYASA, a public-utility company which oversees the water distribution and drainage network, in the preparation of projects for purifying plants and sewer networks, in accordance with the conservation needs of the natural landscape. With regards to achievements made towards development in the area, mention should be made to the biosphere reserve's role in gathering European funds for the cleaning up of polluted areas and upgrading activities.

Together with Urdaibai, this is the only BR that boasts of the participation of a member of the Spanish Committee of MaB on its Board of Governors. Similarly to other natural areas, this Board is created on the concept of participation and control and promotion although extension of its actions and functions are also considered important. Members represent the different sectors within the protected areas and have approved Internal Bylaws.

In the field of *environmental education and training*, two vocational training centers have been created in conjunction with two local town councils. Course content is based on conservation, public use, environmental education, ecosystems restoration, etc. These centers have participated in related works within the Natural Landscape and maintain close contacts with the

Forestry Training School of Huelva, where many of the people working in protected areas in Andalusia are trained. Both centers use the Biosphere Reserve as an area to put conservation and environmental education into practice.

As of 1987, canoe trips through the Biosphere Reserve are available to groups of adults accompanied by a guide. An estimated 3,000 people have participated in this activity. Canoes are also used in activities directed at school age children with the aid of an itinerary guide and other actions. Approximately 13,000 children have participated to date. Land itineraries, with the support of various published material, have also been carried out.

Although the reception and interpretation center in Calatilla (a well-needed facility in an area lacking an amenity of this type) was completed over a year ago, it has not yet been brought into operations. The center has a permanent interpretation exhibit and an audio-visual one.

In proportion with the total area of the Biosphere Reserve, its *endowment*, is not very ample. A significant part is linked to actions described in the Mitigation Plan for Industrial Dumping.

There are only twelve permanent employees on the management staff of the natural landscape, but the worker-area ratio, at 596 ha./person, is the most favorable of all those Biosphere Reserves in Spain coinciding with protected areas. On the other extreme, the investment budget is the smallest for this same group of areas, amounting to 4,191 pesetas/ha., which is less than the average.

In addition to aid received from the Environmental Agency, in an atmosphere of outstanding cooperation, other organizations occasionally contribute significant sums to the budget: the Huelva City Council contributed 50% towards the building the interpretation center, other town councils contributed part of the economic benefits from the use of the forests found within the biosphere reserve, the Huelva Regional Council has engaged some of its own employees in several actions, the XI Directorate-General funded the Program on Comprehensive Management of the Marismas del Odiel and, lastly, the company in charge of the industrial salt works lends staff and technical equipment to resolve problems related to water handling and recently donated its all-terrain vehicle.

The development of the reserve for Public Use is pending, despite the existence of a drafted Plan. Current tourism possibilities are based on the traditional attractions of «beach fun and sun» with the growth of residential developments and a few hotels. Water sports and fishing are important activities. The influx of visitors to the beaches on a summer holiday can reach a massive 4,000 people. The total annual number of visitors is estimated to be around 250,000, almost always linked to the bathing area on the jetty beach.

The sectorial plans and actions which are most affecting the biosphere reserve at the moment include extraearly crops in the surroundings, the development of the «El Portil» tourist resort and the expansion of «Punta Umbría» as well as the construction of enclosures for the storage of polluted sludge from the Huelva river.

Perspectives and Conclusions

Noteworthy among the goals achieved in this Biosphere Reserve, is the considerable improvement in the state of the ecosystems, with emphasis on the growth of bird populations and the reduction of industrial discharges and emissions which affected the same, and the development of important research lines and the monitoring of various resource aspects, pollutants, etcetera.

Important points for the future include the need and difficulty of emphasizing topics of development, the importance of fostering public use activities and the regulation of tourism as well as the integration of extractive activities of the estuary.

The greatest limitation of this biosphere reserve is that which is entailed in its dedication to conservation while fulfilling its function of fostering local development: both its relatively small size and its protection status of natural landscape coincide more with the concept

of a core area of a typical biosphere reserve than to a site for the development of productive activities.

Under Law 2/1989 other protected areas linked to the Marismas del Odiel were declared. The «Enebrales de Punta Umbría» and the «Laguna de El Portil Natural Reserve», are joined to the Biosphere Reserve by protected sites. Other natural landscapes declared under this same Law include «Lagunas de Palos y las Madres», «Estero de Domingo Rubio», «Marismas del río Piedras y Flecha del Rompido», and «Marismas de Islas Cristina». Together with the above areas they form a geomorphological, ecological and socioeconomic unit which would justify homogeneous and comprehensive management. Moreover, a Governing Use and Management Plan is being drafted at present for those coastal areas in the Province of Huelva to include the same.

Therefore, recommendations are to enlarge the present biosphere reserve to include the above mentioned protected areas together with their urban centers, tourist enclaves and any other territory that would ensure an adequate integration of conservation and development policies within the conceptual framework of the Biosphere Reserves. Another idea would be to create a trans-frontier Biosphere Reserve to include the Ría Formosa Natural Park in Portugal which has characteristics similar to the Huelva wetlands and shares many of the same management problems.

URDAIBAI

Location and Characterization

The Urdaibai Biosphere Reserve was declared by the International Coordinating Council of the Program on Man and the Biosphere in December 1984. During the same session a document was approved, which would later serve as the basis for Biosphere Reserve related management - the Action Plan for Biosphere Reserves. This document and the Urdaibai Biosphere Reserve have been united ever since inasmuch as it was the Action Plan that inspired its management guidelines and its documents and planning regulations. Several years later in 1989 the Basque Autonomous Government itself declared by law the Urdaibai Biosphere Reserve under the same name. This is an exceptional situation in the Spanish network.

This Biosphere Reserve is 22,041 ha. river basin, which opens in the north into the Cantabrian sea. The name Urdaibai means «Estuary of Wild Boars», in reference to the abundance of this mammal in one of the most characteristic habitats of the basin. The key ecosystems are coastal areas, estuary and marshes, Cantabrian holm oak forests, Atlantic forests and countryside and the evergreen reforestations, shore woodlands, and urban environments, which are well-represented.

Maximum heights above sea-level in the Biosphere Reserve are 1,026 m., rainfall averages approximately 1,400 mm. and the average temperature year round is 14°C (at the altitude of 100 m.).

The vegetal covering of the Biosphere Reserve is made up of a mosaic of different units of vegetation which, in view of the degree of human interference, can be divided into two types. These are spontaneous communities luxuriant woodlands, thickets and moorlands, aquatic vegetation and the sandy coastal terrain or those which depend on human maintenance (conifer plantations, meadows, and crops).

There is a varied zoological community associated to each environment. Marshes, as wetlands, are an important area for bird fauna; this site has been a RAMSAR Convention Site since 1992.

In addition to the diversity of natural environments, there are several representations of valuable agricultural systems, which constitute a diverse and harmonious landscape, with the existence of traditional Basque country houses, villages and urban communities of remarkable historical and economic importance such as Guernica and Bermeo.

Industrial activity is concentrated in these two com-

munities while in the remaining towns and villages primary economic activity is predominant (fishing, agriculture and stock rearing).

Planning and Management

The Urdaibai Biosphere Reserve is not exactly comparable to a typical protected area even though it shares many of the formalities (declaration by law, Governing Use and Management Plan, Board of Governors). Instead it constitutes more of a regulated area, in line with the last two Biosphere Reserves to be incorporated into the international network, Lanzarote and Menorca, where there is a noteworthy representation of not only natural areas but also man-modified landscapes (urban areas, industrial parks, etc.). The greatest difference lies in where management is most stressed: coordinating actions of the different administrations and socioeconomic actors involved on a territorial and sectorial level, in order to achieve development which is harmonious to the conservation of natural and cultural resources. In other words, the aim is to develop a model of development which is compatible to other «normal» territories which may not be privileged natural environments.

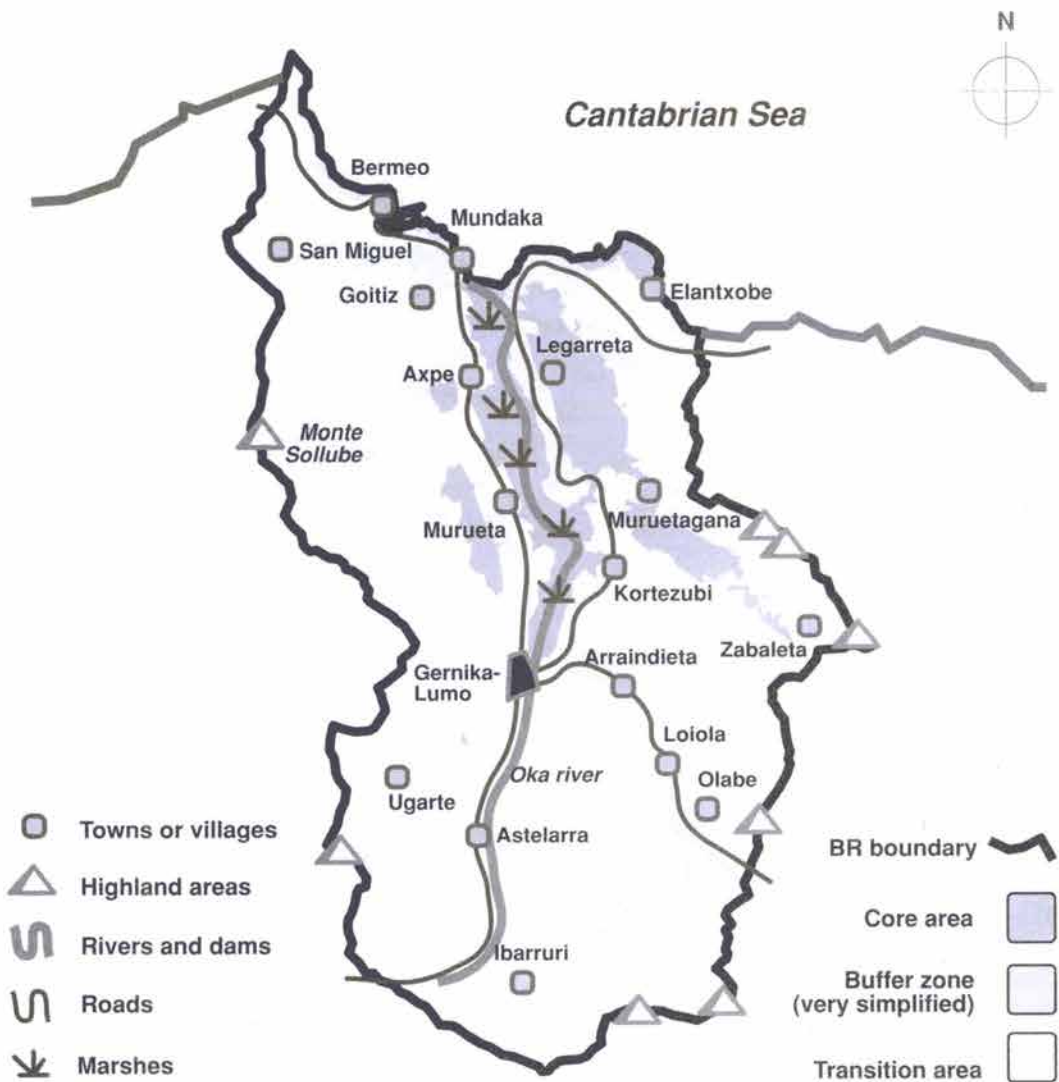
Urdaibai's principal contribution to the *International Network* are the ecosystems of the Atlantic region of the Iberian Peninsula.

Legislation which declared the area a Biosphere Reserve (Basque Autonomous Law 5/1989, of Protection and Management of the Urdaibai Biosphere Reserve), similarly to the Governing Use and Management Plan approved in 1992, affects land which is not zoned for building - 97% of its total area. For this land, municipal regulations must adhere to the resolutions laid out in the Governing Use and Management Plan which prevails over it.

Urdaibai is a complex geographic area which is managed by many coinciding administrations and by different sectorial administrations. The central government is responsible for the coastal areas, the Basque Autonomous Government for fishing, shellfishing, agricultural research, education, etc.; the Provincial Government's Fish and Game Department is responsible for final approval of urban planning regulations, public services (sanitation, garbage collection, etc.) and lastly, the city and municipal councils establish their own regulations and fields of action.

The Governing Use and Management Plan is the consensual legal instrument for management and coor-

Urdaibai



Biosphere reserve

URDAIBAI

Declaration date		7 December, 1984		
Location (Province)		Biogeographical region/province		
Biscay		Eurosiberiana/Cántabro-atlántica		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
22,041 ha	11.4%	24.6%	64%	10%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
45,000	22	61,050	Services (47%), Industry and Construction (31%)	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — RAMSAR Convention Site (1992) — Ría de Mundaka Game Refuge Regional 		<ul style="list-style-type: none"> — Valley, estuary, coastal area — Oceanic climate — Holm oak grove, atlantic forest, countryside, marshes ,cities 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Wetlands, autochthonous forests — Well-preserved traditional land uses — Well-preserved natural and cultural values 		<ul style="list-style-type: none"> — Attempt at coordinated management for the sustainable development of a man-modified area and complex — Incorporation of ecosystems of the Siberian Atlantic edge of the Iberian Peninsula 		

Associated protected area

URDAIBAI NATURAL PARK

Declaration date		1989	
Institution responsible for management		Environmental Office of the Basque Autonomous Government	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
22,041 ha			
Protection/Planing legislation			
<ul style="list-style-type: none"> — Law 5/1989, 6 July, on the Protection and Management of the Urdaibai Biosphere Reserve — Governing Use and Management Plan: Approved by the Government Council on 30 August, 1992 — Municipal Recommendations: general plans and subsidiary regulations (Statutory Orders) 			

dination of the reserve. Several administrations participate in the same, under the guidance of the Basque Autonomous Government (see Box 3). The main objective of said plan is to stimulate the socioeconomic development of the rural environment in a manner compatible with the conservation of environmental resources. The Board of Governors is the administrative body responsi-

ble for coordinating the activities within its scope of application - land not zoned for building.

The Territorial Action Plans corresponding to cantabrian oak groves, the marshes and coast and the Environmental Education Plan are currently being drafted.

Several of the activities related to *conservation and restoration* currently underway are the restoration of

The Urdaibai **Governing Use and Management Plan** is a baseline plan which establishes the guidelines for territorial management, but it should be developed through the following plans:

- Territorial Action Plans, similar to special urban planning schemes, devoted to the protection and management of resources, not only in environmental units but also in areas established by zoning,
- Handling Plans, which integrate plans for the study of resource exploitation, conservation, education and organization, etc.,
- Program for the Harmonization and Development of Socioeconomic Activities, in order to coordinate the different activities within the productive sectors.

holm oak groves (since 1990), an ecotoxicological monitoring of the estuary (since 1993), and the monitoring of the regeneration of the holm oak grove affected by fire in 1989 (since 1990).

A constant exchange of information has taken place among the Universidad del País Vasco [The Basque Regional University] (represented on the Board of Governors) and the different Biosphere Reserves in Spain through the Spanish Committee of Man and the Biosphere.

This Biosphere Reserve's major contribution to conservation has been the preservation of fragile ecosystems of considerable ecological importance (the estuary and cantabrian oak groves. With regards to its limitations, many of the disturbed habitats have still not been regenerated and there continues to be a lack of research on ecosystems and mechanisms for monitoring habitats and species. This is common among the Biosphere Reserves in Spain and is a reflection of the general situation with respect to the awareness of protected areas and the environment as a whole in the country.

The Governing Use and Management Plan clearly establishes the need to carry out *research and monitoring* on the conservation and management of resources, sustainable development, education and the socioeconomic factors of the Biosphere Reserve. Significant work has been carried out in the field of research. Some of the projects which are underway or have recently been completed are the following:

- Ecotoxicological Monitoring of the Estuary, measuring different parameters and levels of toxic substances on a monthly basis.
- Several studies on the wild fauna of the estuary.
- Plan for the Minimization and Management of Industrial Waste in the area south of Urdaibai.
- Designing of an Experimental Environmental Education Plan for Urdaibai.
- Modifications in Land Use in the Urdaibai Biosphere Reserve and their Influence on Ecosystems for which agricultural and forestry inventories (ex-

ploitation, coverage, distribution) have been taken together with the uses of the soil over the last 30 years and surveys on land uses, activities, housing, unemployment, etc.

- Management Guidelines and Proposals for the Urdaibai Cantabrian Oak Groves.

