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HABITATS OF E.U. INTEREST AFFECTED BY A RIVER-DAMMING PROJECT (OTIVAR DAM) IN ALMIJARA MOUNTAINS, GRANADA, S.E. SPAIN

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Abstract

In the present study the plant formations of EU interest (Directive 92/43/EEC "Habitats") which will be affected by a dam construction project in the upper reaches of the Verde River, Almuñécar, Granada, SE Spain (between the Cázulas and Almijara mountain ranges) are listed and described. A cartographic study of the elements of interest has been carried out and the ecological value of the various areas affected is discussed.

Introduction

In view of the possible negative effects on vegetation derived from the Otívar Dam project, the vegetation formations present at the proposed site of the dam and the area downstream have been studied. The aim of this study was to identify plant communities of ecological interest for the European Union (EU) in order to estimate the ecological value of the vegetation which will be affected. The dam will be built on the Verde river (Almuñécar, SW Granada province) in the Serranía de Cazulas mountains, near the village of Otívar. (Figure 1).

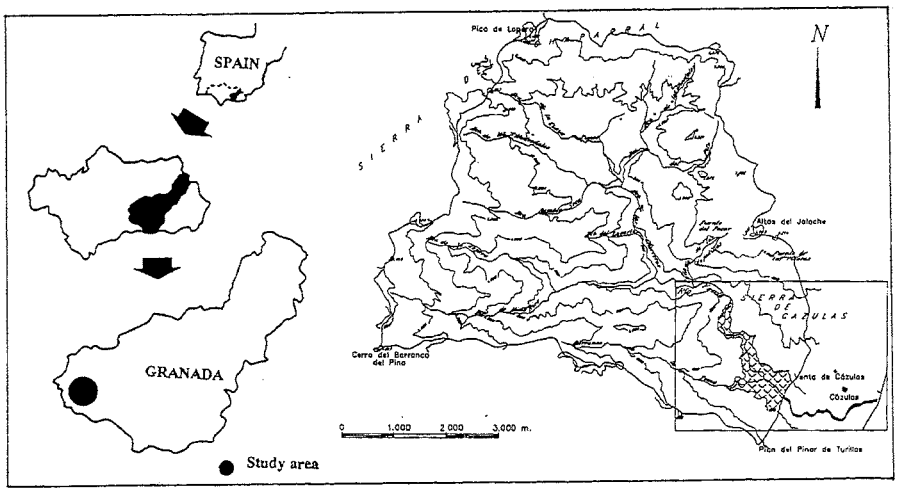


Fig. 1. Location map. The area study belongs to the high basin of the Verde river, that flows between Almijara and Cázulas ranges, placed in the southwestern part of Granada province (South Spain).

All climatic and riparian communities occupying the flood zone and downstream from the dam site were mapped and described. Downstream from the dam the most seriously affected vegetation will be the riverbank communities, so in this area only the habitats of riparian formations were studied.

Objectives

The main objective of this study was to determine the number, definition and geographical representation of all plant communities of EU interest which will be affected by the dam project. A cartographic study (scale 1:25.000) was carried out of all the formations of EU interest present in the area.

With the habitat element data obtained from the cartographic study, the watercourse was divided into three stretches –upper, middle and lower– and mapped (also at 1:25.000 scale).

Methodology

The phytosociological study was based on the methodology of the Zürich-Montpellier school (BRAUN-BLANQUET, 1979), composed of inventaries of the various communities followed by syntaxonomic classification.

Mapping was carried out according to the methodology of GÓMEZ MERCADO & VALLE (1988), in which stereoscopic aerial photographs are interpreted in order to identify vegetation units.

The identification of plant communities of EU interest was based on the norms described in EEC Directive 92/43 "Habitats", using a topographical map at a scale of 1:50.000. The codes and graphic elements used to denote the communities inventoried are as specified in Appendix I, as follows:

1, Crosses: denote surface areas of less than 6.25 Ha with a nonlinear structure, in different classes according to the distribution area in question—Class I: 0–100 m^2; Class II: 101–1.000 m^2; Class III: 1001–10.000 m^2; and Class IV: 10 001–62 500 m^2.

2, Lines: denote only those units with a linear structure which are less than 250 m in width. Also divided into classes—Class 1: 0–25 m; Class II: 26–50 m; Class III: 51–100 m; and Class IV: 101–250 m.

3, Polygons: denote those units with an area of at least 6.25 Ha (no specific surface area is given).

A naturalness index was assigned to each element to reflect the degree of conservation of the habitat, and was calculated according to such factors as biodiversity, cover and originality. This index had three possible values: 1, low; 2, medium; 3, or high.

