PROTECTED AREA PLANNING TO CONSERVE THREATENED SPECIES AND HABITATS: S.I.C. OF TUFIA (GRAN CANARIA, CANARY ISLANDS)

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With 5 figures and 3 tables

ABSTRACT. The greatest number of conservation problems faced by species (or populations) are the result of human activities. Only in very specific cases are required actions of population management for their recovery.

The usual way to recover a threatened species population is to regulate human activities in a territory. This regulation should not only be based on a correct planning of the space, but in the participation of the resident population, as an essential guarantee for the succesful planning of the protected areas.

Following these premises, this work is carried out as a theoretical approach to the planning and management of the S.I.C of Tufia (Scientific Interest Site), with the aim to guarantee the protection of its habitats and species.

INTRODUCTION

The Canary Islands are densely inhabited and the environmental conservation cannot disregard the needs of the local people. The public will of protection of the natural values is written in the 12/94 Law of "Canarian Natural Spaces", that establishes different categories of protection for the Canarian Network of Natural Protected Spaces. Within this network, the S.I.C. of Tufia is consisting of 54,1 hectares on the east coast of Gran Canaria. This area has been proposed by the Canarian Government to be included in the Natura Network 2000 of the European Union and belongs to UICN's protected areas,

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category IV- Nature Conservation Reserve, that includes "areas for the management of habitats and species" (IUCN, 1994).

MATERIAL AND METHODS

First was conducted a human and environmental inventory of the area to know its values, characteristics and special items, and plotted them on a map. This information would serve as a basis for later management actions. Information was gathered by interviewing visitors and members of the neighbors' association to learn about their ideas about their environment. They were asked about their needs, their opinions about the different parts of the area, their jobs and leisure activities, etc.

Once the above inventory was completed, we made a site diagnosis with a double view, first of all a descriptive diagnosis was done, that produced 14 geoenvironmental units, reflecting their distinctive characteres and its conservation status.

Subsequently, a land suitability diagnosis was done to evaluate the abilities of different units to support different activities, as well as their nature fragilities (Fig. 1).

The main idea of the management was to transfer human pressure to the higher land capability units and to control it in the rest of them. To achieve the latter, areas were zoned based on the 12/94 Law categories (Fig. 2), and several actions were proposed.

Site inventory

The purpose of this site, according to Annex of 12/94 Law, is "... the protection of the halophiles habitats and in particular, the *Convolvulus caput-medusae* and *Atractylis preauxiana* species, as well as, their respective habitats..." therefore, an environmental inventory was conducted to locate these habitats and species and any possible threats to the site. This work was based on the fieldwork, due to the lack of enough detailed previous bibliography. There are few scientific papers available on sandy habitats (MONTELONGO, 1983) or conserving their species in the Canary Islands (GONZÁLEZ-MARTÍN, 1994; MAYA et al. 1988, 1989).

Environmental factors

Geomorphology

The area is composed of:

1) A substratum of basaltic lavas which give rise to sea cliffs and a litoral erosion coast platform.

2) A damaged volcanic cone, which gives rise to the peninsula of Tufia.

3) Dunes created by the wind transport of sand.

4) Two small sandy beaches with a longitudinal scarce development.
5) Alluvial detritus deposits, in a small ravine.

Climatology

This area has an average annual of 20.5 ºC with modest annual variation, and a low average annual of rainfall 118.5 mm. The trade winds blow almost all the year. This fact is very important for the dinamic of the sands. Bioclimatologically the area occurs in the arid inferior infracanarian bioclimatic region (RIVAS MARTÍNEZ, 1987).

Flora and vegetation

Of 40 taxa inventoried, 8 are endemic to the macaronesian area, and 6 of these are endemic to the Canary Islands (Table 1).

The two main species, *Convolvulus caput-medusae* Lowe and *Atractylis preauxiana* Sch. Bip. are considered "in danger of extinction" (E) based on IUCN's categories (BARRENO et al., 1984). Both are included in the Habitats Directive Annex IIB, in the annex I of the Agreement of Bern and Regional Orders, such as the February 20, 1991 Order about "The protection of the wild vascular flora species in the Autonomic Canary Islands Community". The main vegetational communities are:

Moving sand communities: *Euphorbia paralias* L. and *Cyperus capitatus* Vand. are grouped in the *Euphorbio-Cyperetum kalli* Sunding association.

Sandy chamaephytee communities: *Convolvulus caput-medusae* and *Atractylis preauxiana*, that are grouped in the *Frankenio-Astydamion* Santos 1976 association.

The rest of the area is covered by different substitution communities of chenopodiaceae shrubs, that are grouped in the class *Pegano-Salsoletea* Br. Bl. & O. BÒLOS 1958.