Other activities included taking an inventory of polluted soil, with inspections at local businesses, and the characterization of the Guernica aquifer in order to measure existing levels of mercury pollution.

Those centers cooperating with the research are the *Universidad del País Vasco* (natural resources, studies on the estuary: phytoplankton and zooplankton, molluscs, pollution), the *Instituto Oceanográfico Vasco* [Basque Institute of Oceanography] and the *Universidad Complutense de Madrid* (Ecology, study of land uses, erosion and monitoring). The recently opened headquarters of the Board of Governors has a documentation center whose endowment will be progressively extended.

Programmes and conferences have been held on the subject of scientific research at Urdaibai. These occasions provide an opportunity to measure the degree of awareness of the environment, to detect deficiencies, and exchange information from the perspective of each area involved, thus enabling an exchange of scientific knowledge with the aim of resolving territorial problems. Several grants have also been awarded for projects in applied research and environmental education in the Biosphere Reserve, as well as direct aid towards research projects.

At present funding and support are needed for the creation of a center for research and monitoring directly associated to the Biosphere Reserve. This center would help improve coordination of research and act as an impulse to work already carried out.

Among those specific actions which promote a balanced *development* in the Biosphere Reserve, the following are particularly noteworthy:

- promote labelling for various products (Guernica peppers, meat products from Basque country houses),
- foster traditional methods of fishing,
- strengthen traditional land-use activities in harmony with the surroundings,
- establish limitations on forestry and agricultural uses in specific areas, and establish distance limits between forests,
- foster centers for agricultural tourism, while controlling clandestine activities.

Within the scope of regional planning, the most important challenge facing the Biosphere Reserve, as specified in its founding law and the Governing Plan for Use and Management, is the elaboration of a Program for the Harmonization and Development of Socioeconomic Activities, which would set out the methods of putting into practice that which is stipulated in the Gover-

ning Plan for Use and Management: the way to direct, promote and coordinate activities and the productive sectors in land not zoned for building. In order to gather contributions and suggestions from technicians and specialists in the creation of this Harmonization Plan, a Conference on Environmental Planning of Territory and Sustainable Development was held in November, 1994.

One of the current difficulties and most important challenges, of this Biosphere Reserve is the ongoing conflicts among responsible authorities and the lack of coordination among the different administrations. Another thing that conditions action capacity at Urdaibai is the belief on behalf of the municipal council and landowners that there are no effective compensation mechanisms for restrictions placed on land use. This is a serious hindrance to active cooperation in the promotion of the Biosphere Reserve.

The most important mechanisms for promoting local participation in the Biosphere Reserve are, in addition to the usual forms of informing the public, the Board of Governors, the Reserve's Council for Cooperation (in its initiation phase), and the Friends of the Urdaibai Biosphere Reserve Association.

The Board of Governors, constituted in January, 1990, is a body attached to the Basque Autonomous Government, composed of representatives from the regional administration (5), national government (1), and local government (3 from the provincial government, 3 from municipal councils), along with other representatives from different naturalist and cultural sectors: University, Spanish Committee on Man and the Biosphere and conservationists and nature study groups. The Board of Governors includes a Permanent Commission which informs, in a non-binding way on the various urban management plans and research projects. Despite initial proposals which assigned management functions to the Board, its current responsibilities are of a consulting and coordinating nature, similar to other participating bodies of the remaining Biosphere Reserves in Spain.

In order to support reports and actions of the Board, or the sanctioning body established by the founding charter of the Urdaibai Biosphere Reserve.

The Board of Governors has been involved in a complex process in order to achieve a consensual Governing Plan of Use and Management, which was finally approved in 1992. In addition, they have also appraised several municipal planning instruments and actions in special protection areas.

In July 1994, the Council on Cooperation was created. It constitutes an organization which enables participation in the management of the Biosphere Reserve and provides an opportunity for the same for those socioeconomic, cultural and environmental organizations which do not form part of the Board of Governors.

The main reason why many of the Urdaibai residents are displeased is that mechanisms for compensation for the regulation of uses have not been yet been establis-

hed; a situation which also seriously hinders participation in the development of the Biosphere Reserve. With 90% of the land privately owned, the general opinion is that those who most benefit from environmental protection are those who do not own rural land. Owners feel they are not compensated for limitations placed on land uses nor are they compensated as generators of social good.

Environmental education is one of the declared priorities at Urdaibai. Some of the activities which have been carried out since 1991 are ecological-cultural itineraries for adults, workshops and environmental education centers for school-age children. Subsidies have also been granted in order to promote visitation. Moreover, private initiative exists in the form of teaching farms, field classes in the sea, guide groups, etc.

This Biosphere Reserve lacks an interpretation center which is effective in coordinating the different actions being carried out to this effect.

Urdaibai is perhaps one of the places where the dissemination of *information* and of the concept of the Biosphere Reserve and its functions has been the most successful. Some of the actions undertaken have been the publication of a book about the Biosphere Reserve, the creation of a specialized insert to accompany *Bizia* magazine, a publicity campaign for newspapers and television, publication of various materials (brochures, books, maps), as well as direct information to the public and conferences and debates.

The Board of Governors main offices, located in the Palacio de Udetxea, also serves as an information center for the Biosphere Reserve.

When referring to endowment at Urdaibai, it is important to remember that the purpose of the BR is somewhat different than a typical protected area. Instead it acts as a coordinating body for activities carried out in the territory and without specific endowment to this effect. An example is the case of the wardenry. Although the biosphere reserve only engages one inspector in this task, it is responsible for coordinating the actions of up to fifty people who depend on different environmental surveillance organizations such as the Central Government, the provincial government, forestry asso-

Hagina Environmental Education, a local association, carried out a study on the **awareness and attitudes of the Urdaibai residents with respect to the Biosphere Reserve**. The results that follow are particularly noteworthy:

- Only 37% had heard of the Biosphere Reserve. A total of 84.3% believe it will be beneficial to the community.
- Among political representatives in the municipal councils, the general feeling is that they were not taken into consideration. They also believe that development should take priority and that compensations for restrictions placed on uses are necessary.

One of the most original activities of the Biosphere Reserve in 1994 was **orientation courses on the «Governing Use and Management Plan»** geared to administrators and managers (town clerks, local architects, developers of urban planning schemes and interested public). These intensive courses devoted the morning to the theory of the objectives and characteristics of the Governing Use and Management Plan and its coordination in sectorial administrations and an afternoon to practical analyses of real cases.

ciations, the Basque Regional Government, fishing and shellfishing associations, and different *Erzaintza* (Basque Regional police) stations and municipal police stations.

There are eleven employees on the Biosphere Reserve staff. Seven are in charge of technical-administrative management, two are engaged in educational activities and another two oversee topics related to research. The most notable problem is the lack of and need for a stable and operative administrative unit.

The operations budget of the Board of Governors is covered in full by the Basque Autonomous Government. In 1994 this figure was set at 130 million pesetas. The total budget, which depends on the plan of the Biosphere Reserve, would include entries from both official and private organizations that fulfilled the objectives laid out in the Action Plan for Biosphere Reserves. As per Article 21 of the Law of Protection and Management of the Urdaibai Biosphere Reserve, "The involved Administrations, with debits to their budgets, shall cover all necessary expenses for the proper management of the Reserve".

Infrastructure for *public* use at Urdaibai is not very extensive. The majority of visitors during the summer converge on the large expanses of sand at the mouth of the estuary and on the small beaches along the coast. Other important tourist attractions are the available cultural offerings (Celtic settlements, the Pilgrimage Route to Santiago de Compostela, the city of Guernica, museums) and the quality of the natural environment. The

number of visitors to the beaches alone in 1994 was close to 500,000, and it is difficult to estimate the number of visitors to the remaining sites of the Biosphere Reserve. The number of people occupying second homes in Urdaibai is close to the total number of inhabitants.

The greatest environmental impacts in Urdaibai are caused by fires, residential developments, industrial expansion, development of infrastructure, high-tension electrical lines, extractive activities, pollution of ground water and surface water, crop and tree felling, leveling of forests in the evergreen plantations.

Perspectives and Conclusions

The Urdaibai Biosphere Reserve is one of the reserves which has most clearly incorporated the principles of the Action Plan for Biosphere Reserve into its concept and regulations.

Actions carried out to date in Urdaibai have laid the foundations for the conservation and regeneration of the different ecosystems. However, specific conservation and recovery programmes have not yet been implemented and the increase of publicly-owned land in the core area is also imminent.

Other problems which this Biosphere Reserve will have to tackle in the future are the following: the lack of coordination among administrations, the crisis suffered by the rural environment, the pressure the BR is under from tourism and urban growth, the industrial and fishing crises and the shortage of infrastructures.

Urdaibai is one of the Biosphere Reserves where the ways to achieve harmony between the conservation of resources and development are most explored. One of the noteworthy tasks to this effect is the anticipated creation of a Program for the Harmonization and Development of Socioeconomic Activities in order to coordinate the actions of the different economic sectors. Also pending completion is the elaboration of legal instruments that enable the development of the Governing Use and Management Plan. Nevertheless, in order for the provisions set out in the plan to be effective, significant financial support will be necessary.

SIERRA NEVADA

Location and Characterization

This Biosphere Reserve was declared in 1986 but it was not until three years later, when it was designated the Sierra Nevada Natural Park, that it was associated with a protected area. The only specific regulations before its declaration as a Park were related to the National Game Reserve, which occupied but a fifth part of the area which is now protected and regulated. Of the current 171,646 ha. of the Natural Park, which has been made to coincide with the Biosphere Reserve, 69% lies in the Province of Granada and the rest in the Province of Almería.

The Biosphere Reserve includes the Sierra Nevada mountains, a fairly individualized massif, which is the center of the Interior Penibética Mountain Chain and the highest in the peninsula. Despite its considerable height (3,481 m. at the Mulhacén summit and over 3,000 at others), the relief in the highlands is generally compact and tempered by erosion. Due to its proximity to the coast, its landscape includes steep slopes in most of the territory. The mark of glacial erosion is evident in many spots. Similarly, periglacial patterns are frequent in the highlands. With regards to its geological characteristics, the core is made up of schist surrounded by thick limestone and dolomites which are found on slate. Also frequent are areas of schist, slate, gneiss, marble, etc.

The key ecosystems of the Biosphere Reserve are the following: highland ecosystems, pine forests and sabine groves, deciduous forests, sclerophyllous forests (holm oak groves), shore woodlands and mountain wetlands (lagoons, peat bogs). The high diversity of environments is due, in particular, to the significant differences in altitude within the Park. These range from 300 m. to over 3,000 m. at the summits thus creating different layers of ecosystems. Precipitation reflects these changes in altitude, with averages of 350 mm. to 1,600 mm. depending on the area. Temperatures vary also.

These mountains are of great biological interest

partly because of their high biodiversity and endemisms which are conditioned by the diversity of environments: a quarter of all plant taxa in the Iberian Peninsula can be found here. These amount to more than 2,000, or rather two thirds of the total number of existing taxa in Andalusia. Moreover, 66 of the existing flora species are endemisms. The situation is similar with regards to diversity and specificity of fauna, with special emphasis on the invertebrates: there are 80 endemisms

among the existing insect species, and even a unique genus of orthoptera.

Since the beginning of the century there have been two different tendencies in the population of towns and villages inside the Park which are parallel to those of other mountain areas in Spain. Until 1950 the population rose. Since then, however, with the onset of significant migration, the population has fallen steadily to less than 17% of the population of 1900. In addition, the rate at which the population within the Park is growing is below the regional averages of Almería and Granada. In 1985, almost 55% of the working population was engaged in farming activities, close to 11% in industry, 10% in construction trades and 25% worked in the service sector.

Decreases in population have important consequences on the environment such as the abandonment of croplands, which strongly modifies the landscape and thus leads to a loss of richness and diversity. Though stock rearing has experienced significant reductions, it continues to be important (due mainly to the fostering of highland farming and EU subsidies for livestock) and therefore calls for regulation. Mining was also quite important but today many quarries and mines are in disuse and do have a marked impact on the landscape. Tourism is becoming the dominant activity in the local communities. Especially noteworthy is the massive influx of visitors to the ski resort located in the heart of the Biosphere Reserve.

Among existing cultivations, the most notable are ligneous, of which fruit trees, especially almond trees, are dominant. The vineyards are also noteworthy occupying 13% of the area. There is also a predominance of small farms: those with less than 5 ha. amount to 83% of the total number.

Park management is complex because of the extensive size of the Park itself, because the mountain makes access difficult and because of the amount of towns and villages (70, counting 30 urban areas in the Park's perimeter) which are either totally or partly situated inside the Biosphere Reserve.

At present, on the occasion of the 1995 World Ski Championships, considerable investments are being made in order to upgrade the ski slopes and general infrastructure, as well as in improvements related to the city of Granada and its surroundings (connecting highways in Andalusia to the Mediterranean Motorway, etc.). Total investment amounts to approximately

Sierra Nevada



Sierra Nevada Natural Park



Land coinciding with the BR: 100%

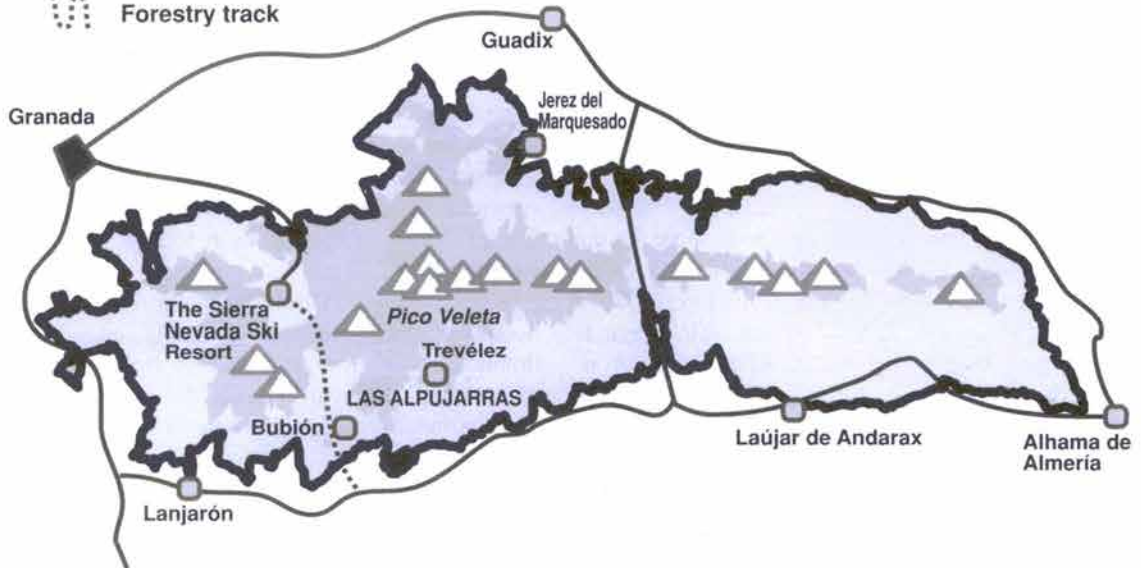
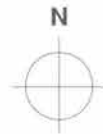
40 km



171.646 ha



- Towns or villages
- △ Highland areas
- ⚡ Rivers and dams
- ⤵ Roads
- ⋯ Forestry track



- BR boundary
- Core area
- Buffer zone

Biosphere reserve

SIERRA NEVADA

Declaration date		April 1986		
Location (Province)		Biogeographical region/province		
Granada and Almería		Mediterráneo-Ibero-Atlántica/Bética		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
171,646 ha	30%	70%		60%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
19,946	60	80,692	Agriculture and Services	
Other designations		Ecological characteristics		
— National Game Preserve (1966 with 34,092 ha, Law 37/1966, 31 may)		<ul style="list-style-type: none"> — Highland areas, valleys, lagoons — Mediterranean/Continental climate — Good representation of different layers of vegetation: holm oak groves, pine groves, juniper groves, grazing land 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — High biodiversity and endemisms — Threatened species — Highland and lowland habitats 		<ul style="list-style-type: none"> — Pilot strategies for rural development 		

Associated protected area

THE SIERRA NEVADA NATURAL PARK

Declaration date		1989	
Institution responsible for management		The Environmental Agency of the Regional Government of Andalusia	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
171,646 ha	100%	100%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Declaration: Law 2/1989, 18 July — Natural Resources Management Plan: Decree 64/1994, 15 March — Governing Use and Management Plan: Decree 64/1994, 15 March — Special Protection Plan of the Physical Medium and Catalogue of the Province of Granada (Resolution of 6-03-1987) 			

Another obvious example of the dialectic between **conservation and development** in the biosphere reserve, are the local expectations of urban development associated with a cross country ski resort in the Puerto de la Ragua mountain pass. The Park administration has rejected proposals for urban development because they clearly oppose prevailing regulations and has instead opted for fostering the economy of the affected communities by setting up an infrastructure for tourism within the town centers. Thus, a minimal infrastructure has been established in the area of the mountain pass. In addition, proposals have been made for the diversification of low impact uses and activities in order to make the facility profitable during the rest of the year. However, an agreement has not yet been reached with the association which promotes the project.