Cover is a measure of the surface area occupied by the habitat within the relevant graphic element. There were four possible values for this parameter: 1 (<25%), 2 (26–50%), 3 (51–75%), or 4 (>75%).

Results

By studying the vegetation of this basin below an altitude of 400 m (the altitude of the proposed dam), ten formations of EU interest can be identified. Three of these formations are climatic in character (they depend on the general ombroclimate), while the remaining seven were rupicolous (formations along the watercourse), and would be the most seriously affected formations downriver from the dam. If these seven communities are to survive, a minimum ecological streamflow will need to be maintained.

Phytosociological associations present in the study area

1, as. *Charetum vulgare* Corillion 1957

Community characterized by the presence of the green alga *Chara vulgaris*, which totally covers the shallow beds of endorrhoeic ponds and slow-flowing freshwater irrigation channels generally presenting little eutrophication. It is sometimes submerged below other aquatic plant communities.

2, as. *Trachelio caeruleae-Adiantetum capilli-veneris* O.Bolós 1957

Rupicolous vegetation on sodden banks not present above the meso-Mediterranean zone. It is typically found on shady vertical walls, some of which may overhang. The community is dominated by *Adiantum capillus-veneris*, together with throatwort (*Trachelium caeruleum*). Higrophilous (*Hypericum caprifolium, Samolus valerandi*) and bryophyte (e.g. *Cratoneuron commutatum, Cratoneuron filicinum, Lophozia turbinata, Pellia fabbroniana*) elements are frequently present.

3, as. *Molinio arundinaceae-Ericetum erigenae* Costa & al. 1983

Dense Mediterranean reedy grassland, dominated by reeds (*Scirpus holoschoenus*) and Gramineae (*Molinia arundinacea*), with the presence of *Erica erigena*, a heather species with a preference for cool, shady riverbanks and high humidity levels.

4, as. *Cirsio monpessulani-Holoschoenetum vulgaris* Br.-Bl. 1931

A relatively thermophilous meso-Mediterranean reed community, represented in enclaves among poplar groves (*Populus alba*) in the following chorological provinces: Catalano-Valenciano-Provenzal-Balear, Castellano-Maestrazgo-Manchega, Murciano-Almeriense and Baetic (Malacitano-Almijarense, Alpujarro-Gadorense, sub-Baetic and Guadiciano-Bacense sectors).

5, as. *Arundini donacis-Convolvuletum sepii* Tuxen & Oberdorfer ex Bolós 1962

Creeping vegetation typical of reed communities and fences on fertile soils, where *Calystegia sepium* and *Cynanchum acutum* are dominant, together with *Arundo donax* and *Phragmites australis* (as plant support). The thermo-Mediterranean and lower meso-Mediterranean are the optimal zones for this association.

6, as. *Sarcocapnetum crassifoliae* Cuatrecasas ex Esteve & Fernández Casas 1971

A crack-dwelling association dominated by *Sarcocapnos crassifolia*, which develops on generally shady, hard limestone overhangs. It reaches its optimum in the meso-Mediterranean zone with a dry to semi-humid ombroclimate.

7, as. *Rubo ulmifolii-Nerietum oleandri* O. Bolós 1956

Oleander and bramble communities which develop on heterometric soil, frequently with outcrops of large limestone rocks to which the oleander (*Nerium oleander*) clings. Its cover is low, and it can withstand both long periods of drought and torrential rains. It is typical of thermophilous zones (thermo-Mediterranean and lower meso-Mediterranean).

8, *Thymo gracile-Lavanduletum lanatae* Pérez Raya 1987

A small-scale rosemary-scrub community with medium-to-dense cover, composed of nanophanerophytes and chamaephytes with some graminoid hemicryptophytes and therophytes. It may develop on virtually any type of non-acidic soil in lower meso and dry middle bioclamatic zones (sometimes as low as the upper thermo-Mediterranean zone. Characteristic species include *Lavandula lanata, Ulex parviflorus, Thymus gracilis, Digitalis obscura*, and *Ptilostemum hispanicum.*

9, as. *Bupleuro gibraltarici-Pistacietum lentisci* Martínez Parras, Peinado & Alcaraz 1985

This formation is composed of optimally Baetic lower thermo-Mediterranean lentisc communities. It constitutes the potential vegetation in these areas where there is insufficient rainfall for holm-oak communities to develop. In wetter areas, it is a stage in the degradation of thermophilous forests.

