*Ecología Austral 8:145-153, 1998*
*Asociación Argentina de Ecología*

# Biozones of Patagonia (Argentina)

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**Abstract.** *We present a classification of Patagonian ecosystems based on functional attributes derived from the seasonal curves of Normalized Difference Vegetation Index (NDVI), calculated from spectral data provided by the NOAA/AVHRR satellites. The attributes used were the annual integral, the relative range of NDVI, and the date of maximum NDVI. These attributes capture critical aspects of the seasonal dynamics of carbon gains and allow for a good description of the spatial heterogeneity of ecosystem function in temperate areas. Our analysis defined 12 biozones that capture current ecosystem functioning. The units defined showed a good agreement with previously defined phytogeographical provinces. Mapping biozones based on attributes derived from satellite data does not require assumptions on the relationship between vegetation units and environmental features. This reduces the errors associated to the lack of correlation between the vegetation and environmental features.*

## Introduction

Traditionally the description of the regional heterogeneity of ecosystem types was based on structural characteristics of vegetation. The main goal was to describe and map the potential vegetation of the region. The regional studies performed in Patagonia were not the exception. The attributes more frequently used to describe the vegetation were the relative abundance of plant functional types, species composition, and physiognomy (Hauman 1926, Soriano 1956, Boelcke et al. 1985, León et al. 1998). Maps were constructed by extrapolating point observations. The underlying hypothesis of this mapping strategy was the existence of a correlation between the structural characteristics recorded or observed and some environmental features easy to map (landscape units, geoforms, etc.). These relationships between the environment and the vegetation have not been tested formally.

Human activities have modified most of the Patagonian region. There are evidences that the introduction of domestic herbivores at the beginning of the century altered both the functioning and the structure of its ecosystems (León and Aguiar 1985, Borelli et al. 1988, Paruelo et al. 1993, Aguiar et al. 1996, Bisigato and Bertiller 1997, Perelman et al. 1997). To understand the impact of human-related disturbances (grazing, mining, and global change) on a regional basis it is necessary to characterize the present status of the vegetation. To base such characterization only on structural features (i.e. species composition, relative abundance of plant functional types) may have some problems. For example, the inertia of the vegetation structure may delay the perception of the response of the ecosystem to a disturbance (Pennington 1986, Malanson et al. 1992, Milchunas and Lauenroth 1995). Functioning, the exchange of energy and matter of the ecosystem, has in general a shorter response time than structure. This represents a clear advantage for the use of functional attributes to characterize ecosystems. An additional advantage is that functional attributes can be monitored using satellite data easier than structure (Malingreau 1986).It is difficult to extrapolate point observations of actual vegetation based on a description of the physical environment (soils, topography, geomorphology) because the relative importance of disturbances and the response of