100,000 million pesetas, 11,500 million pesetas of which is funded by FEDER. A heated discussion is taking place with respect to the consequences that such work and the massive influx of tourists will have on the environment, despite the many mitigating measures being carried out to reduce the impact and improve Park amenities within the framework of the Sierra Nevada 1995 World Ski Championships program.

Planning and Management

The Natural Resources Management Plan and the Governing Use and Management Plan for the Sierra Nevada Park have recently been approved. These will enable management to clearly follow the guidelines outlined in said documents. Prior to these plans, The Special Plan for the Protection of the Physical Medium and the Catalogue of the Province of Granada of 1987, which affects the Province of Granada and Sierra Nevada, was the principle legal instrument for land use planning. After the approval of both the NRMP and GUMP, the provisions of this Special Plan will be supplementary to those of the Park.

The Natural Resources Management Plan has a validity of eight years. The objectives laid out clearly establish the objective of harmonizing the conservation of natural resources with socioeconomic promotion by avoiding the uprooting of rural communities, directing the exploitation of resources and limiting activities with an impact, in accordance with Park zoning. The provisions set out in The Natural Resources Management Plan are binding for the creation of the Governing Use and Management Plan, a Comprehensive Development Plan, technical and sectorial schemes and further legislation, that should adapt to its regulations, including territorial and urban planning.

The Governing Use and Management Plan is the principal legal instrument on planning for the Natural Park's management. It is valid for a period of 4 years and determines:

- the functions of the Board of Managers; as a "membership body to participate with the Environmental Agency, with duties of coordinating the Government Bodies and community participation for the conservation of protected areas";
- the functions of Promotion Office; to analyze and carry out the monitoring of the socioeconomic situation and foster its development;
- regulation of management and administration;
- regulations on public use, research and natural resource use and management.

None of the sectorial plans specified in the Governing Use and Management Plan have been carried out. Recently undertaken activities include the management of livestock activity. On the other hand, there is not one management scheme for mountain areas valid in the entire Park. Only between 4 and 6 municipalities have Supplementary Planning Regulations.

Of the *conservation* programs being carried out at the moment, the most significant ones with respect to funding, are the upgrading of silviculture for fire prevention, plant restoration in burnt-out areas, hydrological restoration and erosion control, etc.

Other activities underway are the following:

- Recovery Schemes for Endangered Plant Species, (see Box 6) with projects being carried out in one of the botanical gardens, and citing and distribution studies of the Sierra Nevada plant communities.
- Plan for the monitoring and protection against sarcoptic scabies affecting the wild goat.
- Project for the conservation and reproduction of endemic vegetation in Sierra Nevada.
- Upgrading of fish populations in the Park's rivers.

A considerable part of the activities underway at present focus on the environmental restoration plan at the World Ski Championships site.

Several organizations are involved in *research* and conservation projects being carried out in the Biosphere Reserve, in particular the University of Granada, the Higher Council on Scientific Research, the Botanical Garden of Córdoba and the Center for Agricultural Research and Development of Granada.

Due to the shortage of resources, research focuses on the most pressing problems at each moment. An

Analysis of environmental related claims and complaints.

Complaints and claims that had been made on behalf of collectives and individuals and presented to Park authorities, have recently been studied. At the moment there are no definitive cost figures, but the study does reveal the social consequences the Park has had as well as management problems of the same. Follow-up on this information will turn out to be very beneficial for management.

example is the recent scabies epidemic in populations of wild goat. A Forestry Center in Padul is expected to open at the end of 1995 as a center for research on mountain wetlands and peat bogs. The creation of a Scientific Committee, within the Board of Managers whose purpose is to lay the foundations for the research program is also foreseen.

The activities undertaken in the Biosphere Reserve related to the fostering of *regional development* are based on the conservation of resources, limitations imposed on negative uses and the promotion of activities compatible with conservation. Among specific activities to this effect are the following:

- Pilot implementation of fruit-bearing scrub in the Alpujarra Mountains.
- The Alpujarra Leader Program, which has been an important stimulus to this region.
- Management of pasturelands and the building up of folds.
- Surveillance and control of urban planning.
- Development of infrastructure for public use.

As is the case in other natural parks in Andalusia, a Natural Park Promotion Office exists which is headed by a Promotional Manager who coordinates the different administrations related to development in the area and holds a seat on the Board of Managers (see Box 9). In order to ensure the proper functioning of the Promotional Office, Park administrators must be closely involved, which has not always been the case at Sierra Nevada.

The existence of legal instruments on planning, such as the NRMP and GUMP, are allowing conflicts between conservation and development, (inevitable in such a vast and complex expanse of land as Sierra Nevada) to be approached with clear criteria. An example of this are the limitations imposed on development of the Pradolano ski resort (see Box 4).

Many of the possibilities for development are linked to rural tourism, which is becoming an important alternative to the masses of tourists attracted by the ski resort. The management has established criteria that involves associating said tourism to already existing centers of population, providing dwellings that mimic the traditional local architecture as well as offering low impact activities and bringing into operation elements of infrastructure which would act as models.

Many of the conflicts of the biosphere reserve are associated with the ski resort and have been aggravated by the impending 1995 World Ski Championship. On the one hand, the resort plays an important role in the economy of the region, but some believe it may not be so profitable. According to an audit performed by the Arthur Andersen company, for the periods 1990-1992, "creditors exceeded current assets", not to mention the tremendous impact on the environment and the costs of government investment.

On the other hand, this additional funding for the

1995 World Ski Championship is financing not only a number of conservation and restoration actions in the natural environment but also amenities and facilities for public use, which are making up for some of the existing shortages.

As is the case throughout Spain, regional planning provides limited support for the biosphere reserve. Carrying out proposed actions exceeds the possibilities of managers since they in turn depend on the sectorial actions of other organizations. An example of this is the case of urban waste disposal. This is at present pending commencement on behalf of the Executive Plan of Solid Urban Waste Management of the Province of Granada (none of the towns inside the Natural Park have managed dump sites, and there are an estimated 100 refuse tips). Another example is the case of waste water treatment, with the Master Plan for Urban Waste Water Purification of the Province of Granada currently in its preliminary study phase.

Local participation is channeled through the Board of Managers of the Natural Park and the Hunting Advisory Committee which is a joint organization of the National Game Reserve and the Board of Managers, and forms part of the latter. The Board of Managers, which is composed of 60 mayors from those towns and villages inside the Park, had a great deal of work to do until the definitive NRMP and GUMP were approved.

The Environmental Training Program carried out between 1987 and 1992, which included five vocational training centers, gave significant impetus to environmental training. Some of these facilities evolved into companies that now engage in projects in the area. Other interesting training activities included the «Conference on The Regionalization of the Alpujarra Mountains» as part of the Rural Development Plan of Andalusia, and courses held within the framework of the Alpujarra-Leader program.

Courses on the flora of Sierra Nevada for university graduates have been offered since 1987 and plans are to broaden subject areas; courses for Park wardens have also been on the agenda since 1991; at the end of 1994 a program of Nature classes was initiated.

The park's endowment has improved considerably over the last few years although it is not as extensive as would be desirable.

The Park Administration is supervising a strategy of cooperation agreements with different organizations, in order to overcome budget limitations and tackle several necessary actions in the Natural Park. These agreements are:

- with the Directorate-General of Tourism of the Regional Government of Andalusia for the co-financing of projects in the Refuges Plan;
- with the Council on Public Works and Transportation and the Natural Geographic Institute for the creation and publication of a guide-map;
- with CETURSA, the concessionaire of the ski re-

sort, in order to work together on recovering the natural environment and on fostering educational programs (CETURSA contributes 3% of ticket sales).

However, there still is a shortage of significant resources to cover certain features, such as the appropriate management of mountain areas, or for the maintenance of the network of forest tracks which totals 1,173 km.

As to personnel engaged in Park management, at 2,524 ha. of protected areas per person the worker/area ratio is the best of all the biosphere reserves. The Park Administration estimated the need for 183 people to adequately cover all work areas and regions inside the Natural Park, but to date there are only 68 permanent employees on staff. Training an interdisciplinary task team will also enable the fostering of several work lines in the Reserve.

The budgetary situation has been more favorable as of 1993 due to the extraordinary investment of 1,153 million pesetas (as part of the actions for the 1995 World Ski Championship) for the carrying out of conservation tasks, restoration and protection of the natural medium, development of the Public Use and Infrastructure Plan and studies. Thanks to this additional contribution, the budget for the Park in 1994 doubled that of 1992, amounting to 9,071 ptas./ha., which is close to the average of other Biosphere Reserves coinciding with protected areas.

One of the biggest investments ever made since the creation of the Natural Park has been devoted to the operations of public use facilities which, although they still do not match the needs of the Park, have been markedly improved. This includes the launching of interpretation centers, camping areas, and recreational areas.

The area has many attractions. Particularly noteworthy are its highland characteristics or cultural landscapes linked to human settlements, such as the Alpujarra Mountains or the Marquessate of Zenete. However, the greatest influx of tourist centers is in the area of the ski resort which is located in the heart of the biosphere reserve. Of the 1,200,000 people who visited Sierra Nevada in 1993, 800,000 were drawn to the ski resort. Such massive tourism has had the greatest impact on the biosphere reserve.

Nevertheless, the Rural Tourism Comprehensive Development Plan has been initiated in the above mentioned site and a coordinating body of professionals, involving the majority of tourist businesses or cooperatives in the Park, has been created.

The most significant impact facing this Biosphere Reserve at present is related to the following:

- Fires, poaching and uncontrolled land development.
- Abandonment of croplands and traditional land uses in the Alpujarra Mountains.
- Very marked development and urban growth in the Sierra Nevada ski resort, which is located within a extremely fragile ecosystem, as well as the existence of other high impact tourist development projects.

Another problem at present is the installing of a radar system by the Ministry of Defense at Sierra Nevada's highest summit, the Mulhacén peak, which is in the heart of the reserve. Despite opposition on behalf of the Council on the Environment of the Regional Government of Andalusia, work has already begun. Given its nature as an instrument of national defense such a project prevails over any protection or urban planning regulation.

Perspectives and Conclusions

Tasks carried out in Sierra Nevada over the last five years have endowed this area with all the instruments necessary to ensure its fulfillment of the objectives and functions as a Biosphere Reserve. The following are noteworthy:

- The creation of the Natural Park.
- Development and approval of the Natural Resources Management Plan (NRMP) [*PORN* in Spanish].
- Creation and initiation of a Managers Board.
- General increase in the endowment of facilities, especially those for public use.

The biosphere reserve's main limitations are of a financial nature which has led to a shortage of personnel and resources which are necessary for the proper fulfillment of each management objective. Another significant limitation is the problems inherent in coordinating different administrations who have competence in an area as large as Sierra Nevada. Actions on behalf of these administrations frequently condition those of the Natural Park's administration.

Sierra Nevada is bestowed with many scenic, climatic, cultural and ethnographical resources which make it an important tourist attraction. Properly directed tourism, with attention to the diversification of offerings, and in harmony with the natural values of the site, constitutes the greatest long-term economic resource of this biosphere reserve.

MANZANARES

Location and Characterization

The Manzanares Biosphere Reserve was declared at the end of 1992, making it one of the last reserves to be designated. Its boundaries were adapted to the already existing 47,000 ha. of the Cuenca Alta del Manzanares Regional Park (a pioneer of the Parks in the Autonomous Region of Madrid). This arrangement is actually not very common for Biosphere Reserves associated with Natural Parks. Except for this and the Montseny BR, all the remaining parks were established prior to their declaration as a Biosphere Reserve. The Regional Park was declared in 1985 due to the necessity of protecting and promoting, as a vast natural reserve, the green corridor which stretches from urban Madrid to the Sierra de Guadarrama. It initially occupied an area of 37,500 ha. and has successively been enlarged to its present size.

At its southern edge, the Biosphere Reserve embraces and protects yet another important area known as the Monte de *El Pardo* which is a magnificent holm oak grove on sandy soil. With its 17,000 ha., it extends to the city of Madrid and is considered part of the ecological system of the Cuenca Alta del Manzanares [The Upper Manzanares River Basin]. This BR is managed by National Heritage, which imposes strict regulations as to its use and access under the protection of Law 23/1982 of 16, June.

The key ecosystems of the Biosphere Reserve, in ascending altitude, are the following: ash groves, which are found accompanying waterways or in hydromorphic terrain of little depth frequently turned into meadows after being subject to livestock use; holm oak groves, which are also frequently turned into meadows and mixed with juniper; scotch pine forests which occupy only a few areas above 1,900 m.; broom formations and creeping juniper; and highland pastures. Another important feature to point out are the crags, due to their extension and specificity. Other environments which have undergone significant transformation are woodland plantations of allochthonous species, the urban areas and the reservoirs.

Within the BR, there is a complete representation of vertebrates: 12 species of fish; 13 amphibians (of particular interest is the Iberian newt and the long-legged frog, which are both endemic to the peninsula and are found here in the eastern limit of their distribution area); 22 reptile species (a total of 35 autochthonous of the Iberian Peninsula); approximately 200 bird species, with special emphasis on those associated to the Mediterranean mountain (Imperial eagle, black vulture and

the black stork) or those communities associated with craggy terrain and highlands. The Santillana reservoir, designated a RAMSAR site, is an important site for wintering aquatic birds. Mammals form the most poorly known group of vertebrates. Nevertheless, although a complete catalogue on chiroptera and micromammals has yet to be compiled, there have been more than 40 species cited in the Biosphere Reserve.

Traditionally, stock rearing has been the major activity of land use in the area and that which is of particular cultural and ecological significance. It has strongly conditioned the present landscape with meadows, stone walls, etc. In addition to several breeds of livestock adapted to local conditions, fighting bulls are also common and recently milking cows, in particular, the Dutch Frisian cow have gained importance.

The Regional Park preserves an important network of livestock routes which amount to approximately 257 km. and cover an area of 1,400 ha.

During the sixties and seventies, the construction industry was a major activity within the Park's communities, later diminishing significantly during the eighties. At present, the service industry dominates the region's economy although this is, in general, closely related to the seasonal influx of residents with second homes.

The change which has taken place in productive habits and lifestyles due to tourism has followed patterns similar to other areas of Spain. This change can be seen in the case of the town of Soto del Real, one of 16 municipalities within the Biosphere Reserve. In 1981, the 1,712 second homes amounted to 80% of the total number of homes; the agrarian population went from 70.9% in 1950 to 10.4% in 1975, while the population devoted to services increased from 20.9% to 81.5% during the same period. The enforcement in 1985 of the Law of Regional Parks has regulated construction and kept it confined to the areas established for such.

There is also an important historic-artistic heritage throughout the Biosphere Reserve. Noteworthy are the remains of several peoples of different periods, along with a considerable number of dwellings of both urban and religious interest and, in particular, the new Manzanares Castle which was built in 1482 and declared a National Monument in 1931.

