Composición vegetal de la Estación Biológica de la UCM 'Finca de Ontalba'

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RESUMEN

Se ha llevado a cabo un estudio sobre la vegetación de la recientemente designada Estación Biológica Complutense 'Finca de Ontalba', localizada en la Sierra de Guadarrama (N Madrid). Identificamos 12 comunidades vegetales agrupadas en siete grandes tipos de vegetación: 1) Comunidades higrófilas y acuáticas; 2) Prados; 3) Comunidad pionera de suelos alterados; 4) Vegetación herbácea nitrófila de lindero de bosque; 5) Vegetación herbácea de lindero de bosque; 6) Comunidad arbustiva de orla de bosque; y 7) Vegetación forestal. Se señala el interés de la Estación para trabajos de investigación. Su campo de aplicación incluye sucesión primaria, ambientes anfibios, gradientes de humedad del suelo, ecotonos, y ambientes forestales. La Estación Biológica alberga, además, un tipo de hábitat listado en la Directiva 92/43/CEE que corresponde a cursos de agua de llanura o montanos con vegetación de Ranunculion fluitantis y Callitricho-Batrachion (hábitat 3260).

Palabras clave: Actividades de investigación, Comunidades vegetales, Conservación, Gradientes ambientales, Sierra de Guadarrama.

Vegetation composition of the UCM Biological Field Station "Finca de Ontalba"

ABSTRACT

A vegetation study in the Biological Field Station of the Complutense University of Madrid named 'Finca de Ontalba', located in Guadarrama Mountains (North Madrid), was carried out. We identified 12 plant communities grouped in the following seven vegetation types: 1) Hygrophilous and aquatic communities; 2) Meadows; 3) Pioneer community of open disturbed soils; 4) Nitrophilous tall-herb vegetation of forest edge; 5) Forest-edge herbaceous community; 6) Forest-edge scrub community; and 7) Forest vegetation. The interest of the Station for research studies is pointed out. Its scope includes primary succession, amphibious environment, soil moisture gradient, ecotones, and forested environment. Besides, the Biological Station hosts a freshwater habitat type listed in the European Community Directive (92/43/EEC) which corresponds to water courses of plain or montane levels with Ranunculion fluitantis and Callitricho-Batrachion vegetation (habitat code 3260).

Keywords: Conservation, Environmental gradients, Guadarrama Mountains, Plant communities, Research activities.

Composition végétal de la Station Biologique de l' UCM 'Finca de Ontalba'

RÉSUMÉ

Nous avons réalisé une étude sur la végétation de la Station Biologique Complutense, nommée 'Finca de Ontalba', et située dans la Sierra de Guadarrama (N Madrid). Á cet endroit, nous avons identifié 12 communautés végétales regroupées en sept grands types de végétation: 1) Communautés hygrophiles et aquatiques; 2) Prairies; 3) Communautés pionnières des sols perturbés; 4) Végétation herbacée nitrophile de la limite de la forêt; 5) Végétation herbacée des lisières de la forêt; 6) Communauté frontièrienne arbustive de la limite de la forêt; et 7) Végétation forestière. L'intérêt que cette station suscite pour les travaux de recherche est remarquable. Son champ d'application comprend les environnements de succession primaire, les amphibiens, les gradients d'humidité du sol, les écotones et les environnements forestiers. La Station Biologique abrite également un type d'habitat cité dans la directive 92/43/CEE, qui correspond à des cours d'eau de la végétation des plaines ou de montagne avec le Ranunculion fluitantis et le Callitricho-Batrachion (habitat 3260).

Mot clé: Recherche, Communautés végétales, Conservation, Gradients environnementaux, Sierra de Guadarrama.

1. INTRODUCTION

Environmental managements such as fire, grazing, agriculture and plantations modify natural vegetation and landscape (Mooney et al. 1980, Trabaud 1980, Adler et al 2001, Quintana et al. 2004). The Mediterranean region has been under human influence for thousands of years. The landscapes of this part of the world have, therefore, evolved under this constant human impact, environmental impacts of ancient civilisations still being visible (Tzatzanis et al. 2003). The Mediterranean landscape has resulted in a highly differentiated mosaic of semi-natural landscape types (Rackham & Moody 1996). These landscapes include natural habitats meaning terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural (EC 2007). The knowledge of the natural habitats content of any area with environmental interest is essential for its preservation and protection.