10, as. *Erico mediterraneae-Salicetum pedicellatae* Esteve 1973

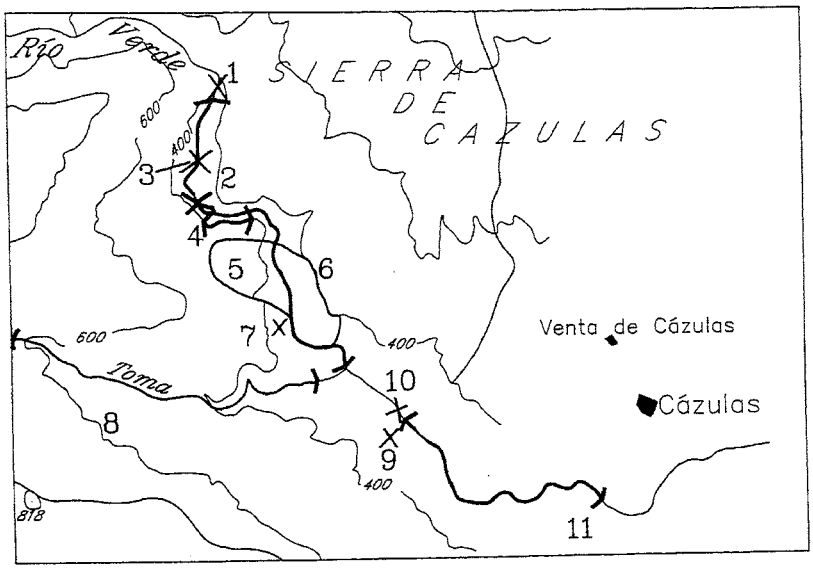
Willow gallery-forest communities present along rivers with prolonged periods of drought followed by flash floods. It develops on silicate substrates or colluvia of these materials surrounded by limestone in the thermo-Mediterranean and lower meso-Mediterranean bioclimatic zones.

Map of habitats of EU interest

Map 1 (scale 1:25.000, Fig. 2) shows the eleven elements described above and topographically mapped at a scale of 1:25.000. The limited distribution area of the formations –linear in many cases– means that only one polygonal element is represented, with the remaining elements corresponding to crosses and lines (see Methodology).

Each element is described in Table 1, in which details of the order number, Habitat code(s), name of association(s) represented, type of element and classes of area, cover and naturalness are given.

The most 'natural' communities (those with the highest value for the naturalness parameter) are located in the upper reaches of the watercourse. This area has been less affected by human impact than the other two stretches of river delimited.



MAP 1

0 1.000 2.000 m. *Escala 1:25.000*

Fig. 2. Map of habitats of E.U. interest.

Element No.	Code No.	Association	Element type	Class	Naturalness Index	Cover Index
1	622027	*Trachelio-Adiantetum capilli-veneris*	X	II	3	1
	433114	*Bupleuro-Pistacietum lentisci*		II	2	4
2	82D033	*Rubo-Nerietum oleandri*	(---)	I	2	2
3	214011	*Charetum vulgare*	X	I	3	1
4	721189	*Sarcocapnetum crassifoliae*	(---)	I	3	1
5	43345B	*Thymo-Lavanduletum lanatae*		I	2	3
6	82D033	*Rubo-Nerietum oleandri*	(---)	I	2	2
	54201L	*Molinio-Ericetum erigenae*		I	1	1
7	622027	*Trachelio-Adiantetum capilli-veneris*	X	–	2	3
8	82A052	*Erico-Salicetum pedicellatae*	(---)	I	1	1
9	43345B	*Thymo-Lavanduletum lanatae*	X	IV	3	4
10	542015	*Cirsio-Holoschoenetum vulgaris*	X	I	2	4
11	82D033	*Rubo-Nerietum oleandri*		I	2	2
	82A052	*Erico-Salicetum pedicellatae*	(---)	I	2	3
	543112	*Arundini-Convolvuletum sepii*		I	1	1

Table 1. Clasification of the communities present in the study area.