Three communities from Habitats Directive Annex I, that are categorized as "Special Natural Habitats", are present in Tufia and is necessary to designe special areas for its conservation, these habitats are:

16.211 Moving dunes with primary vegetation.
12.23 Vegetation of coastal macaronesian cliffs.
15.17 Halonitrophilous Iberian schrublands (*Pegano-Salsoletea* Br. Bl. & O. BÒLOS 1958).

Fauna

The primary vertebrates are birds and reptiles. The avifauna consists of many breeding and non-breeding species (Table 2), including macaronesian or canarian endemic subspecies. The importance of these species is indicated in Spanish and European legal documents.

The Spanish document R.D. of March 439/1990 which regulates the "National Threatened Species Catalogue", lists "Special Interest" birds species from Tufia (Annex

II). Some of these species are included in Annexes I and II/2 of Directive April 2, 1979, and are of interest to European Union.

Reptiles are represented by three Grancanarian endemic taxa: *Gallotia stehlini*, *Chalcides sexlineatus* and *Tarentola boettgeri*, also included in the Habitats Directive (Annex IV). The first species is also included in the Annex II of the "National Threatened Species Catalogue".

All of the mammals of Tufia were introduced by man, such as *Atelerix algirus* included in the Habitats Directive (Annex IV) and in the National "Threatened Species Catalogue" (Annex II).

The invertebrate fauna is typically from sandy areas and is larguely unstudied, with exceptions like GARCÍA-BECERRA & PEÑA-ESTÉVEZ, (1995).

Human factors

Human population characteristics, building locations and use.

Sixty families (240-360 people) are permanent residents in the area, mostly with little education. In most of the cases, the active population works outside of the area. The economic activity in Tufia is fishing, made by retired fishers as a complement to their rents.

There are two built-up areas, the main one (100 buildings) around Tufia beach and a smaller one at the botton of the coastal cliff (14 buildings). A third area once occurred at another beach but it was demolished in 1987. The highest part of Tufia's volcanic cone is occupied by an old prehistoric village.

Uses of the area include: providing area for dwelling, sport fishing, recreational swimming, educational endevors such as visiting (the archeological site) and agriculture like (greenhouses occur just outside its boundary).

Sporadic uses that impact the environment include off-road vehicles, pollution and illegal extraction of sand from an old sandpit.

Social participation

Land planning aims to regulate the human activities, so it is very important to know the population´s point of view. We contacted the local neighbors' association and made inquires of 50 people between May-July, 1995.

This survey revealed that the neighbors' needs (Fig. 3) were not in conflict, at this moment, with the conservation of natural habitats and species and the purpose of the protected area. Most support the Natural Protected Area (Fig. 4 and 5). The percentages that are shown in figures are related to the number of people that support each option.

Site Diagnosis

The site diagnosis has a double view: First of all a descriptive diagnosis, based on

its physical and human elements; and the land suitability diagnosis (evaluation of the ability of a place to support different uses) studied by the nature fragility and the nature regeneration capability of this place.

The information obtained by the descriptive diagnosis was shaped in 14 geoenvironmental units, and they were useful for the following methodical stages.

The land suitability diagnosis showed us the land capability of each geoenvironmental unit, from two parameters: its nature fragility degree and its nature regeneration capability in accordance with its current uses and the Canarian Protected Areas Law (Table 3).

In short, the site diagnosis divides the area in some geoenvironmental units with high, medium and low land capability, useful to zone based on the 12/94 Law.

DISCUSSION AND RESULTS

The area was zoned using the site diagnosis (Fig. 1) in accordance with the land use categories outlined in 12/94 Law (Fig. 2):

Exclusion area: It is a unit with a low land capability, which contains the weakest environmental components: the moving sands, where *Euphorbia paralias* communities and a relict population of *Atractylis preauxiana* are.

Restricted use area: This area is composed by the sandy places, the prehispanic village and the old sandpit. These units have a low, medium and high land capability. They are gruped to protect the *Convolvulus caput-medusae*, the archaeological location and avoid the illegal extractions of sand.

Moderate use area: Beaches and coastal cliffs except the ones in the exclusion area. They are units with medium and high land capability.

Tradicional use area: Greenhouses.

General use area: They are places without actual use in uncultivated lands, units with very high land capability.

Special use area: Built-up areas in Tufia, where the most people live.

Based on the above and the neighbors' demanding, were proposed several actions. To effect the transition of human pressure from the low to high land capability areas, we considered an alternative new road, elimination of illegal houses in the dune areas, to recover the sandpit using walls to retain the sand and fencing the restricted and the exclusion areas (Fig. 2).

Other essential action is to eliminate debris, and it's also important to interpret the cultural and natural charateristics of the area using guided tours.