Many prestigious universities around the world have associated Biological Field Stations which are used as important tools for research and educational activities (Wilson 1982). These Biological Stations include wild ecosystems providing a place for conservation biodiversity and a setting for short and long-term ecological studies (Eisner 1982). Specifically, studies on their biological content and the ecological processes operating on are essential to know the ecosystem functions. Recently, the 'Finca de Ontalba' (Rascafría, Madrid) has been designed as Biological Station of the Complutense University (http://www.ucm.es/). In this work, we aim to identify the plant-community types occurring in the UCM Biological Station. The results provide knowledge on biological and ecological

values of the Station. Furthermore, vegetation discontinuities help to detect environmental changes and anthropic disturbances.

2. MATERIAL AND METHODS

The UCM Biological Station 'Finca de Ontalba' (50 ha, Paular valley, Rascafría, 1234 m a.s.l., 40°54'N, 3°52'W) is located in the north of Madrid region, in Sierra de Guadarrama. Paular valley is home to considerable plant diversity with 1,378 species and 112 plant-community types (Fernández-González 1988, 1991). Mean annual precipitation is 1,030 mm, and mean annual temperature is 9.8º C. The area has a Supra-submediterranean bioclimate (Rivas-Martínez et al. 2004a) with cold and humid winters (Fernández-González 1988). Soils in the study area correspond to brown soils on silicate rocks (Guerra et al. 1966). The area is located in the Central Sector of the Western Central System with a dominance of Palaeozoic metamorphic gneiss (Bellido et al. 1981). Paular valley remains a Cretaceous-Tertiary sedimentary series partially dismantled and fragmented by the river network, and largely buried under Quaternary deposits, both fluvial and fluvioglacial. Biogeographically, the territory is included in the Carpetano-Leonese Sector, Mediterranean West Iberian Province, Mediterranean Region (Rivas-Martínez et al. 2004b). The natural potential vegetation consists of Pyrenean oak (*Quercus pyrenaica*) forests (Rivas-Martínez 1987). The area has been widely subjected to Scots pine plantations (*Pinus sylvestris* var. *iberica*) which has resulted in forested areas with pine and oak (Rivas-Martínez & Cantó 1987, Cañellas et al. 2000).

Field work was carried out during the spring and summer 2009 and 2010. Vegetation sampling was performed according to the phytosociological method (Braun-Blanquet 1979). Sampling plots (relevés) were made in areas with homogeneous vegetation, according to growth forms and physiognomic-ecological plant formations (Mueller-Dombois & Ellenberg 1974). Relevés were gathered in detailed phytosociological tables (not shown) by means of floristic similarities. Table sorting was used to detect and characterize vegetation types. Plant-communities were assigned to phytosociological syntaxa according to Rivas-Martínez et al. (2001). Plant nomenclature is according to Flora iberica (Castroviejo et al. 1986-2012) and Flora Europaea (Tutin et al. 1964-1980). Identification of human activities has been based on field observations, bibliographic references, and maintenance personnel communications.

3. RESULTS AND DISCUSSION

3.1 VEGETATION DESCRIPTION

In the Biological Field Station we identified 12 community types (Table 1) which we have grouped in seven vegetation groups.

1. HYGROPHILOUS AND AQUATIC COMMUNITIES

Three hygrophilous communities and two aquatic communities, all of them with a scarce distribution in the studied area, were identified. The helophytic community dominated by the tall herb *Oenanthe crocata* was found in the bed of temporary streams. This community is ascribed to the Atlantic-Mediterranean association Glycerio declinatae-Oenanthetum crocatae (Molina & Moreno 1999). Low water margin vegetation was also indentified in the spring from which the Finca takes its name, Fuente Alba. On coarse sandy soil margins the vegetation is dominated by *Veronica anagallis-aquatica*, whereas on silty soil margins the vegetation is presided by Myosotis stoloniferа. We ascribe the former to Glycerio declinatae-Apietum nodiflori association (Molina 1996) and the later to Myosotidetum stoloniferae association (Molina 2001).