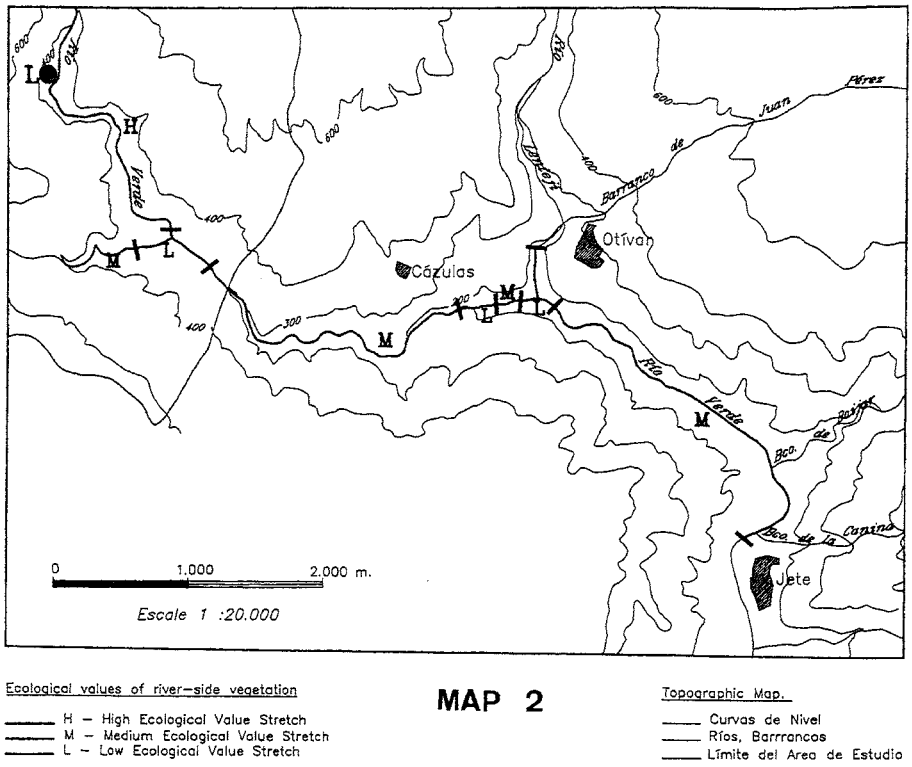


Fig. 3. Map of ecological value stretches.

Based on the originality and state of conservation of the habitats described above, a 1:20.000 map has been drawn up (Map 2, Fig. 3) to show the stretches of riparian vegetation of high (H), medium (M), or low (L) value. The high-value stretches present oleander communities, which are typical of banks and overhanging cliffs, as well as submerged alga and moss communities. The medium-value stretches, where human impact has been greater, present willow, oleander and reed communities. In the low-value stretches there are few formations of EU interest, as agricultural activity and deforestation are more intensive here, and fires are relatively frequent.

Cross-sections of two zones, corresponding to two stretches of the watercourse with different value, show the distribution of the various communities along both banks of the river (Cross-sections 1 and 2, Fig. 4).