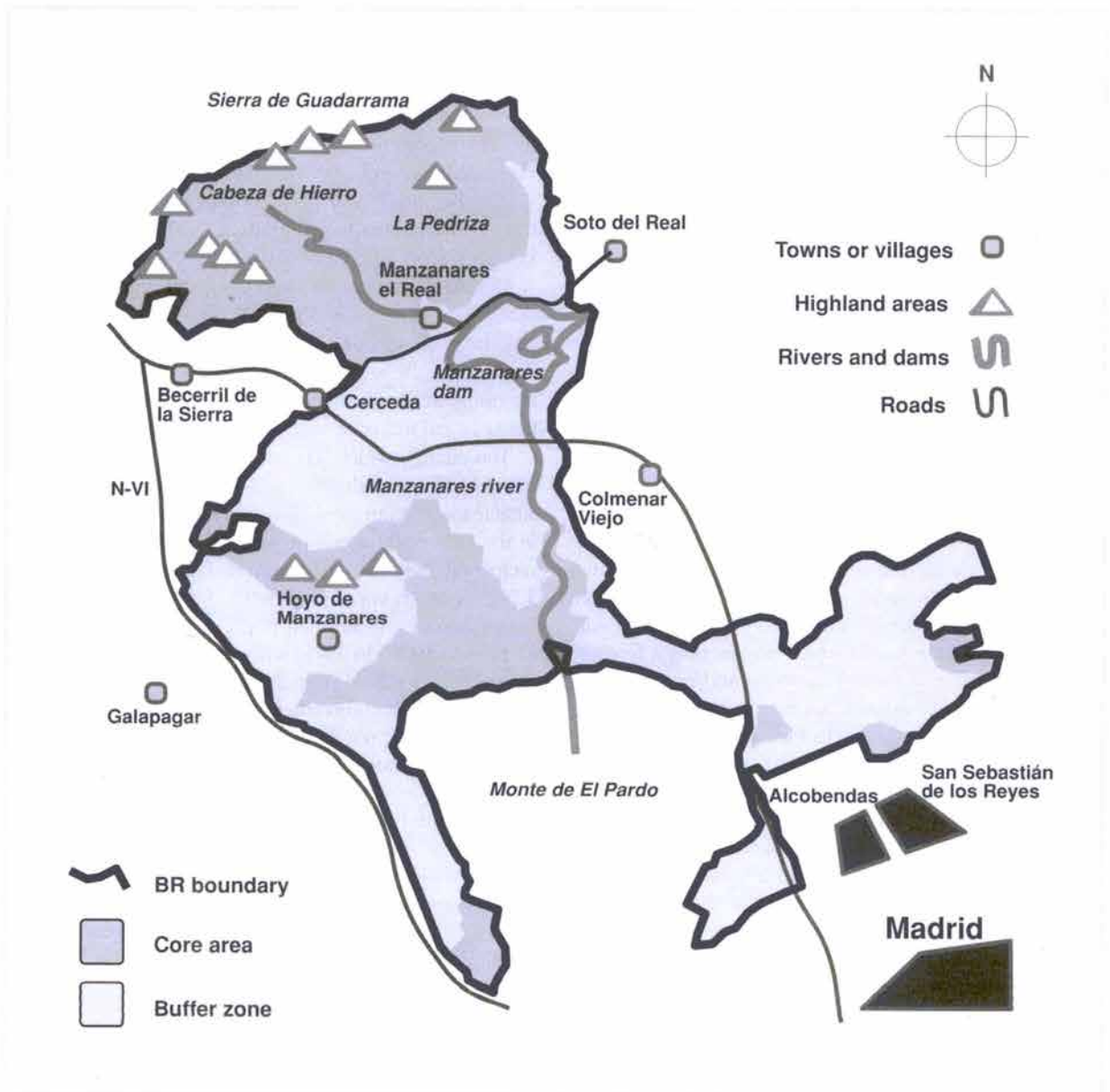
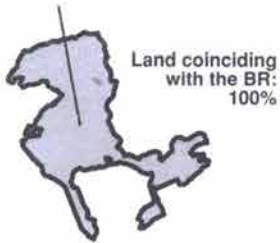
Planning and Management

The level of *management and planning* in this area was already high when it was declared a Biosphere Re-

Manzanares



Cuenca Alta del Manzanares Regional Park



Biosphere reserve

MANZANARES

Declaration date		9 November, 1992		
Location (Province)		Biogeographical region/province		
Madrid		Mediterráneo-Ibero-Atlántica/Carpetano-Ibérico-Leonesa		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
47,500 ha	39%	61%		38%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
5,812	16	266,2390 (-Madrid)	Services	
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Special Bird Protection Area (El Soto de Viñuelas) — RAMSAR Convention Site (The Manzanares reservoir) 		<ul style="list-style-type: none"> — Midland and highland mountain areas, valleys and crags on granite and gneisses — Mediterranean and continental climates — Holm oak grove, ash groves, pinewoods, <i>Cystisus scoparius</i> broom formations and <i>debesas</i> 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Threatened species — Proximity to large urban community — Traditional agricultural systems — Exceptional and representative landscape 		<ul style="list-style-type: none"> — Research Center associated to the planning and management of the Biosphere Reserve 		

Associated protected area

THE CUENCA ALTA DEL MANZANARES REGIONAL PARK

Declaration date		1985, extended in 1987, 1991 and 1993	
Institution responsible for management		The Environmental Agency of the Regional Government of Madrid	
Area	Area of the BR within protected areas	Area of protected areas within the BR	
47,500 ha	100%	100%	
Protection/Planing legislation			
<ul style="list-style-type: none"> — Creation: Law 1/1985, 23 January. (37,500 ha) — Ammendments: Law 2/1987, 23 April; Law 1/1991, 7 February; Law 7/1991, 4 April; and Law 5/1993, 21 April — Governing Use and Management Plan: Order of 28 May, 1987 			

serve. Law 1/1985 had already been created and its Governing Use and Management Plan had been approved in 1987. This plan, one of the first approved in Spain, was also the first of those schemes for protected areas associated with Biosphere Reserves and it laid the foundation for others that developed subsequently. Its creation was based on a strategy of participation.

The harmony of the management and planning legislation and the principles of actions of the Biosphere Reserve are notable. Thus, the aim of the Regional Park Law of the Cuenca Alta del Manzanares is to promote the improvement, recovery and implementation of traditional productive activities in farming, stock rearing and forestry as a means of actively preserving and protecting the physical medium.

Of those schemes listed in the GUMP, the following have been carried out.

- Plan for Waste Disposal Sites, incorporating the municipalities into the Coordinated Program for Action on Solid Urban Waste of the Council on Territorial Planning, Environment and Housing.
- Plan for Actions on Dumping Materials and Waste Water Purification in P Areas (The General-Directorate of Hydraulic Resources created a plan, which has been executed, establishing the need to reach at least a secondary level of waste purification).
- Public Use Plan, approved by the Board in December, 1993, and in its operations phase.

Park zoning is comparable to a typical Biosphere Reserve which puts A Areas on the same level as core areas and B areas (Agricultural and Farming Regional Park), T areas (Transition) and P areas (subject to Urban Planning) are considered equivalent to the buffer zone. There is no area defined as the equivalent of the transition area. A areas are devoted to the protection of natural resources, the landscape, cultural resources and to the protection of people.

For their part, the areas which make up the Agricultural and Farming Regional Park, include ecosystems which have been partially modified by traditional land uses. Traditional productive uses, such as extensive stock rearing, is both permitted and promoted. Agricultural and Farming Regional Parks are categorized into three types which are the following: Protective, Productive, and Regenerative.

Area T occupies only 5% of the whole Park and is devoted to protecting the Monte de El Pardo from the nearby National-VI motorway. Areas subject to urban planning (P) represent 8% of the total area and are also subject to special urban-planning restrictions. All land within the Biosphere Reserve is classified as an area of special protection and urbanization is prohibited.

Thirty-eight percent (38%) of land within the Biosphere Reserve is publicly-owned and this figure is proportionately higher in the core area, where it reaches 56%. A policy of land acquisition is maintained in these areas (2,140 h. were purchased in Area A in 1988).

The following are among the recently applied actions for the conservation of resources:

- Hydrological-Forestry Restorations.
- Reintroduction of the wild goat, which has tripled its initial population.
- Several works on the regeneration of degraded areas, in particular disused quarries, which are now prohibited in the Regional Park.
- Modifications on high tension electrical lines in order to avoid harm to avifauna (in 1993, 3 km. of a 20,000 voltage high tension electrical line, regarded as the most dangerous, was run underground because it killed 100 birds of prey annually).
- Activities related to the prevention and fighting of forest fires, control and treatment of woodlands including woodland infestations. Similarly to other biosphere reserves with woodlands, these actions require the most amount of resources. A plant nursery dedicated to autochthonous species has been created and has undertaken plantation works with the same.
- Several actions of restoration of scotch pine forests and meadows of holm oak and ash groves.

In the field of research, this biosphere reserves stands out for the Fernando González Bernáldez Center for Research in Protected Areas (see Box 7). This center is not only devoted to research in the Regional Park but also oversees other protected areas in Madrid and is cu-

Review of the Governing Use and Management Plan (GUMP) as per the Action Plan for Biosphere Reserves:

The first review of this plan is currently being carried out, and should be valid for the period 1995-1998. It faithfully adheres to the guidelines laid out in the Action Plan for Biosphere Reserves. As stated in the draft for the new Governing Use and Management Plan «management recommendations for the Biosphere Reserves can be adopted by introducing certain improvements in the planning of the Regional Park. Thus a framework of scientific reference and management at the international level can be obtained». This document, while considering the recommendations made by MaB and the current state of the Regional Park, establishes six management priorities:

1. Conservation of Biological Diversity
2. Conservation of Traditional Land Use Systems
3. Management of Recreational Activities
4. Research and Permanent Surveillance
5. Training and Education
6. Cooperation (among local communities, authorities, scientists, support groups and other BR's and protected areas).

In addition to defining the guidelines for the pursuing of The Regional Park's management related objectives, it includes an indication of funding requirements for actions per objective, set at 600 million pesetas/year, for the 1995-98 period.

rently the headquarters for the Federation of Nature and National Parks of Europe. The Research Center is developing the following four research programs on different features of the Biosphere Reserve: agricultural ecosystems, landscape, aquatic ecosystems (among other projects, an inventory of the lenitic aquatic ecosystems of the Park and its subsequent characterization was completed as well as a study to determine the water quality in the Park's waterways, etc.) and ecological cartography.

Moreover, the proximity to a large urban community such as Madrid and its metropolitan area, which is home to several universities, has favored research work within the geographical area of the Regional Park.

With regards to *monitoring*, based on research conducted by the Interuniversity Department of Ecology of Madrid, permanent parcels for pasture sampling have been maintained since 1976. Here there is a considerably higher diversity of species: the presence and abundance of 200 herbaceous species is recorded with the aim of detecting changes in the structure of the pastures and their workings. Several groups of organisms have also been studied and monitored on a permanent basis in the Park area. However, there is a serious need for the compilation of studies and a systematization of data. Through the Center for Research in Protected Areas, several lines of research on monitoring and control are being followed.

Significant investments have been made in *regional planning*, with many directed at promoting traditional farming activities: clearing of pastures, enclosing property, building feeding troughs and pens, livestock crossings, vaccination alleys, and the upgrading of country roads and forestry tracks (in order to provide access to cattle farms, 115 km. of country roads have been improved without the use of asphalt).

Nevertheless, we are at a critical moment for many farming activities (in particular semi-extensive stock rearing), which are so representative of the Regional Park. The application of the European Community Agricultural Policy, is leading to the abandonment of many farms, especially those devoted to the production of milk. Given the important role traditional livestock activities play in the current landscape of the Biosphere Reserve, its substitution or complete abandonment would have serious repercussions on the surrounding ecosystems. As stated in the base document for the new Governing Use and Management Plan «farm uses in the area of the Regional Park have not yet been significantly favored, due, in large part, to the National and E.U. agricultural and environmental policies which have not been opposed by the Regional Government of Ma-

drid»²⁰. However, the E.U. proposes the endowment of programs that, to some extent, make up for where the Community Agricultural Policy fails, and the following would lead to improvement of agricultural activities within the Park: Leader Programs, the designation of areas as environmentally sensitive and, more recently, the Habitats Directive.

It seems wise, therefore, that livestock related actions should be carried out with a better basis and planning in order to seriously remedy the current tendency to abandon farms since they are important factors in preserving the functionality of the territory and landscape of the Park.

Participation of local residents in the Biosphere Reserve is channeled through the Board of the Regional Park. The Board of Governor's Plenary Meeting is attended by political authorities from both the regional government and local administration, representatives from the University and from conservation groups, professional agricultural organizations as well as the Park's Director-Curator.

The greatest objection to the Park on behalf of part of the local community is due to the restrictions placed on urban development that the Park's existence entails.

As laid out in the Governing Use and Management Plan, several *environmental education* and training programs were initiated and are still carried out to date. Among the major actions in this field, it is worth pointing out the environmental education activities directed at grade school children, the educational and interpretational actions which take place at the Interpretation Center, and the functions related to training and education carried out by the Research Center. Among the latter, of particular interest is the course on Research Methods and Management of Natural Areas which is offered yearly.

Moreover, a vocational training center has been part of the Regional Park since 1988. This educational center offers training in environmentally related jobs to up to 40 students.

The Park *budgets* are covered by the Environmental Agency of the Regional Government of Madrid. In 1994, the budget amounted to 436 million pesetas, in addition to a small contribution by ICONA for forestry works. Sums dedicated to investments in 1994, set at 7,053 pesetas/ha., were somewhat lower than the average annual investment per hectare in other Biosphere Reserves coinciding with protected areas. With regards to the ratio of permanent worker engaged in park management per square area, this Park's ratio is the second highest for the same group of reserves, at 1,827 ha./person group of reserves.

One of the major problems facing the Manzanares Biosphere Reserve is the severe pressure it is under due to the masses of visitors who frequent very localized spots. Thus it is not surprising that a *public use* plan has been developed.

²⁰ Center for Research on Protected Areas, *Memoria de actualización del PRUG y del PRCAM según la revisión aprobada por el Patronato del Parque el 10 de diciembre de 1993* (Report, 1994)

The majority of tourists are one-day (80%) or weekend visitors. Although current data does not provide exact figures, the total number of people visiting the park per year is estimated at one million, with approximately 225,000 going to *La Pedriza de Manzanares*. Here they converge on area of

6 km² in the heart of the reserve. For this reason, access has been limited to 500 motor vehicles at a time.

The recreational area of the Park is comparatively small given that the park occupies a total of 50,000 ha. This reality is even more surprising because of the fact that the majority of visitors come from urban areas and that the surrounding communities have populations of over 5 million inhabitants. At present, the supply clearly does not match the demand, and this is particularly intensified due to the poor quality of the recreational areas from excessive use.

Livestock routes, which cover a large part of the total area of the park, although currently underexploited, are an important recreational resource and offer a fine alternative to the congested areas. They also provide a perfect medium for green tourism and environmental activities which are both compatible with livestock use.

From the Center for Research in Protected Areas, research is taking place on the resilience of the different sites. This would lay the foundations for uses permitted and the number of visitors allowed in each.

In addition to recreational areas, other amenities for public use include an interpretation center, an information center, several refuges and a variety of itineraries.

The lack of tourism related infrastructure is quite surprising. The only well-developed sector includes restaurants and bars. Lodging and other services for tourists remain scarce.

Perspectives and Conclusions

The Cuenca Alta del Manzanares Regional Park already had at its disposal the necessary elements for it to develop its functions as a Biosphere Reserve when it was declared as such, though it is currently completing its objectives with regard to regulations following the principles of the Action Plan. Due to its proximity to a large city, this Biosphere Reserve is representative of a protected area under enormous pressure from visitors (as is Montseny). For this reason, endowment related to infrastructure for public use and to the regulation of tourism should be of utmost importance.

Despite the predominance of the services sector, many traditional land use systems are still evident, in particular the agro-silvo-pastoral utilizations linked to the maintenance of dehesas, enclosures and fields. If the current tendencies prevail, many of the estates and farms inside the Park could fall into disuse and lead to a consequent deterioration of the surrounding ecology and landscape. This is why a detailed study on present land use systems and their cultural, ecological and economic viability should be undertaken. The objective should be to select and determinedly support those alternatives that are compatible with the existence of the Biosphere Reserve.

In conclusion, it is therefore advisable to progress further in the concept and effectiveness of the Manzanares Biosphere Reserve, leaving behind the first and necessary phase of limiting urbanization and regulating the pressure of tourism, in order to undertake more active conservation measures based on applied research, and for which the modifications in the Governing Plan for Use and Management and the Research Center can be substantial instruments.

LANZAROTE

Location and Characterization

Lanzarote and the island of Menorca were the last two Biosphere Reserves in Spain to be incorporated into the International Network of Biosphere Reserves. The designation of Lanzarote was upon petition of the Government of the Canary Islands in October, 1993.

The Lanzarote Biosphere Reserve is relatively flat, volcanic in origin, with two extreme mountain massifs, corresponding to a former series of volcanoes and a group of isolated volcanoes on the island's central axis. There are historical lava fields, such as Timanfaya, and an important area of aeolian sands which make up the area known as Jable de Famara. The highest altitude on the island is only 670 m. and the ocean floor is also relatively flat.

The key ecosystems and environments found on Lanzarote are the following: volcanoes and lava fields, marine environments (shallow ocean floors, lava platforms, cavities) and coastal environments (small volcanic islands, large expanses of rocky sand and rocky flatlands, steep cliffs as well as man-modified environments, such as cities and cultivations on volcanic ash.