We recognized two water-plant communities according to water flow: the lotic community of Ranunculus pseudofluitans, restricted to the sand bed of La Yesera stream in the eastern part of the Station; and the lentic community of Ranunculus peltatus, found in some pools of doline origin. The first community is ascribed to Callitricho brutiae-Ranunculetum pseudofluitantis association and the second to Callitricho brutiae-Ranunculetum peltati association (Rivas-Martínez et al. 2001).

2. MEADOWS

We recognized two types of meadows along a soil moisture gradient. The Agrostis castellana meadow, "vallicar", which occupy seasonally, wet soils with a pronounced summer drying. They correspond to the phytosociological association Festuco amplae-Agrostietum castellanae. The *Cynosurus cristatus* meadow is developed in seasonally wet soils for extended periods. It is ascribed to Festuco amplae-Cynosuretum cristati association.

3. PIONEER COMMUNITY OF OPEN DISTURBED SOILS

We found a community characterized by the moss *Funaria hygrometrica* colonizing recent fire areas resulting from the slash-pile prescribed burns. This type of burns is a common forest management procedure in Guadarrama Mountains in order to control tree growth and insect pests (Montero González et al. 2001, Castoldi 2009). We do not know the syntaxonomical place of this community.

4. NITROPHILOUS TALL-HERB VEGETATION OF FOREST EDGE

In semi-shaded nutrient-rich soils of forest edge a forb community with the following characteristic species was found: *Alliaria petiolata, Lapsana communis, Myrrhoides nodosa,* and *Galium aparine*. We ascribe this community to Myrrhoidi nodosae-Alliarietum petiolatae association.

5. FOREST-EDGE HERBACEOUS COMMUNITY

Vegetation consisted of perennial forbs occupying a narrow, semi-shaded fringe between forests and neighbouring meadows. It is well characterized in the area by *Vicia tenuifolia, Trifolium ochroleucon*, and *Tanacetum corymbosum*, among others species. We ascribe this community to Trifolio medii-Lathyretum nigri association.

6. SCRUB COMMUNITY OF FOREST EDGE

A community dominated by thorny and spiny shrubs occurs at the forest edge, especially when the forest is managed to favour meadows. This community develops on well structured and deep soils and includes as characteristic species in the area *Prunus spinosa, Crataegus monogyna, Rosa canina,* and *Adenocarpus complicatus*. It corresponds to the Rubo ulmifolii-Rosetum corymbiferae association (Fernández-González 1991).

7. FOREST VEGETATION

As consequence of past and current management which includes plantation of Scots pines and clearing of Pyrenean oaks, mixed stands of both trees are the main components of the forest landscape (Castoldi 2009). The understory is rich in herbs such as *Arenaria montana, Primula veris, Prunella grandiflora, Viola riviniana, Veronica officinalis*, and *Pteridium aquilinum*, among others species. In the Station, Pinus sylvestris trees reach a greater height (22 m height and 41 cm dbh on average) than *Quercus pyrenaica* trees (7 m height and 7 cm dbh on average). Only one oak was found with 14 m height and 44 cm dbh.

Table 1. Plant community types in the UCM Biological Field Station 'Finca de Ontalba'