In conclusion, the participation of all the local community in the planning and management of a Natural Protected Area is the proper way to attempt to safeguard of its natural values.

TABLE 1 - PLANT LIST

AIZOACEAE

Aizoon canariense L.
Mesembryanthemum crystallinum L.
Mesembryanthemum nodiflorum L.

ASTERACEAE

2 *Artemisia reptans* Chr. Sm. in Buch
*1(H B) *Atractylis preauxiana* Sch. Bip.
Launaea arborescens (Batt.) Murb.
Launaea nudicaulis (L.) Hook. fil.
* *Schyzogyne glaberrima* DC.
x *Schyzogyne sericea* (L. fil.) DC.

BASSICACEAE

Mathiola cf. *livida* (Delarb.) DC.

BORAGINACEAE

Heliotropium ramossisimum (Lehm.) DC.

CACTACEAE

Opuntia dillenii (Ker-Gawl.) Haw.

CARYOPYLLACEAE

Herniaria fontanesii J. Gay
Polycarpaea nivea (Ait.) Webb

CHENOPODIACEAE

Atriplex glauca L. var. *ifniensis* (Cab.) Maire
Atriplex semibaccata R. Br.
Chenoleoides tomentosa (Lowe) Botsch.
Patellifolia patellaris (Moq.) S.,F.-L-et W.
Salsola kali L.

Suaeda vera Forssk. ex J.F. Gmel.
Suaeda vermiculata Forssk. ex J.F. Gmel.

CISTACEAE
Helianthemum canariense (Jacq.) Pers.

CONVOLVULACEAE

*1 (H B) *Convolvulus caput-medusae*Lowe
CYPERACEAE
Cyperus capitatus Vand.

EUPHORBIACEAE
Euphorbia paralias L.

FABACEAE
x *Lotus glaucus* Ait.
Ononis cf. *diffusa* Ten.

FRANKENIACEAE
Frankenia laevis L.

PLANTAGINACEAE
* *Plantago aschersonii* Bolle

POACEAE
Cenchrus ciliaris L.
Cynodon dactylon (L.) Pers.
Schismus barbatus (L.) Thell.

POLYGONACEAE
2 *Polygonum maritimum* L.
Rumex vesicarius L. var. *rhodophysa* Ball.

RESEDACEAE
*2 *Reseda scoparia* Brouss. ex Willd.

RUBIACEAE
* *Plocama pendula* Ait.

SOLANACEAE
Lycium intrincatum Boiss.

Nicotiana glauca Grah.

TAMARICACEAE
2 *Tamarix canariensis* Willd.

ZYGOPHYLLACEAE
2 *Zygophyllum fontanesii* W. & B.

* Canarian endemic species, x macaronesian endemic species
1 & 2: Annexes I and II from the February 20, 1991 Order about "the protection of the wild vascular flora species in the autonomic Canary Islands Community".
H: Species included in the Annex IIb (Habitats Directive).
B: Species included in the Bern Agreement.

TABLE 2 - AVIFAUNA

BREEDERS

* 1 *Calandrella rufescens polatzeki*
* 1, 2 *Anthus berthelotii berthelotii*
* 1 *Lanius excurbitor koenigi*
* 1 A *Rodopechys githagineus amantum*
1 *Phylloscopus collybita canariensis*
3 *Turdus merula cabrerae*
* 1 *Sylvia conspicillata orbitalis*
* 1 *Sylvia melanocephala leucogastra*
* 3 *Petronia petronia madeirensis*
* 3 *Falco tinnunculus canariensis*
* 1 *Asio otus canariensis*
* *Upupa epops*
1 *Columba livia canariensis*
* 2 *Apus unicolor unicolor*
* *Apus pallidus brehmorum*
* A *Calonectris diomedea borealis*

NON BREEDERS

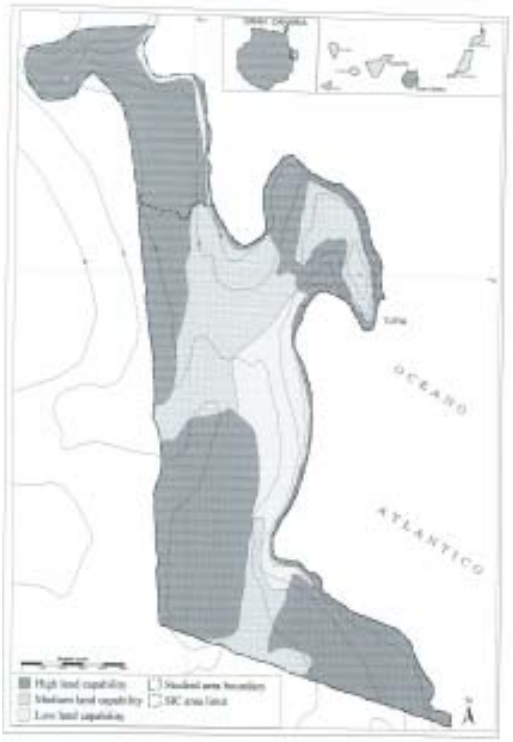
* *Arenaria interpres*
* *Calidris alpina*
* *Calidris alba*
* *Calidris ferrugina*