Annual average rainfall is as little as 115 mm. and therefore there are no permanent waterways. This lack of water fostered ancient and interesting adaptations in human uses. Current production of water for consumption is almost completely carried out by desalinating sea water while at the same time obtaining a third of the energy needed from aeolic energy.

Although biodiversity is not as high as in the other islands of the archipelago (in part due to the homogeneity of the climate which causes the islands low altitude) there are many noteworthy biological communities. The following have been cited on the island: 586 species and 37 subspecies of vascular plants, close to 200 species of lichen (very well-represented on the island because of new colonization taking place in many of the volcanic areas), and 35 species of nesting birds.

Conversely, the number of endemisms is high (corresponding to its island features) including 17% of the vacuolar plants (21 endemic to the island, 67 to the archipelago and 21 macaronesian, 60% of nesting birds are subspecies exclusive to the island and 100% of the reptiles (2 species and one subspecies). The number of insect endemisms is also noteworthy: 40% of all entomological fauna in the Canary Islands. Some of the places on the island such as Jameos del Agua, which was recently declared a Site of Scientific Interest, contain a

considerable number of exclusive taxa: of the 26 aquatic invertebrates described on the volcano, 14 are endemic to the island of Lanzarote.

Although in progressive decline, many of the characteristic human uses on the island played an important role in the island's landscape until tertiary production based on tourism took over. Key traditional uses included volcanic ash crops, the breeding of cochineal on *Opuntia*, fishing and the salt works industry. All of these, apart from their repercussions on the landscape, are the result of interesting adaptations and interactions of human uses with environmental conditions.

The services sector is the leading economic sector. Tourism is the most relevant given the fact that three quarters of the island's working population is engaged in related activities. Less important are construction (14%), the manufacturing (5.6%) and fishing and agriculture (5.5%).

The influence of César Manrique is well-known on the island. The network of tourist centers which he designed, perfectly integrated in the surroundings, is one of Lanzarote's unique tourist attributes.

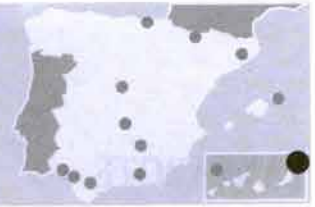
Planning and Management

The island's principal legal instrument for management is the Island Plan for Regional Planning on Lanzarote (Decree 63/1991). This document establishes the framework for island management, defining the physical boundaries and criteria for the conservation of the environment, as well as a territorial development strategy which establishes limits on tourist related development, amongst other things. A previous plan existed in 1973 which, given the relatively small size of the island, explains the scarce development of the municipal urban planning regulations.

The majority of actions of the recently created Biosphere Reserve have been carried out within the frame-

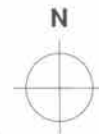
The work of César Manrique in Lanzarote is a wonderful example of sensitive human interaction adapted to the surroundings. He uses the unique landscape of the island as the site to harmoniously express his creativity. Among his works are some of Lanzarote's most characteristic tourist sites: Jameos del Agua, Montañas del Fuego, Mirador del Río, Cueva de los Verdes and Jardín de Cactus.

Lanzarote



□ Towns or villages

∩ Roads



Montaña Clara

Graciosa

Roque del Este

Atlantic Ocean

Timanfaya National Park

Haría

La Villa de Teguise

Tinajo

San Bartolomé

Yaiza

Tías

Arrecife

BR boundary

Core area

Buffer zone

Transition area

Biosphere reserve

LANZAROTE				
Declaration date		7 October, 1993		
Location (Province)		Biogeographical region/province		
Las Palmas		Macaronesian		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
84,610 ha	11.1%	36.4%	52.5%	
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
88,475	7	88,475	Services	
Institution responsible for management		Government to The Canary Islands		
Management/Planning legislations affecting the entire BR territory				
<ul style="list-style-type: none"> — Territorial Management Plan for the Island of Lanzarote, Decree 63/1991, 9 April — Law 12/1994, 19 December of Protected Areas of the Canary Islands 				

Other designations	Ecological characteristics
<ul style="list-style-type: none"> — Special Bird Protection Area (the protected areas) 	<ul style="list-style-type: none"> — Volcanic island, lava fields, cliffs, coast — Endemic species — Xeric vegetation
Conservation interest	Major contributions to RB
<ul style="list-style-type: none"> — Representative of rare ecosystems — Endemic species — Observation site for the colonization of undisturbed areas 	<ul style="list-style-type: none"> — Harmonious balance between traditional land uses and the environment — Possible example of comprehensive management for the sustainable development of a complex geographic area — Possible example of maintenance of cultural landscapes subject to use

work of the above mentioned Island Plan for Regional Development and, in general, are harmonious with its philosophy. However, the management office itself admits that such scarce development of the same has been due to budgetary difficulties and insufficient political support.

As per the Biosphere Reserve strategy presented in the report which was prepared for its designation and in agreement with the requirements of the Spanish Committee of MaB, there are plans to create a coordinating body for the Biosphere Reserve and to implement a Sustainable Development Plan for the island. The Biosphere Reserve Council is the anticipated coordinating body, though other proposals have been made, and no effective steps have been taken towards its

founding. Also, the other pillar on which actions strategy should be based, the Sustainable Development Plan, has not been initiated.

The new Law of Protected Areas for the Canary Islands (Law 12/1994, 19 December) was recently passed. Forty-two percent (42%) of the total geographic area of the island (including the Timanfaya National Park, overseen by the Central Government) was given different a different management category. One of the most novel features of this law is that it stipulates the elaboration of a Natural Resources Management Plan for each island (based on the guidelines of National Law 4/1989) and their integration in Island Management Plans. In other words, Island Management Plans, like the one for Lanzarote, legal instruments for regional planning, urban

Associated protected area

TIMANFAYA NATIONAL PARK

Declaration date	1974	
Institution responsible for management	ICONA, The Ministry of Agriculture, Fisheries and Food	
Area	Area of the BR within protected areas	Area of protected areas within the BR
5,107 ha	6%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — Declaration: Decree 2615/1974, 9 August — Reclassification: Law 6/81, 25 March — Legal basis: Law 4/1989, 27 March, of the Conservation of Protected Areas, Wild Flora and Fauna — Governing Use and Management Plan: Royal Decree 1621/1990, 14 December 		

Associated protected area

THE NATURAL PARKS OF THE CHINJO Y LOS VOLCANES DEL ARCHIPIELAGO

Declaration date	1994	
Institution responsible for management	Govt. of the Canary Islands, delegating powers to the Island Council	
Area	Area of the BR within protected areas	Area of protected areas within the BR
19,270 ha (9,112 ha +10,158 ha.)	22.7%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — Declaration: Law 12/1994, 19 December, on Protected, on Areas in the Canary Islands (Official Bulletin of the Govt. of the Canary Islands, No 157, 12-24-1994) 		

planning and natural resources will all fall under the category of Natural Resources Management Plans.

The law establishes several management categories and five of these are represented on Lanzarote. One of these is the Natural Park, of which there are two on the island. These Parks are defined as areas only slightly transformed by human interaction devoted to education, research and public use, and with no residential zones. In other words, regulations are more restrictive than for natural parks associated to other biosphere reserves in Spain.

Lastly, the law also stipulates that management of protected areas shall be delegated to the Municipal councils of the islands acting as common bodies representative of the Regional Government on each island and which must be approved within one year of the delegation decree.

To date, the only protected area which has an appro-

ved legal instrument for planning is the Timanfaya National Park (Governing Use and Management Plan). The remaining areas have not developed regulations, which is not surprising given their recent designations. For its part, the Island Plan for Territorial Planning also acts as protection for several areas, based on regeneration: El Jable, large expanses of sand and badlands, coastal lagoons, volcanic domes and the coastal area of public domain.

Other existing sectorial plans for the island are the following:

- Special Plans for the Janubio and El Río salt works, Plan for Footpaths, Gulf Route;
- Environmental Action Plan, which has recently been drafted by the Island Council, and is meant to act as an inventory of needs and actions directed towards the recovery of the island's natural medium, only a few of which have been implemented.

Associated Protected Areas

— LOS ISLOTES STRIC NATURAL RESERVE
 — CORONA, LOS AJACHES, CUEVA DE LOS NATURALISTAS, ISLOTE DE HALCONES AND MONTAÑAS DE FUEGO NATURAL
 — TENEGÜIME AND DE LA GERIA PROTECTED LANDSCAPES
 — JAMEOS AND DEL JANUBIO SCIENTIFIC INTEREST SITES

Declaration date	1994	
Institution responsible for management	Govt. of the Canary Islands, delegating to Island Council	
Superficie	Superficie RB en ENP	Superficie ENP en RB
Total: 11.252,9 ha (Reserve, 165 ha; Natural Monuments, 1.797,2 + 3.009,5 + 2,1 + 10,6 + 392,5 ha; Protected Landscapes: 421,1 + 5.255, 4 ha; Scientific Interest Sites, 30,9 + 168,6 ha).	Total: 13,3% (Reserve, 0,2%; Natural Monuments, 6,2%; Protected Landscapes, 6,7%; Scientific Interest Sites: 0,2%).	100%
Normativa de Protección/Planificación		
— Law 12/1994, 19 December, of Protected Areas of the Canary Islands		

There are serious gaps with regards to sectorial management and these are some of the points which the development of the biosphere reserve should emphasize: coastal planning, the fishing sector and the threat of the spatial distortion caused by infrastructure and public operations.

Among those *conservation* plans and actions implemented almost always within the framework of the Island Plan for Territorial Management are the following:

- Plan for the Rehabilitation of the Janubio Salt Works, initiated in 1993,
- Plan for the Recovery of the Canarian Houbara Bustard,

-Subsidies for the maintenance of cultivation processes in La Geria, although to date they do not appear sufficient to guarantee a return on these interesting uses which are responsible for one of the most characteristic cultural landscapes on the island,

- Creation of a nursery for autochthonous plants to be used in landscape enhancement projects,
- Installing telephone network and low tension electrical lines underground in specific areas.

Most of the research carried out on the island to date has focused on volcanism and its associated phenomena. Lanzarote provides an excellent setting for such studies. Most of the scientific research anticipated for the near future also follows this tendency. For this reason, it is not surprising that La Casa de los Volcanoes [The House of Volcanoes] is the center of the biosphere

reserve with regards to information, documentation and the promotion of research.

Other relatively developed lines of work on the island have focused on marine, plant, paleontologic and ornithic biology. On the other hand, there are no noteworthy actions with regards to monitoring.

Exchanges of information take place with Menorca and other research centers: La Laguna University, Las Palmas University, the Santa Cruz de Tenerife Museum of Natural Science, the Higher Council on Scientific Research and the Jardín Canario Viera y Clavijo [The Viera and Clavijo Canary Island Gardens].

With regards to regional planning, the Island Plan for Territorial Management, together with the network of protected areas, although not fully developed as to planning and management, lay the foundations for what could be considered a balanced territorial model. Plans which should be developed in the future, such as the Natural Resources Management Plan for the island and the Sustainable Development Plan should provide the necessary coordination among the actions of the different economic sectors and the administration in order to achieve such development.

To date, some of the actions implemented in support of sustainable regional development are the following:

- approval of the Island Plan for Territorial Management,
- protection and support of traditional agricultural systems,

- creation of the Teguise Agroindustrial Complex, (actions have been halted),
- initiation of actions in arrangement with the tourism sector, the island's principal economic strength, in order to improve its quality and sustainability.

Some of the most important deficiencies include waste in a way compatible with the island and the scarce treatment and subsequent use of waste water.

The process of declaring the island a biosphere reserve has provoked the participation of many of the social sectors. Although it is still a rich and creative process, it has been disoriented by the unstable political situation of the Island Council during this time (there have been three changes in the presidency since the process of declaring the biosphere reserve was initiated) which has also caused numerous changes in direction as to the responsibility of promoting the development of the biosphere reserve and of channeling public participation.

The Law of Protected Areas stipulates the creation of a Board of Managers attributed to each Island Council to cooperate in the management of protected areas. Its responsibilities are similar to those boards of managers of other biosphere reserves, but it should also oversee management of all the protected areas on all of the islands. Members of the board will include three representatives of the Government of the Canary Islands, three from the Island Council, two from the towns and villages of the islands, a representative from each of the Canary Island Universities and a representative of a nature conservation group. Presidency will be assigned to the president of the Island Council.

On the other hand, prior to this law, the report which was presented upon designation of the biosphere reserve proposed establishing a Biosphere Reserve Council whose functions would be to provide «lateral technical and scientific advice between administrators and social agents.» It has not yet been determined to what extent the Island Board of Managers (an obligatory body) will supplement or complement the functions of the anticipated Biosphere Reserve Council.

As to environmental education and training a nature classroom was recently created in Máguez, Haría, which is an amenity that the island was lacking until then. The center for interpretation for the Timanfaya National Park in Tinajo has also been inaugurated. Educational tours and visits to the House of the Volcanoes Interpretation Center are organized for school children.

In order to disseminate information about the biosphere reserve brochures have been issued, articles written and press interviews and conferences given. There is a project planned for the signposting of the territory with the logo of the biosphere reserve that has not yet begun.

As is the case in Menorca and Urdaibai, in order to calculate the endowment for personnel and for the bud-

Local participation in designing a biosphere reserve strategy.

After the declaration of the biosphere reserve a technical committee was implemented with personnel from the office of the Island Management Plan and from the Island Council. This group kept up a tight calendar of meetings creating eight committees that gathered the principal collectives of the island: city council members, ecologists, farmers and fishermen, businesspeople and tourism promoters, professionals and members of the administration, cultural organizers, educators, unionists and members of political parties. The objective was to gather these committees proposals with the aim of designing an operative plan for the biosphere reserve. Some of the proposals were unusual, like that of the tourism operators that requested that no more hotels be constructed but that two golf courses be built. However, they are an important experience in participation and discussion with the objective of designing a development plan that falls within the framework of the biosphere reserve. The general proposals are:

- the transfer of responsibilities to the island government for solid waste, waste water, etc.
- upgrading of coastal areas
- the need for the underground installation of high tension electrical lines
- the need for an informational campaign on the importance of the biosphere reserve due to the lack of existing information.

get it is not possible to differentiate the ordinary management of the island with that specific to the biosphere reserve, especially since a coordinating body has not yet been formed nor has an action plan be established.

The principal funding, logistics, planning and management support for the biosphere reserve comes from the Council on Territorial Policy and from the Island Council. Funds are also obtained from the central government and from the European Union (Structural Funds for Objective 1 Zones) for different programs which are not necessarily related to actions foreseen in connection to the biosphere reserve.

There is an important influx of tourists to the island (1.200.000 tourists in 1992), due to the pleasantness of the climate, the peculiarity of its volcanic and cultural landscapes and the important network of Island Council Centers for Art, Culture and Tourism, which are in large part based on the work of César Manrique. The majority of the tourists could be classified as «beach, sun and fun» tourists, but amongst the actions foreseen for the biosphere reserve is the promotion of new complementary offers (hiking, horse trails, marine tourism combined with traditional fishing, etc.). The average stay of each tourist is between one and two weeks. The lodging capacity for tourists, 53,000, is close to that of the total population of the island.

In December of 1993, two months after the declaration of Lanzarote as a biosphere reserve, the Island Council did a study on the **level of awareness of the inhabitants of the island of the biosphere reserve**. Half of the population (49.5%) responded that they had no information about it and a third (30%) said they were poorly informed. On the other hand, of those who were informed about the reserve, 55.5% viewed it as either positive or very positive. The same study concluded that there was a need for «an informational campaign directed toward the island population t»at clears up the content and scope of the declaration»²¹.

There is an important network of paths that are being rehabilitated within the framework of the Regis community program. Those chosen are the ones most suited to getting to know and enjoy each area.

The biosphere reserve must face the challenge of developing a sustainable model for tourism while at the same time achieving a level of awareness in visitors and the local population.

The biggest impacts on the island are related to residential developments, high tension electrical lines (which are very noticeable in an area with little vegetation), extractive activities and the pollution of marine water. To a lesser extent unmanaged dump sites and infrastructure also effect the quality of the environment.

Perspectives and conclusions

The incorporation of Lanzarote to the International Network of Biosphere Reserves, like that of Menorca, is an important contribution to the new way of thinking

²¹ MARTIN ROSA, M. A., 1993: *Estudio sociológico en la Isla de Lanzarote*, Report, 1993

about the concept of the biosphere reserve. This includes the integrated and comprehensive management of complex geographical areas, not necessarily tied to protected areas, a philosophy in which the Urdaibai Biosphere Reserve has already made important contributions.