Vegetation description	Association
Riparian tall-helophytic forbs of *Oenanthe crocata*	Glycerio declinatae-Oenanthetum crocatae
Low-helophytic forbs of *Veronica anagallis-aquatica*	Glycerio declinatae-Apietum nodiflori
Low-helophytic forbs of *Myosotis stolonifera*	Myosotidetum stoloniferae
Hydrophytic vegetation of lotic waters of *Ranunculus pseudofluitans*	Callitricho brutiae-Ranunculetum pseudo-fluitantis
Hydrophytic vegetation of lentic waters of *Ranunculus peltatus*	Callitricho brutiae-Ranunculetum peltati
Meadows of *Agrostis castellana*	Festuco amplae-Agrostietum castellanae
Meadows of *Cynosurus cristatus*	Festuco amplae-Cynosuretum cristat
Community of *Funaria hygrometrica*	———————————-
Nitrophilous forbs of forest edge	Myrrhoidi nodosae-Alliarietum petiolatae
Herbaceous edge forest vegetation	Trifolio medii-Lathyretum nigri
Spiny scrubs of forest edge	Rubo ulmifolii-Rosetum corymbiferae
Forest vegetation of *Pinus sylvestris* and *Quercus pyrenaica*	Luzulo forsteri-Quercetum pyrenaicae

3.2 HABITATS VALUE

In the Station, primary succession can be studied in two contrasting habitats. The habitat defined by Glycerio declinatae-Oenanthetum crocatae corresponds to tall-forb vegetation of shallow water in temporary streams where the stages of primary succession can be observed on alluvial soils in a riparian environment (Molina &

Moreno 1999). The habitat, designed here as Community of *Funaria hygrometrica*, belongs to plant succession early stages after slash-pile prescribed burns. Primary succession can be studied, in this case, on ash-rich soils in a forest environment (Delasheras et al. 1994).

Spring habitats constituted by communities of *Myosostis stolonifera* or *Veronica anagallis-aquatica* in the territory are characterized by permanently or semi- permanently flooded soils, and acid waters that flow at a relatively constant rate and cold temperature throughout the year. These habitats more resilient to variation in precipitation and climate change than surface run-off watersheds (Jeffres et al. 2009).

Aquatic habitats found in the territory are part of lotic (Callitricho brutiae-Ranunculetum pseudofluitantis) or lentic (Callitricho brutiae-Ranunculetum peltati) ecosystems. The former is listed in the Directive Habitat (92/43/EEC) as 'water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion' (habitat code 3260). The habitat Directive forms the cornerstone of Europe's nature conservation policy (CE 2007).

The meadows identified in the Station are related to a hydric gradient. Soil moisture regime defines the existence of Festuco amplae-Agrostietum castellanae or Festuco amplae-Cynosuretum cristati in wet soils according to longer or shorter seasonally drying conditions, respectively. This gradient allows studying the incidence of dry or humid period on the balance. Furthermore, grazing and harvesting managements increase meadow type and richness (Fernández-González 1988, Rodríguez-Rojo & Sánchez-Mata 2004). Studies about their relationships are important for future management plans which should preserve these uses in order to maintain biodiversity of grasslands.

We recognized three ecotone-habitats, two defined by herbaceous plant-communities (Myrrhoidi nodosae-Alliarietum petiolatae, Trifolio medii-Lathyretum nigri) and one by shrubby vegetation (Rubo ulmifolii-Rosetum corymbiferae). The knowledge of border zone function has important implications in terms of forests conservation and regeneration (López-Barrera 2004).

Oak woods of *Quercus pyrenaica* are listed in the Directive Habitat (92/43/EEC), as natural habitat type of European community interest for conservation (habitat code 9230). This is the natural potential vegetation of the area (Luzulo forsteri-Quercetum pyrenaicae, Rivas-Martínez 1987). However, Finca de Ontalba is mainly cover by a mixed pine-oak forest as the result of systematic *Pinus sylvestris* plantation for timber production, while young *Quercus pyrenaica* stands are recovering from intensive grazing and cutting. Since Quercus pyrenaica forests show a depressed regeneration at least in the past three decades (Barbour et al. 2007) and since they are sensitive to drier conditions caused by climate change (Hernández-Santana et al. 2009), the favouring of *Quercus pyrenaica* stands is important for European biodiversity conservation.

Past and current management of the territory include pine plantation, prescribed burns, charcoal production, clay mining, watercourses diversion, cattle and horse grazing. Investigating the relationships between these activities and vegetation res-

ponse is crucial to understand the current plant-landscape and the major driving environmental factors. Furthermore, it can help to forecast future plant-landscape in a global change scenario.

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