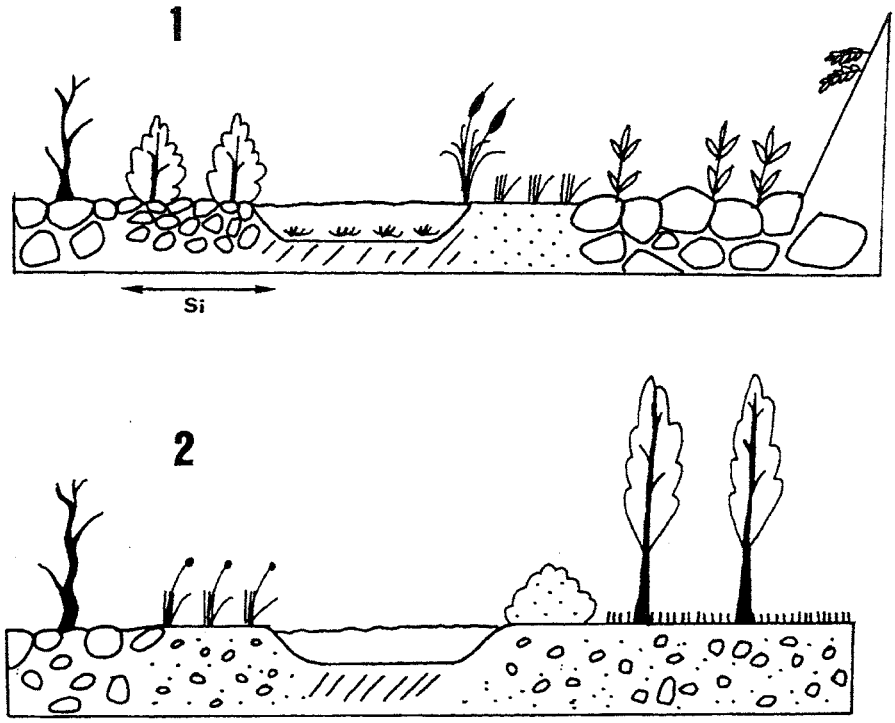


Fig. 4. *Cross-section 1:* Vegetation in the upper reaches (>400 m) of the watercourse which will be affected by the damming project. Climatic formations are present in the river itself, as the water table lies deep below ground. Acidophilous willow communities are present on silicaceous materials (Si). Hydrophyte and helophyte communities are submerged in the river. Reed communities develop on banks of fine silt, intermingling with oleander communities on heterometric carbonate soils. The fern communities present on banks are poorly developed due to the acidity of the rocks. *Cross-section 2:* The vegetation zone with the most human impact. Climatic formations are present on part of the riverbank. More thermophilous reed communities appear on medium-texture soils. Thermophilous bramble communities appear following the degradation of willow and oleander communities. Cultivated poplar groves present a herbaceous stratum on humid soils with varying degrees of nitrification; a dense stratum of Equisetales is occasionally present.

Appendix

Syntaxonomic index of formations studied

I. Cl *CHARETEA FRAGILIS* (Fukarek 1961) Krausch 1964
O. *Charetalia hispidae* Sauer 1937
Al. *Charion fragilis* Krausch 1964
1. as. ***Charetum vulgare*** **Corillion 1957**

II. Cl. *ADIANTETEA CAPILLI-VENERIS* Br.-Bl 1947
O. *Adiantetalia capilli-veneris* Br.-Bl. 1931
Al. *Adiantion capilli-veneris* Br.-Bl 1931
2. as. ***Trachelio caeruleae-Adiantetum capilli-veneris* O. Bolós 1957**

III Cl. *MOLINIO-ARRHENATHERETEA* Tuxen 1937
O. *Holoschoenetalia* Br.-Bl. (1931) 1937
Al. *Molinio-Holoschoenion* Br.-Bl. (1931) 1937
3. as. ***Molinio arundinaceae-Ericetum erigenae* Costa & al. 1983**
4. as. ***Cirsio monspessulani-Holoschoenetum vulgaris* Br.-Bl. 1931**

IV. Cl. *ARTEMISIETEA VULGARIS* Lohmeyer, Preissing & R. Tx. 1950
O. *Convolvuletalia sepii* Tuxen 1950
Al. *Cynancho acuti-Calystegion sepii* Rivas Goday & Rivas Martínez 1963
5. as. ***Arundini donacis-Convolvuletum sepii* Tuxen & Oberdorfer ex Bolós.**

V. Cl. *ASPLENIETA TRICHOMANIS* Br.Bl. in Meier & Br.Bl. (1934) Oberdorfer 1947
O. *Sarcocapnetalia enneaphyllae* Fdez. Casas 1972
Al. *Sarcocapnion crassifoliae* Fdez. Casas 1972
6. As. ***Sarcocapnetum crassifoliae* (Cuatrecasas 1929) Esteve & Fernández Casas 1971**

VI. Cl. *NERIO-TAMARICETEA* Br.-Bl. & O. Bolós 1958
Al. *Rubo ulmifolii-Nerion oleandri* O. Bolós 1985
7. as. ***Rubo ulmifolii-Nerietum oleandri* O. Bolós 1956**

VII Cl. *ROSMARINETEA OFFICINALIS* Br. Bl. 1947
em. Rivas Martínez, Díaz, Prieto & Loidi 1991
O. *Rosmarinetalia* Br.Bl. (1931) 1952
Al. *Saturejo-Corydothymion* Rivas Goday & Rivas Martínez 1964
8. as. ***Thymo gracile-Lavanduletum lanatae* Pérez Raya 1987**

VIII Cl. *QUERCETEA ILICIS* Br.Bl. 1947
O. *Quercetalia ilicis* Br.Bl. Ex. Molinier 1934 em Rivas Martínez 1975
Al. *Asparago albi-Rhamnion oleoidis* Rivas Goday 1964 em. Rivas Martínez 1975
9. as. ***Bupleuro gibraltarici-Pistacietum lentisci* Martínez Parras & al. 1985**

IX Cl. *QUERCO-FAGETEA* Br.-Bl. & Vlieger 1937
O. *Salicetalia purpureae* Moor 1958
Al. *Salicion salvifoliae* Rivas Martínez, R.E. Díaz, Fern. Prieto, Loidi & Penas 1984
10. as. *Erico meriterraneae–Salicetum pedicellatae* Esteve 1973

References

BRAUN-BLANQUET, J. (1979). *Fitosociología*. Madrid, Editorial Blume.

GÓMEZ MERCADO, F. & F. VALLE (1988). *Mapa de Vegetación de la Sierra de Baza*. Granada, Servicio de Publicaciones de la Universidad de Granada.

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