The Lanzarote Biosphere Reserve is getting off to a good start, with legislation for territorial planning like the Island Territorial Management Plan, a complete network of protected natural areas, a noteworthy network of tourism centers and a natural environment in an acceptable state of conservation.

Nevertheless, few of the actions planned in the initial strategy of the biosphere reserve have been implemented, although the fact that only a little more than a year has passed since it was declared has to be taken into consideration. Due in part to the political instability of the Island Council and to shortcomings in the coordination of the actions, some of the actions undertaken have not had continuity (the creation of a Technical Commission, the drafting of an Environmental Action Plan for Lanzarote, the proposal for a Council on the Biosphere Reserve). At the same time different proceedings have been undertaken including the Council of Territorial Politics and the Island Council, but there has been a lack of integration into a common strategy. The actions brought about within the framework of the Island Territorial Management Plan are generally based on a philosophy similar to that of the biosphere reserve.

The reality is that the potential of the biosphere reserve has not yet been developed. The main points that have to be resolved are the formation of a coordinating body, the Council of the Biosphere Reserve, and the launching of an action plan that sets the strategies to be followed, as well as arranging the funding to put them into practice.

MENORCA

Location and Characterization

The island of Menorca was declared a Biosphere Reserve by the International Coordinating Council of the Program on Man and the Biosphere at its session in October 1993. Lanzarote was declared at this time as well.

The island of Menorca is 702 km² and has 65,000 inhabitants making the population density 85 inhabitants/km². This is only slightly higher than the average in the rest of Spain, but if we include tourists in this figure, it would be considerably higher. The coast is 216 km. and seems very jagged in some sections. Relief is not particularly uneven, and the Monte Toro is the highest point of the island at 358 m. The temperature year round averages 17°C and rainfall ranges from 450 mm. to 650 mm. Winds are notorious for their intensity and frequency; there are more than 30 days a year with strong winds from the North Tramuntana. There are no permanent rivers, only seasonal torrents and gullies.

The Menorca Biosphere Reserve is characterized by its marked Mediterranean features and by very old human settlements both of which have had serious repercussions on the biological characteristics of the island. For example, an estimated one-third of the flora has been artificially introduced. There is a notable abundance of archaeological ruins, many of which belong to the talayotic culture which was predominant from the end of the second millennium B.C. until the Romans occupied the island.

The key ecosystems of the Biosphere Reserve are, in addition to urban environments, the following: Mediterranean scrub and evergreen forests, aleppo pines, wild olive machias; rocky coastal communities and dunes; permanent and seasonal wetlands; and areas of extensive agriculture. The excavated ruins on the southern half of the island and the 22 surrounding small islands and islets are particularly noteworthy. There is a significant and characteristic interlocking of cultivated and natural areas.

Biological diversity is not very high on the island, with about 300 bird species, 8 terrestrial mammals, 8 reptiles and 3 amphibians. The number of vascular plants represented on Menorca reach close to 1,000 species. The number of endemisms is also high: 7% of the phanerogams are endemic, and there is even an exclusive genus, 100% of the gasteropoda (with the exception of those species introduced by humans) and 7% of the coleoptera.

The income per capita is the highest of the Balearic

Islands, of the rest of the regions in Spain and of all the Mediterranean islands. The island's main resource is tourism, which amounts to 60% of the GNP, followed by industry (23%), construction (15%), and agriculture which, despite its affects on the landscape and the environment, only makes up 2%. Thus, although there is a predominance of tourism, the economy is somewhat diversified.

To some extent the island has managed to avoid the more aggressive processes related to mass tourism which is so common in the Mediterranean and has instead followed its own path guided by its environmental values and its important archaeological and historical heritage. At present only 5% of the coast has undergone urban development.

Extensive rural activities, particularly the maintenance of grazing lands in harmony with the natural system, was productive until 1975. Since then tourism has become the most important economic activity and these other activities are in decline. This could have significant consequences on some of the more characteristic landscapes of the island.

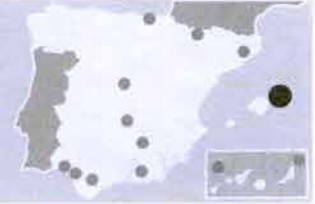
Planning and Management

Although many points depend on the Regional Government, through the Parlament de Les Illes Balears y del Govern Balear, or the Central Administration, many are transferred to the Consell Insular de Menorca which is made up of the thirteen elected members of the Balearic Parlament on the island. The main responsibilities of the Consell are those of the former island government (supramunicipal services and social services) and many matters are managed through the decentralization of responsibilities of the Regional Government of the Balearic Islands autonomous authority such as regional planning and protected areas. The Consell Insular de Menorca petitioned the designation of the Biosphere Reserve from UNESCO and is the organization in charge of its management.

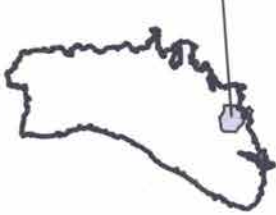
Management of this geographical area is the main challenge facing the island in order to fulfill its functions and objectives as a Biosphere Reserve. Several legal instruments for management, protection and planning have been afforded to the island which should provide a legislative framework enabling said objectives to be reached. But these are not developed enough at present and as will be discussed below.

The most important regulations with regards to plan-

Menorca



Future Albufera Es Grau Natural Park



40 km

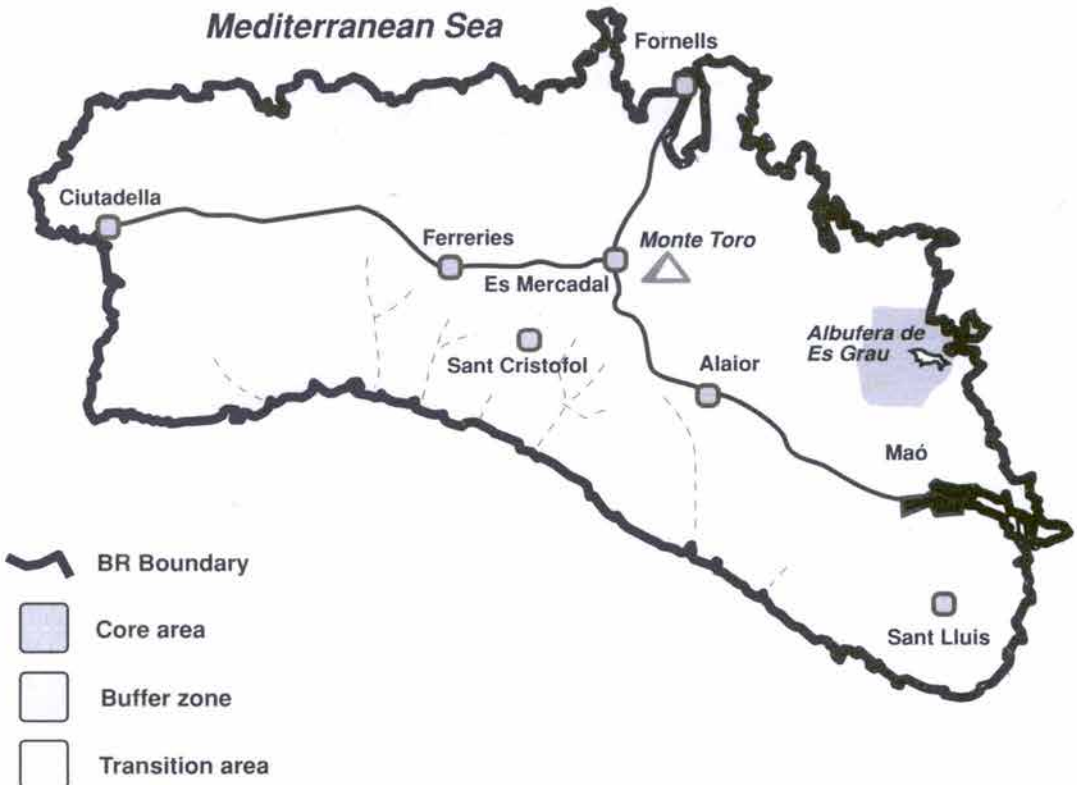
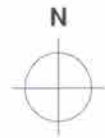


70.200 ha

Balearic Islands



-  Towns or villages
-  Highland areas
-  Ravines
-  Roads



Biosphere reserve

MENORCA				
Declaration date		7 October, 1993		
Location (Province)		Biogeographical region/province		
Las Palmas		Macaronesian		
Area	Core area	Buffer zone	Transition area	Publicly-owned land
70,200 ga	3.5%	39.5%	57%	Aprox. 2%
Pop. within the BR	No. of towns/villages within the RB	Pop. of towns/villages within the BR	Leading economic sector of towns/villages within the BR	
65,552	8	65,552	Services	
Institution responsible for management		Mediterráneo Ibero Levantina/Baleárica		
Management/Planning legislations affecting the entire BR territory				
<ul style="list-style-type: none"> — Law 8/1987, 1 April, Territorial Planning for the Balearic Island — Law 1/1991, 30 January, Protected Areas and Urban Planning Regime for Special Protection Areas of the Balearic Island — Decree 76/1991, 24 July, approval of the Executive Solid Urban Waste Plan 				
Other designations		Ecological characteristics		
<ul style="list-style-type: none"> — Special bird Protection Area (Albufera des Grau and the Northwest Coast) 		<ul style="list-style-type: none"> — Island, sinuous platform, ravines, coast — Mediterranean, Mesothermic, Subhumid and Subarid climates — Pine groves, scrub formations, mosaics of cultivations and scrub, urban areas 		
Conservation interest		Major contributions to RB		
<ul style="list-style-type: none"> — Complexity of the territory due to different uses — Example of harmonious human-environment relationships — Significant artistic-historic heritage 		<ul style="list-style-type: none"> — Possible example of comprehensive management for the sustainable development of such a complex territory 		

ning and management is Law 8/1987, 1 April, on Regional Planning of the Balearic Islands. This law defines the creation of several legal instruments for planning: Guidelines for Territorial Planning; Partial Territorial Plans; Sectorial Executive Plans; and Environmental Management Plans. To date, only several sectorial executive plans have been created.

— The Guidelines for Territorial Planning are regarded as an instrument for the management of the entire geographic area of the Balearic Islands. They define the criteria to be followed by the administrations involved in anything that has territorial repercussions and in matters for which the regional government is responsible. The remaining legal instruments should develop those determinations contained in the Guidelines for Territorial

Management, whose approval depends on the Govern Balear.

- The Partial Area Plans should include the designation of areas of natural interest, indicating the protective measures that should be adopted there. These Partial Area Plans could be a valuable instrument for the management of the biosphere reserve. They are based on the arrangement of supramunicipal geographic areas and their objectives are to promote socioeconomic development that is compatible with the environment and to improve the quality of life of the population. They can be developed both by the Govern Balear and by the Consell Insular.
- Of the Sectional Directive Plans only the Urban Solid Waste Plan and the Recreational Port Plan

Associated protected area

18 AREAS OF SPECIAL NATURAL INTEREST (ASNI)		
Declaration date	1991	
Institution responsible for management	The Menorca Island Council	
Area	Area of the BR within protected areas	Area of protected areas within the BR
27,787 ha (—Albufera de Es Grau)	39,5%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — Law 1/1984, 14 March on the Management and Protection of Special Interest Protected Areas — Declaration: Law 1/91, 30 January on Protected Areas and Urban Planning Regime of the Special Protection Areas on the Balearic Islands — Ammendment of previously mentioned: Law 7/92, 23 December 		

Associated protected area

LA ALBUFERA DE ES GRAU NATURAL PARK		
Declaration date	Currently in transaction	
Institution responsible for management	The Menorca Island Council	
Area	Area of the BR within protected areas	Area of protected areas within the BR
2,455 ha	3.5%	100%
Protection/Planing legislation		
<ul style="list-style-type: none"> — Declaration: Law 1/1991, 30 January of Protected Areas and Urban Planning Regime in Special Protection Areas of the Balearic Islands. — Natural Resources Management Plan in information available to the public 		

have been developed. This leaves some important gaps such as the one caused by the lack of a Hydraulic Plan, given the limited amount of water found in many parts of the island. At this moment the Tourism Management Plan and the Energy Installation Plan are being developed.

- Environmental Development Plans, which were conceived as instruments for the planning of protected natural spaces, have not been approved either.
- In addition, Law 1/1991 of the 30th of January, of Natural Spaces and of Urban Regulations of Special Protection Areas of the Balearic Islands; defines the boundaries of 19 Areas of Special Natural Interest on the island of Menorca. These were later reduced to 18 and make up 43% of the total surface area of the island.

Through this law Areas of Special Natural Interest

were declared Specially Protected Non-urban Zones and it was specified that the planning of the spaces would be brought about through Plans for the Management of the Environment or Special Plans. However, none of these planning normatives has been approved to date. The law defines areas that will be declared protected natural spaces according to the criteria of National Law 4/1989 (of Conservation of the Natural Spaces and of the Flora and wild Fauna) and also declares La Albufera de Es Grau a natural park. This space constitutes the nucleus of the present biosphere reserve and its Plan for the Management of Natural Resources is currently public information.

The rest of the Areas of Special Natural Interest constitute the buffer zone of the biosphere reserve. There are no signs or indications that signal the location of these geographical areas, not even in the most sensitive areas or those under the most pressure.

The transitional area is made up of the rest of the island, that is to say, all the territory that is not protected as an Area of Special Environmental Interest. Thus, this area is made up of urban areas, coastal and interior developments, land zoned for urbanization, farm fields, transportation infrastructure, military zones, etc., which extend over 57% of the island.

For their part, five of the eight municipalities of the island have a General Urban Development Plan and the other three function with Subsidiary Planning Regulations.

In the same way that it did for the Lanzarote Biosphere Reserve, the Spanish Committee of MaB has set some conditions to be met by the biosphere reserves that have recently been declared. These are the existence of an organism of coordination and an Action Plan for the Biosphere Reserve. At this moment things are moving forward to complete these requisites, as is explained below.

The document that is being used as the basis for the strategy of the biosphere reserve is the fourth volume of the report that was presented to UNESCO for its designation, named Strategy for the Reserve - Basic Action Program. Of the long series of proposals that are found in this document few have been put into practice, although one should take into consideration the limited time that has passed since its declaration. On the other hand, it is worth mentioning that it is a very general document, despite the fact that it contains a large number of proposals and suggestions, and it lacks details and a set of priorities.

Recently a grant was approved for the fulfillment of a project named the Viability Study - Plan for Sustainable Development of the Island of Menorca (Biosphere Reserve). The objective of this project, 43% of which will be financed by the Life program and the rest by the Consell Insular, is the elaboration of a model of sustainable development aimed at the integration of the environment in the development and management of the territory as well as in socioeconomic activities. It is foreseen that a document that can act as a basis for the administration of the biosphere reserve will come from the project. One of the tasks to be realized in this project is the socio-environmental observation which will be discussed later on.

The Consortium on the Menorcan Biosphere Reserve is the body that is provided for the coordination of the actions in the biosphere reserve and for the representation of the administrations involved in its management and of the different interested collectives. Recently (in December of 1994) its provisional statutes were approved. As is stated in this document "The objective of the consortium consists in the development of the Plan of Action "Menorca, Biosphere Reserve" [the V volume of the cited report] taking special care with the coordination between the different public administrations and between these and the private entities interested in the

action plan." The consortium would consist of the Board of Directors, an executive committee and a scientific commission. At this moment the budgetary allotments have not been fixed for its operation. Possible sources of funds are the environmental fund of the Consell, the participating entities or, finally, the organism whose jurisdiction each action falls under.

Another of the functions that the Consortium should take over is the revision of the regulation that is being elaborated at the moment (Tourism Development Plan, Plan for Energy Installations, Special Plans for Areas of Special Natural Interest, etc.), encouraging its adjustment to the strategy of the biosphere reserve.

The following are several noteworthy *conservation* activities which have been initiated:

- Conservation and restoration of the Gola de la Albufera des Grau, initiated in 1993 and affecting the wetlands and dunes;
- Monitoring of the osprey, which has been underway since the last decade;
- Eradication of *Carpobrotus*, a pilot project initiated in 1994;
- Conservation of germoplasm, initiated in 1990 using the genetic bank in Mallorca, where the germoplasm of all the Balearic Islands botanical species is preserved.