* *Charadrius hiaticula*
Tringa totanus
* *Tringa ochropus*
* *Tringa hypoleucos*
* B *Numenius phaeopus*
* B *Numenius arquata*
* B *Limosa limosa*
* B *Limosa lapponica*
* B *Philomachus pugnax*
B *Larus cachinnas atlantis*
B *Larus ridibundus*
* A *Egretta garzetta*
* *Ardea cinerea*
* *Hirundo rustica*
* *Delichon urbica*
* *Riparia riparia*

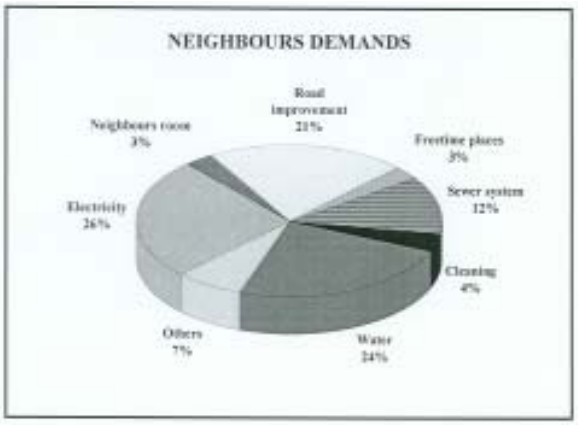
1: Canarian endemic subspecies, 2: Macaronesian endemic species, 3: Macaronesian endemic subspecies.
* Species included in the Annex II from the Document R.D. of March, 439/1990 which regulates the "National Threatened Species Catalogue".
A & B: Annexes I and II/2 from the European Directive (79/409/CEE), related to the conservation of wildbirds, and later modifications of it.

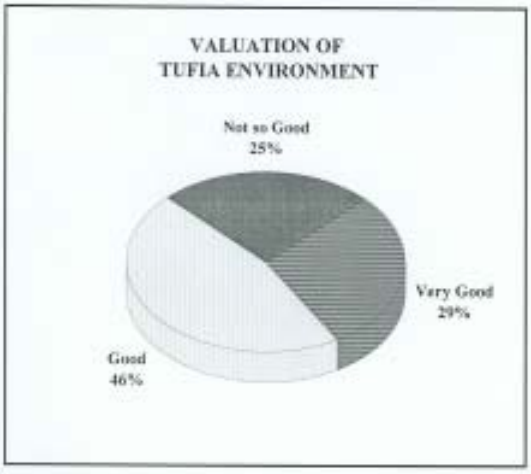
TABLE 3 - LAND CAPABILITY

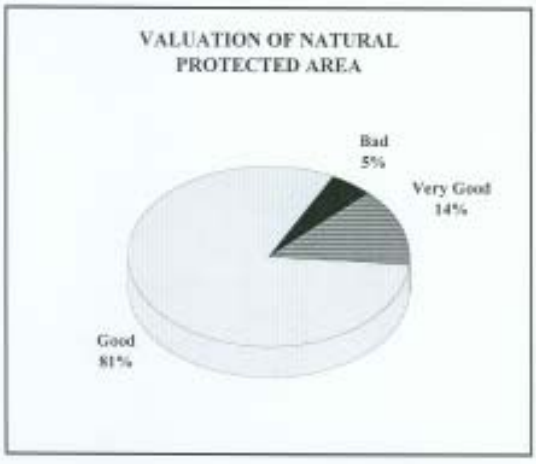
	NATURE FRAGILITY			
		HIGH	MEDIUM	LOW
NATURE REGENERATION CAPABILITY	MEDIUM	**Low**	**Low**	**Medium**
	LOW	**Low**	**Medium**	**High**
	VERY LOW	**Medium**	**High**	**High**


OCEANO
ATLANTICO


OCEANO
ATLANTICO


NEIGHBOURS DEMANDS
Road improvement 21%
Neighbours room 3%
Freetime places 3%
Sewer system 12%
Electricity 26%
Cleaning 4%
Others 7%
Water 24%


VALUATION OF TUFIA ENVIRONMENT
Not so Good 25%
Very Good 29%
Good 46%


VALUATION OF NATURAL PROTECTED AREA
Bad 5%
Very Good 14%
Good 81%

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