A study on the red kite was anticipated for January of 1995.

One of the most important needs at present is a census of the autochthonous livestock breeds and their genetic situation.

Research projects initiated on the island in 1994, with regards to baseline research, include the following: a Study of the Sedimentology of the Es Grau Lagoon; and a Study of Solid Depositions in Rain Water. Noteworthy research related to the conservation and management of resources involves the development of a synthetic ecological cartography.

Noteworthy in this field, is the Institut Menorquí d'Estudis which is a center associated to the research, planning and management of the island. Moreover, specific work lines are being carried out on the Biosphere Reserves at the Universidad de las Islas Baleares in relation to the Island Network, which includes Menorca, and through the Ecology Department at the Universidad de Barcelona.

Among actions initiated to promote development of the island, noteworthy are those carried out within the framework of the Leader project, geared at fostering stock rearing, agriculture, appropriate rural technology, forestry exploitations based on sustainability and the promotion of rural tourism as well as the recovery of cultural heritage. Other actions have included the surfacing of roads, a campaign to supply electricity and telephones to rural areas, the promotion of autochthonous breeds (in 1988 this focused on the horse), "appellation d'origine" for Maó cheese, etc.

The guidelines for development that have been suggested for the island with the intention of achieving balanced progress are based on maintaining the three basic economic sectors so as to avoid a unbalanced push toward the service sector with the abandonment of farm activities. In view of this, regional planning which limits occupation of rural land is deemed necessary.

The agrarian structure considered most appropriate for the maintenance of the natural ecosystems which form part of the identity of Menorca are characterized by the presence of extensive crops devoted to forage, livestock in the countryside, relatively low levels of pesticide usage and the interlocking of cultivated areas and natural areas.

Anticipated actions for the future include the strengthening of the Rural Development Center which was created to apply actions under the Leader I program.

Some of the most noteworthy problems of conservation and regional planning are linked to the use of water. Two towns use underground emissaries; the remaining have a purification station at a secondary level, with the exception of one town that has one at the tertiary level. Waste water is not reclaimed for use in irrigation.

Another important question which should be pointed out is the change in attitude of those responsible for tourism on the island towards the need for higher quality offerings which is associated to environmental quality and protection. This has serious repercussions on the rest of the island society given that tourism is recognized as the center of the local economy.

The process involved in declaring the island a biosphere reserve, both before and after this occurred, has stimulated the *participation* of a significant amount of the population of Menorca. Some social sectors firmly believe that the idea of the biosphere reserve came from the society and that the politicians were only a means of putting it into practice (see Box 12).

As mentioned before, the Menorca Biosphere Reserve Consortium will soon be formed as the body in charge of channeling local participation, which, as has been seen on several occasions, has a lot of potential. A provisional commission which is more political than participatory has been set up. It is called the Special Information Commission for the Monitoring, Study, Informing and Consulting of the program for the operation of the Menorca Biosphere Reserve.

In addition to the *environmental education* programs normally carried out on the island, the Man and the Biosphere audiovisual titled *L'home, la clau per a la conservació* [Mankind-the Key to Conservation] has been actively promoted since 1993. Other recent training activities included courses for forest rangers, monitors of the environment and nature tour guides which began in 1993 and have ended.

The island possesses few amenities which favor the development of environmental education. At present,

There are plans to initiate a **socioenvironmental observatory** during 1995 funded by the Life program which would constitute an important contribution to research on Sustainable Development within the Biosphere Reserve framework.

The principal aim of this observatory is to gather, maintain and analyze sources of necessary data in order to provide permanent information on the global reality of the island of Menorca (biological, physical-chemical, socioeconomic and sociocultural variables). The launching of this observatory is considered to be a basic element in involving scientific information in political decision-making.

there is only one nature classroom, which is Es Pinaret.

Several *research* activities have been carried out for the dissemination of information on Menorca's designation as a biosphere reserve and its consequences. An exhibit was launched in Maó titled *Menorca - A Biosphere Reserve* and it is currently circulating throughout the towns and villages of the island. A book was published under the same name, which points out the natural and cultural values of the island of Menorca and how the application of a strategy like the biosphere reserve is a way to protect, maintain and strengthen the same.

Other actions related to the dissemination of information have been the following: numerous articles in the media (to the extent that the topic of the biosphere reserve has been the most dealt with topic in the press for over a year); conferences and round tables; publication of information brochures, etc.

The biosphere reserve itself has still not been equipped with signposts that identify it as such, but a lot of generated documentation does mention this. This has been particularly true for documents related to the promotion of tourism, which have been the first to adopt the identifying symbol.

Thus, it can be stated that the concept of the biosphere reserve has become, in large part, the center of both social and political debate. This is not at all surprising considering that it is the key to the tourism sector and, therefore, to the future economy of the island.

Menorca has little infrastructure for *public use* and it is therefore more appropriate to comment on the infrastructure related to tourism. As previously mentioned, tourism is the island's major resource. Though tourism

A Purification Station was brought into operation in 1994 for a large part of the jewellery industry. Acids and heavy metals are removed from the waste derived from said industry though they are not reclaimed. Not all businesses are associated to this station but it is important to mention that its financing and launching were the initiative of the owners themselves.

centers around «beach fun and sun», both cultural and natural tourism is gaining importance as well as tourism for the elderly. Up to 90,000 tourists can converge on the island, amounting to 150% of the local population. An estimated 820,000 people visited the island in 1991 and stayed an average of one week or longer.

In addition to the generating income, tourism has one of the worst impacts on the environment. These negative effects are generally associated to the presence of residential developments and to the demand for water but their most negative effects, caused mainly by tourists seeking the beach and sun, are seen on the natural vegetation, landscape and in the generation of garbage.

Regulations on tourism could derive from the expected approval of the Tourism Management Plan. The application of said plan as drafted would put a freeze on land zoned for building and would also entail the adoption of other measures such as the «sponging» of those tourist areas which have suffered most: the regeneration of the same, without reducing lodging, while transferring infrastructure to areas farther from the coast.

Perspectives and Conclusions

Among the principal achievements of the Menorca Biosphere Reserve are, on the one hand its designation as such, and on the other its contribution to the philosophy of the biosphere reserves: the application of said philosophy in a geographical area with the complexity associated to human uses which includes protected areas, agricultural land, industrial parks, and important ur-

ban populations, where the proposal of a better future for all can turn into a reference and means of self-limitation for those sectors most aggressive with the environment. Also worthy of mention is the Institut Menorquí d'Estudis, and the considerable efforts made to spread the idea of the biosphere reserve.

The development of the Life project for the creation of a Sustainable Development strategy for the island of Menorca, which is underway, and the definitive approval and bringing into operations of the consortium as a managing and participating body of the biosphere reserve, will provide the support that Menorca needs in order to adequately fulfill the objectives and functions to which it has committed itself upon incorporation into the International Network of Biosphere Reserves. It will also mean a significant contribution with regards to putting into practice many of the propositions of the MaB program, such as sustainable development, which are not yet fully developed.

There still needs to be a great deal more discussion about these topics between the administration, the local public and scientific and technical bodies, a channeling of public participation, a raising of public awareness, etc. The consensus and collaboration of the different political and social powers is absolutely necessary in order to successfully put into action the strategy of the biosphere reserve since the proposed ends require a positive contribution from all of the sectors.

Only time will tell whether or not the Menorca Biosphere Reserve will be viable.

5 CONCLUSIONS

Many of the conclusions and recommendations have already been made throughout this report, both by topic when analyzing each of the objectives of the Action Plan, and by territory when describing the present situations of each of the thirteen reserves in the Spanish network. For this reason only those general ones which give an idea of the overall current situation of the Spanish Network of Biosphere Reserves will be pointed out.

First, it should be pointed out that the 1984 Action Plan for Biosphere Reserves is still a reasonable, though improvable, framework for the development of biosphere reserve potential, and that implementation of its principles should be studied in more detail. To this effect, this document is very much in line with the current strategies disseminated by many international institutions within the framework of sustainable development, which it preceded.

This report clearly shows that important progress has been made by the Spanish reserves with regard to work carried out in comparison to previous years and the degree of effectiveness of the Action Plan objectives can be considered quite significant.

Nevertheless, this progress has not always been homogeneous, with some reserves making no headway towards fulfillment of their functions. It is therefore recommended that a series of actions be taken, to ensure the potential of the Spanish Network of Biosphere Reserves as a whole. To this effect, one of the recommendations made in the Action Plan is that 'MaB National committees should be asked to review the management of existing biosphere reserves [...] and recommend the implementation of measures to improve the standard of management appropriate to the legal, administrative, ecological, cultural and socio-economic conditions affecting the reserves.'

In addition to operating as a network for coordination and joint projects, another of the more important contributions of the Spanish Network of Biosphere Reserves on a global level is the incorporation of complex

territories such as Lanzarote and Menorca. The value of this contribution depends on its effective implementation based on the philosophy of biosphere reserves.

It would be of significant interest to have a statute which clearly stipulates the functions of the biosphere reserves including the criteria they should follow, and identifies the most suitable procedures to ensure the fulfillment of the same.

As a summary of the present situation of the Spanish reserves and the recommendations made in the description of each of these, several homogeneous groups can be made in terms of the measures which should be taken to improve situations and their potential as biosphere reserves:

- Reserves that need coordination among the responsible administrations coinciding in the territory so that management in line with biosphere reserve philosophy can be carried out in all of their areas; Ordesa-Vinamala and Mancha Húmeda.
- Reserves whose boundaries could be extended in order to obtain coherent functional units that would facilitate the fulfillment of their basic functions: Doñana, Marismas del Odiel, El Canal y Los Tiles.
- Reserves with the necessary structure and legal instruments to develop their biosphere reserve objectives and functions, and in which the only recommendation to be made is to further analyze work carried out: Grazalema, Montseny, Cazorla, Segura y Las Villas, Urdaibai, Sierra Nevada and Manzanares.
- Lastly, those reserves recently incorporated into the network that are still developing the necessary mechanisms to operate as biosphere reserves, such as Lanzarote and Menorca.

In short, it can be said that the evolution in the years to come and the work being carried out within the Spanish Network of Biosphere Reserves allows us to anticipate a successful future for the Spanish biosphere reserves.

6 APPENDIX

SPANISH BIOSPHERE RESERVES QUESTIONNAIRE, Autumn '94

**BIOSPHERE
RESERVE:**

1. Objective 1: International Network

"To enhance the role of the international network of biosphere reserves in global ecosystem conservation".

- 1.1. List the **key ecosystems** which are represented inside the biosphere reserve.
- 1.2. How would you classify the **biological diversity** of the BR?
 High Average Low
- 1.3. Are there data/parameters to support this evaluation?
NOTE: i.e., N° of vascular plant species, mammals, etc.
- 1.4. How would you classify the BR's **degree of endemisms**?
 High Average Low
- 1.5. Are there data/parameters to support this evaluation?
NOTE: i.e., percentage of endemic species of certain taxa.
- 1.6. What are the **key human uses** worthy of conservation and sustainable development within the scope of the BR. List and briefly describe.
- 1.7. **Participation** in the different **BR networks**: international, European national.

	ACTIONS	YES	NO	COMMENTS
INTERN.	Is there contact with other BRs outside of Europe?			
	Does the BR participate in any of the MaB international research programs?			
EUROP.	Is there contact with other European BRs?			
	Does the BR participate in any of the following BRIM activities?:			
	ACCESS Directory			
	Standardized biological monitoring inventories			
	Permanent plots			
	Global change and ecological and ecosystems monitoring			
NATION.	Monitoring of the effects of human activities			
	Is there regular contact with the Spanish Committee of MaB?			
	Is there contact with other Spanish BRs?			
	Does the BR participate in the SNBR meetings?			
	Does the BR participate in the SNBR monitoring committee?			
	Does the BR participate in any National MaB projects?			

Other comments:

2. Objective 2: Management

"To improve and upgrade the management of existing and new biosphere reserves to correspond with their multipurpose objectives".

2.1. What **legal instruments of protection/management** have been afforded to the BR?

LEGAL INSTRUMENT OF PLANNING / MANAGEMENT	RANK	% OF BR AREA AFFECTED	WHAT RESERVE AREA IS AFFECTED	WHAT TOWNS AND VILLAGES ARE AFFECTED

Other comments:

2.2. What **legal instruments of planning** have been afforded to the Biosphere Reserve and which prevail over the others?

LEGAL INSTRUMENTS OF PLANNING	SCOPE OF APPLICATION	PURPOSE
NRMP, GUMP, SDP, Others		

Other comments:

2.3. For each of the legal instruments of planning, please specify the following:

LEGAL INSTRUMENTS OF PLANNING	INSTITUTION RESPONSIBLE FOR ITS DEVELOPMENT	INSTITUTION RESPONSIBLE FOR ITS APPROVAL	PROCEDURE FOR ITS APPROVAL

Other comments:

2.4. **Land ownership** (in % of total BR area)

PROPRIETARY	CORE AREA	BUFFER ZONE	TRANSITION AREA	TOTAL
National Govt.				
Autonomous Govt.				
Provincial				
Municipal				
Public				
Private				
NGO				
Other:				

Other comments:

Total area in hectares, of:

- Core Area (or the equivalent)
- Buffer Zone " "
- Transition Area " "

- 2.5. Draw the **organization chart for BR management/administration** (or for its associated protected area). Specify the following:
- connections with government bodies responsible for BR management.
 - composition and functions of the different management bodies.
 - Briefly assess the effectiveness of each management body.

3. Objective 3: *In situ* Conservation

"To promote the conservation of key species and ecosystems in biosphere reserves".

- 3.1. Do existing legal instruments contemplate the need to implement programs or plans for the **conservation or restoration of species or ecosystems**?

PROGRAMS/PLANS FOR CONSERVATION/REST. OF SPECIES/ECOSYST. CONTEMPLATED IN LEGAL INSTRUMENTS OF PLANNING	LEVEL OF OBLIGATION	TIME LIMITS

Other comments:

- 3.2. Have programs/plans for the conservation/restoration of species or ecosystems been initiated?. If so, which ones?:

PROGRAM / PLAN FOR CONSERVATION / RESTORATION	AFFECTED SPECIES/ECOSYSTEMS	INITIATION DATE	PRESENT STATUS

Other comments:

- 3.3. Do existing legal instruments contemplate the need to initiate pilot projects on models of **species and ecosystems management**? If so, with what level of obligation and within what time limits?

PILOT PROJECTS CONTEMPLATED IN LEGAL INSTRUMENTS OF PLANNING	LEVEL OF OBLIGATION	TIME LIMITS

Other comments:

- 3.4. Have pilot projects on models of species and ecosystems management been initiated? If so, which ones?:

PILOT PROJECTS ON MODELS OF SPECIES / ECOSYSTEMS MANAGEMENT	AFFECTED SPECIES/ECOSYSTEMS	INITIATION DATE	PRESENT STATUS

Other comments:

- 3.5. Have **exchanges of information** on data and experiences taken place between other biosphere reserves, organizations, or institutions?

RECEIVING ENTITIES	PROCEDURES	FREQUENCY

Other comments:

4. Objective 4: Research

"To promote coordinated research projects on conservation science and ecology within biosphere reserves".

- 4.1. Do existing legal instruments of planning contemplate the need to initiate **research programs/plans/projects** on the following topics?:

TYPE OF RESEARCH	YES	NO
Basic research		
Research for the conservation/management of resources		
Research for sustainable development		
Research for education and spreading of knowledge		
Research on the socioeconomics of the region in question		
Other		

Other comments:

- 4.2. Have research programs/plans/projects been initiated on the following topics?. If so, which ones?

TYPE OF RESEARCH	RESEARCH PROGRAM / PLAN/ PROJECT	INIT. DATE	PRESENT STATUS	FORESEEN
Basic				
Research for the conservation / management of resources				
Research for sustainable development				
Research for education and dissemination of information				
Research on the socioeconomics of the region in question				
Other				

Other comments:

- 4.3. Is there an information center available with access to research topics related to the BR, and if not is one foreseen for the future?
 NO YES. Specify:
- 4.4. Is there a research center devoted to BR planning and management?
 NO YES. Specify:
- 4.5. Are **specific lines of work on the BR** being carried out at research centers outside the BR?
 NO YES. Specify:
- 4.6. Are there mechanisms or procedures which provide for the **transference of research**

and knowledge in order to resolve problems of the BR or the region in question?
 ()NO ()YES. Specify:

5. Objective 5: Monitoring

"To develop monitoring activities in biosphere reserves in order to provide a basis for scientific research and management activities and contribute to environmental change".

5.1. Do existing legal instruments of planning contemplate the need to initiate **long-term monitoring programs** on the evolution of the following BR components?:

MONITORING OF:	YES	NO
Biogeographical resources of the BR		
Physical medium		
Socioeconomic development		
Other		

Other comments:

5.2. Have long-term monitoring programs been initiated on the evolution of these components? If so, which ones?

MONITORING OF:	PROGRAM	INITIATION DATE	PRESENT SITUATION	PARAMETERS FOLLOWED	FREQUENCY OF INSPECTIONS	RELATIONSHIP TO OTHER PARAMETERS
Biological resources of the BR						
Physical medium						
Socioeconomic development						
Other						

Other comments:

5.3. Are there procedures for the **reviewal of legal instruments of planning** in light of the results provided by monitoring?

5.4. Does the BR participate in any national program for the monitoring of **global changes**?

() NO () YES. Specify:

6. Objective 6: Regional Planning

"To enhance the role of biosphere reserves in regional planning and development".

6.1. In what way do the existing legal instruments of planning contribute to demonstrating the BR's value in **long-term and sustainable development**? Describe briefly.

6.2. What **specific actions** have been initiated to promote sustainable development in the BR in the following fields:

FIELD	ACTIONS
Agriculture	
Stockbreeding	
Fishing	
Suitable rural technology	
Forestry exploitation	
Tourism	
Urban planning	
Other (specify)	

Other comments

6.3. Is the BR involved in any **development project** outside its geographic area?
 NO YES. Specify:

6.4. Briefly comment on the existing instruments in the BR with regards to their **contribution towards regional development**.

7. Objective 7: Local Participation

"To promote local participation in the management of biosphere reserves".

7.1. Do existing legal instruments of planning contemplate the need to **encourage local participation in planning for the management** of the BR?
 NO YES

7.2. What **mechanisms** are there to facilitate local participation? Is there one specific to the reserve?

7.3. How would you classify the **level of local participation**?
 High Average Low

7.4. **Organization chart of local participation** in the BR (or its associated protected area). Briefly indicate:
 - composition and functions of the different organizations for participation.
 - Briefly assess the effectiveness of each organization for participation.

7.5. Are there any pilot projects based on the principles of local participation?
 NO YES. Specify:

7.6. Have studies been carried out to determine the **degree of the local population's acceptance** of the BR and, if applicable, of its associated protected area?
 NO YES. Briefly comment on the conclusions to this study:

7.7. Is there **regular contact** with the local residents which provides for an idea of their opinions?
 NO YES. Indicate which groups or sectors the BR maintains regular contact with.

8. Objective 8: Environmental Education and Training

"To promote environmental education and training related to biosphere reserves and to use the full potential of the reserves for this purpose".

8.1. Do existing legal instruments of planning specifically contemplate the need to initiate **environmental education and training programs**?

NO YES

8.2. Have programs or specific actions related to **environmental education** been initiated for the following?:

GROUP DIRECTED AT	ENVIRONMENTAL EDUCATION PROGRAM/ACTION	INIT. DATE	PRESENT STATUS
Local adult population			
Local school-age population			
General school-age population			
Visitors			
Reserve staff			
Others (specify)			

Other comments:

8.3. Have specific programs or actions for **environmental training** been initiated for the following:

GROUP DIRECTED AT	TRAINING ACTION / PROGRAM	INIT. DATE	PRESENT STATUS
Local adult population			
Visitors			
Administrators and managers of other protected areas			
Scientists			
University graduates and postgraduates			
Reserve staff			
Other (specify)			

Other comments:

9. Objective 9: Information

"To generate and spread knowledge about the conservation and management of the biosphere reserve and to promote the biosphere reserve concept through information and demonstration".

9.1. Is the biosphere reserve equipped with **identifying features** of the same?

PLACE	YES	NO
Generated documentation		
Signposts in the BR territory		
Other (specify)		

Other comments:

9.2. Have actions been carried out to **spread the concept of the biosphere reserves** and their role in sustainable development? If so, what are they and what groups have they been directed at?

() NO () Yes. Specify:

10. Biosphere Reserve Endowment

10.1. Indicate some of the BR's existing **services, infrastructure and facilities**:

	YES	NO	COMMENTS
Air pollution monitoring station			
<i>Idem</i> climate			
<i>Idem</i> water			
Facilities for conferences/meetings			Holding capacity:
Laboratory			
Library			
Lodging for visiting scientists			No. of rooms:
Logistical support for research such as all-terrain vehicles, boats, etc.			
Permanent plots for lake and river monitoring			
<i>Idem</i> benthic marine communities			
<i>Idem</i> vegetation			
Monitoring of small river basins and research sites			
Facilities for the storage and preservation of biological and environmental collections			
Interpretation centers			
Museums			
Itineraries			
Nature classrooms			
Reception/information centers			
Centers for handicrafts			
Recreational areas			
Bars and restaurants			
Other facilities and services (specify)			

Other comments:

10.2. Biosphere reserve **staff**

NOTE: Full-time employee = 1; part-time employee = 1/2.

POSITION	No. PERMANENT EMPLOYEES	No. TEMPORARY EMPLOYEES	UNIV. STUDIES	ARDENRY	OTHER
Technical-administrative management					
Education, training and demonstration					
Research					
Services for the public					
Other					
TOTAL					

Other comments:

10.3. Explain who provides **technical support and aid** to the BR, and the nature of these:

LEVEL	SOURCE / INSTITUTION	TECHNICAL SUPPORT RECEIVED	AID RECEIVED
National			
Autonomous			
Provincial			
Municipal			
European Union			
International			
NGO			
Other			

Other comments:

10.4. **Budget** and its development over the last four years.

	1991 BUDGET	1992 BUDGET	1993 BUDGET	1994 BUDGET
Personnel				
Ordinary management				
Investments				
Transferences				
Special programs				
Other entries				
TOTAL				

Other comments:

11. Special designations

11.1. Other than the BR designation, has the site been declared any of the following:

- World Heritage Area
- RAMSAR Convention Site
- Special Bird Protection Area
- Game Refuge
- Other (Specify)

12. Evaluation of the current situation of the BR

12.1. Real dedication to each of the objectives as defined in the 1984 Action Plan (AP '84).

'84 AP OBJECTIVE	DEDICATION TO THE OBJECTIVE					
	VERY HIGH	HIGH	AVERAGE	LOW	VERY LOW	NONE
1. International network						
2. Management						
3. <i>In situ</i> conservation						
4. Research						
5. Monitoring						
6. Regional planning						
7. Local participation						
8. Environmental education and training						
9. Information						

Other comments:

12.2. Do existing legal instruments of planning and management help to improve the effectiveness of the BR in carrying out its **three basic functions**? Describe briefly.

BR FUNCTION	YES	NO
Conservation		
Development		
Logistics		

Other comments:

12.3. Indicate in short, what the BR's major **achievements** have been since its declaration in terms of each of the '84 AP objectives and of the three basic functions of biosphere reserves.

'84 AP OBJECTIVE	MAJOR ACHIEVEMENTS
1. International network	
2. Management	
3. <i>In situ</i> conservation	
4. Research	
5. Monitoring	
6. Regional planning	
7. Local participation	
8. Environmental education/training	
9. Information	
Conservation function	
Development function	
Logistics function	

Other comments:

- 12.4. Briefly indicate what the major **deficiencies** of the BR have been since its declaration, in terms of each of the '84 AP objectives and of the three basic functions of biosphere reserves.

'84 AP OBJECTIVES	MAJOR DEFICIENCIES
1. International network	
2. Management	
3. <i>In situ</i> conservation	
4. Research	
5. Monitoring	
6. Regional planning	
7. Local participation	
8. Environmental education/training	
9. Information	
Conservation function	
Development function	
Logistics function	

Other comments:

- 12.5. How would you rate the **BR's contribution** to the international network? Comment briefly.
- 12.6. Briefly explain the most pressing **problems** of the BR **at present**.
- 12.7. What are the most significant **future perspectives and actions** expected to be undertaken in the BR in any of its field of actions? Briefly indicate.

13. Evaluation of the participation in other BR networks

- 13.1. What **value** does the BR concept have for the work being carried out at present in the reserve itself? Briefly explain.
 High Average Low None
- 13.2. What **potential value** does the BR concept have for the work being carried out in the reserve itself? Mention briefly.
 High Average Low None
- 13.3. How important is the **BR's participation in other BR networks** (international, European, national) for the work being carried out in the area?

BR NETWORK	HIGH	AVERAGE	LOW	NONE
International				
European				
National				

Other comments:

14. Information on local economies and the biosphere reserves used in writing this report.¹

14.1. Origin of BR personnel (or of its associated protected area).

- Area of influence
- Other
- Towns/villages inside the BR

% PERSONNEL

Other comments:

14.2. Comment briefly on the existing management models for services in the BR (museums, itineraries, interpretation centers, restaurants, etc.). What criteria was followed in making the decision as to type of management and perspectives?

14.3. Interaction with other administrations and organizations or institutions. Rate the degree of cooperation:

INTERACTION WITH	VERY HIGH	HIGH	AVE-RAGE	LOW	VERY LOW	NONE	COMMENTS
- authorities in charge of regional planning and development							
- local communities and representatives of the residents living in the BR and those living in the adjacent regions							
- institutions that participate in basic and applied research or in monitoring activities							
- institutions that participate in <i>ex-situ</i> conservation of biological resources							
- the coordinating body responsible for incorporating scientific activities into the site							
- organizations that carry out development projects							
- Non-governmental Organizations (NGOs), ecology groups and other groups							
- Other (specify)							

Other comments:

14.4. Indicate and comment on the lines of financial support and the number of actions in support of the population and towns/villages inside the BR which have been carried out through the management mechanisms of the same (i.e.: aid to farmers, to the restoration of buildings, to handicrafts, technical advice services, etc.)

¹ Study done by the Center for Planning Studies, in Barcelona. Coordinated by María del Mar Isla Pera.

14.5. Sectorial plans affecting the BR

SECTOR	ACTION	NEGATIVE ENVIRONMENTAL IMPACT ON THE BR			RESPONSIBLE AUTHORITY
		SERIOUS	MEDIUM	SLIGHT	
Road infrastructure plans					
Plans for clean up					
Waste management plans					
Hydraulic infrastructure					
Territorial planning					
Agriculture					
Forestry					
Tourism					
Littoral planning					
Strategic development plans					
Other (specify)					

How compatible are the existing sectorial plans with each other and with the objectives of the BR itself? Comment briefly.

14.6. Activities, use of resources and problems in the BR which have negative environmental impacts on the same:

	NEGATIVE ENVIRONMENTAL IMPACT			
	SERIOUS	MEDIUM	SLIGHT	NONE
Fires				
Residential developments				
Industrial growth				
Uncontrolled dumpsites				
Poaching				
Infrastructure				
High tension electrical lines				
Noise				
Extractive activities				
Agricultural waste				
Livestock waste				
Air pollution				
Groundwater pollution				
Surfacewater pollution				
Marine pollution				
Sports				
Crops				
Grazing				
Tree felling				
Uncontrolled camping				
Other (specify)				

Other comments:

14.7. Number of **permanent residents** in:

No. PERMANENT RESIDENTS		(%) OCCUPATION PER ECONOMIC SECTOR			(%) AREA OF RESIDENCE	
		AGRICULT. STOCKBREED FISHING	INDUSTRY	OTHER SERVICES	URBAN POP.	DISPERSE POP.
Core area/s						
Buffer zone/s						
Transition area						
TOTAL						

Other comments:

14.8. Does the BR **benefit the inhabitants** of the region in question?

() NO () YES. Specify:

	GREAT ADVANTAG E	SOME ADVANTAG E
Job opportunities		
Opportunities for education and training		
Economic incentives and advantages		
Timber, firewood, fodder and food		
Health and community services		
Rural development aid		
Opportunities for recreational activities and tourism		
Land and water conservation		
Maintenance of traditional crops and resource utilization methods		
Participation in reserve planning and management		
Other (specify)		

Other comments:

14.9. Comment on the reasons for complaints, discontent or lack of understanding on behalf of the towns/villages with regards to BR actions and management (or to its associated protected area).

15.5. DESCRIPTION OF THE PRESENT TOURIST OFFERS

- List and briefly describe the different types of tourist offers and activities available at present.

15.6. CURRENT TOURIST SERVICES

- Lodging: Number of beds, establishments and characterization.

		No. ESTABLISH- MENTS	TOTAL No. BEDS
HOTELS	< 25 BEDS		
	25<X<100		
	>100 BEDS		
OUTSIDE HOTELS	< 25 BEDS		
	25<X<100		
	>100 BEDS		
DISPERSE LODGING (estimates)	Rural or family inns		
	Second homes, seasonal renting		

Other comments:

- Food services (bars, restaurants...)
- Recreational areas
- Specialized tourist resorts
- Information and interpretation centers
- Guide services
- Information (publications, leaflets, multimedia, signposting...)
- Transportation and travel agencies
- Other services

15.7. TOURIST DEMAND

- Influx
 - Maximum:
 - Minimum:
 - Total number of visitors per year:
- Origin
- Characterization in percentages: overnight stays, one-day visits.
- Preferred seasons

15. Information necessary to prepare the document on Sustainable Tourism in the SNBR²

15.1. RESOURCES

List and briefly describe the resources subject to tourism related uses regardless of their capacity.

Conservation and maintenance needs.

- Natural resources
- Cultural landscapes
- Heritage, cultural wealth and resources

15.2. ZONING

- Areas for tourist related uses. Fragility and load capacity (*if this information is available*)
- Land for tourist development. Characterization.
- Land for residential development.

15.3. SOCIOECONOMIC INFORMATION

- Population by right
- Real population
- Age of population
- List the economic sectors and their importance. Make particular reference to the tourist industry.

15.4. INFRASTRUCTURE

- Transportation systems and accesses
- Waste treatment
- Hydrological resources
- Energy sources
- Communications
- Roads
- General services

² Study coordinated by Cipriano Marín Cabrera

15.8. IMPACT OF TOURIST RELATED ACTIVITIES

NOTE: Rate the negative impact, according to those types listed in 15.5, of each of the tourist related activities.

- Rating:
1. none
 2. minor
 3. moderate
 4. serious

TYPES (from 15.5)	IMPACT ON:								
	NAT. VEGE-TATION	FAU-NA	LAND-SCAPE	CULTU-RAL WEALTH	PRODUC-TION OF WASTE	WATER POLLU-TION	TRADITIONAL PRODUCTIVE SYSTEMS	SOCIO-ECONOMIC SYSTEMS	CULTURAL / VALUES SYSTEMS

Other comments:

15.9. PLANNING AND MANAGEMENT

- Authority responsible for tourist related planning.
- Technical and scientific advice on tourism. Responsible parties.
- Existence of plans on territorial planning.
- Existence of plans for the development of tourism.
- Existence of comprehensive plans.
- Tourist initiatives in general. Ideas and projects.
- Sustainable tourist products. Ideas and projects.
- Local products and tourist consumption.

LIST OF ABBREVIATIONS USED

AP:	Action Plan for Biosphere Reserves
APA:	Associated protected area
BR:	Biosphere Reserve
BRIM:	<i>Biosphere Reserve Integrated Monitoring</i>
C-T:	El Canal y Los Tiles Biosphere Reserve
CAZ:	Cazorla, Segura y Las Villas Biosphere Reserve
DON:	Doñana Biosphere Reserve
EA:	Environmental Agency
GUMP:	Governing Use and Management Plan
GRAZ:	Grazalema Biosphere Reserve
HCSR:	Higher Council of Scientific Research
ICONA:	Instituto Nacional para la Conservación de la Naturaleza [The National Institute for Nature Conservation]
LANZ:	Lanzarote Biosphere Reserve
MaB:	Program on <i>Man and the Biosphere</i>
MANZ:	Manzanares Biosphere Reserve
MEN:	Menorca Biosphere Reserve
MHUM:	Mancha Húmeda Biosphere Reserve
MONT:	Montseny Biosphere Reserve
NGO:	Non-governmental Organization
NRMP:	Natural Resources Management Plan
ODIEL:	Marismas del Odiel Biosphere Reserve
ORDE:	Ordesa-Viñamala Biosphere Reserve
SDP:	Sustainable Development Plan
SNEV:	Sierra Nevada Biosphere Reserve
SNRP:	Spanish Network of Biosphere Reserves
URD:	Urdaibai Biosphere Reserve
WWF:	World Wildlife Fund

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