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11

Wealth of Flora and Vegetation in the La Campana-Peñuelas Biosphere Reserve, Valparaiso Region, Chile

Enrique Hauenstein
Catholic University of Temuco, Faculty of Natural Resources, Temuco Chile

1. Introduction

Chile has a National System for State-Protected Wilderness Areas (Sistema Nacional de Áreas Silvestres Protegidas del Estado – SNASPE), which consists of three categories: National Parks (PN), National Reserves (RN) and Natural Monuments (MN). It presently contains 95 units, covering in total 19% of the country's territory. SNASPE has become a fundamental pillar not only for safeguarding an important part of Chile's natural heritage but also for protecting and valuing our cultural heritage, particularly where it is integrated in the areas which make up this system (Oltremari, 2002). By 1985, UNESCO had designated 7 Biosphere Reserves in Chile: Lauca, Fray Jorge, Juan Fernández, La Campana-Peñuelas, Araucarias, Laguna San Rafael and Torres del Paine. To these were later added Cabo de Hornos [Cape Horn], Bosques Templados Lluviosos de los Andes [Wet Temperate Andean Forests], and recently Laguna del Laja-Nevados de Chillán.

The Valparaiso Region contains La Campana National Park, declared a Biosphere Reserve in February of 1985 jointly with Lago Peñuelas National Reserve due to their high biological and ecosystem diversity, representative of the mediterranean environments characteristic of this region (Weber, 1986; CONAF, 1992, 2008; Elórtegui & Moreira, 2002). In 1834, during his stay in Chile, the great naturalist Charles Darwin climbed to the peak of La Campana where he was amazed by the presence of forests of palm trees (*Jubaea chilensis*), and especially by recording a specimen at 1,350 m above sea level (Elórtegui & Moreira, 2002).

The central zone of Chile, also called the mesomorphic or mediterranean zone, extends approximately from 32° to 37° S (Pisano, 1956). It has a mediterranean climate, which Koeppen (1931, 1948) classifies as a "warm-temperate climate with sufficient humidity", in the subdivision "winter rains and prolonged dry season", characterised by regular periods of rain in winter and a strongly marked dry season which may extend from six to eight months. This corresponds to other mediterranean zones around the world such as in California and southern Europe in the Northern Hemisphere, and Australia and southern Africa in the Southern Hemisphere (Grau 1992; Arroyo et al., 1995). The climatic conditions mean that the vegetation in these regions has specially adapted characteristics, such as the presence of sclerophyllous leaves, lignotubers and a great capacity for water-use efficiency (Money & Kumerow, 1971; Araya & Avila, 1981; Avila et al., 1981). According to

Marticorena et al. (1995), the central zone of Chile is a focus where endemic species are concentrated, with great wealth and diversity of flora. Mittermeier et al. (1998) indicate the presence of 1,800 species of endemic plants for this area, leading it to be considered as one of the world's 25 hotspots, requiring priority protection (WWF & IUCN, 1997; Myers et al., 2000).

In this context, flora and vegetation studies are essential basic elements for developing proposals for the conservation and management of species and ecosystems, or defining priority areas (Cavieres et al., 2001; Teillier et al., 2005). The object of the present study is to contribute to knowledge of the flora and vegetation of the La Campana-Peñuelas Biosphere Reserve.

2. Methods and results

2.1 Study area

This Biosphere Reserve includes La Campana National Park (32°55' to 33°01'S; 71°01' to 71°09'W) and Lago Peñuelas National Reserve (33°07' to 33°13'S; 71°24' to 71°34'W). It is important to indicate that by means of offer of the National Forest Corporation of Chile, the year 2008 extended his surface in near 14 times, going on from 17,095 to 238,216 ha (CONAF, 2008). The altitude ranges from ± 350 to ± 2,222 masl, and the highest peaks are "El Roble" (2,222 masl) and "La Campana" (1,920 masl). Some sectors of RN Lago Peñuelas contain plantations of exotic species (*Pinus radiata* D. Don and *Eucalyptus globulus* Labill.). Another part corresponds to Peñuelas lake, a reservoir covering 1,600 ha which supplies water to the cities of Valparaiso and Viña del Mar, and forms a wetland which is important for migratory,

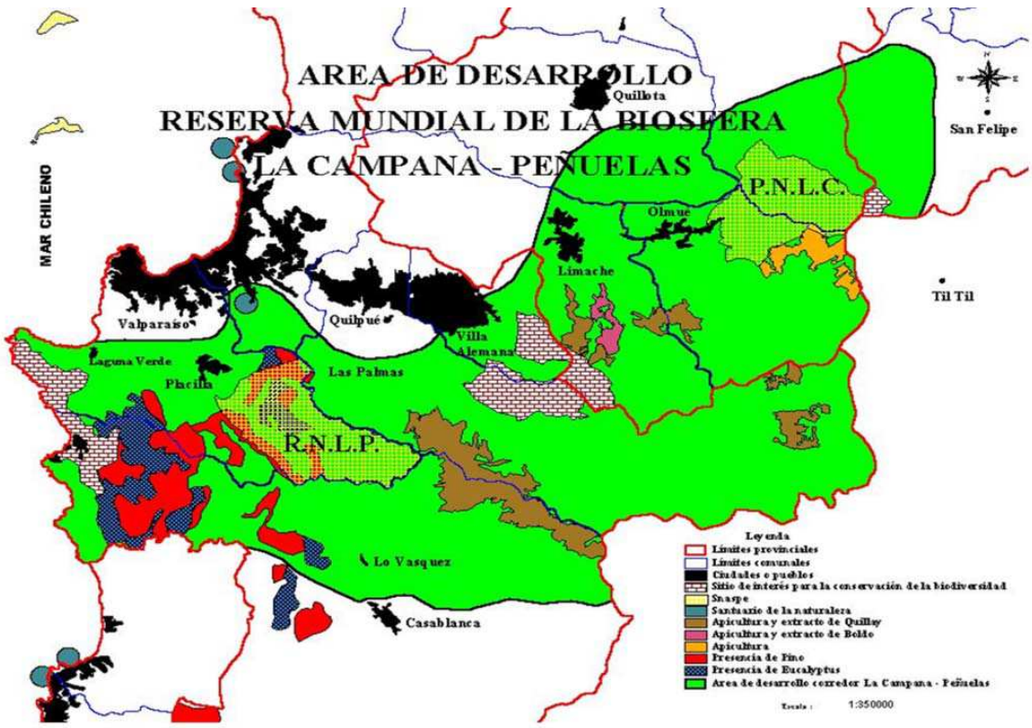


Fig. 1. Map of location of La Campaña-Peñuelas Biosphere Reserve in the Region of Valparaiso, Chile.

occasional or resident birds; more than 125 species of water, land and shore birds have been recorded in the lake (Strang, 1983) (figure 1, photos 1, 2, 3). The climate of the area is temperate-mediterranean, with sufficient humidity, winter rains and a prolonged dry season. The average annual temperature is 13.5ºC; the average maximum is 17.1ºC and the average minimum is 9.4ºC; the temperature occasionally falls to 0ºC, with frosts between May and September. Precipitation is seasonal (656 mm/year), from the end of May to August, with a markedly dry summer of six to eight months from October to March (Di Castri & Hajek, 1976; Luebert & Pliscoff, 2006).



Photo 1. Place of access to the Reserve for the sector of the Peñuelas lake.



Photo 2. Place of access to the Reserve for the sector of Ocoa's Palms.



Photo 3. Sight of the Hill the Oak, major summit of La Campana-Peñuelas Biosphere Reserve.

2.2 Methodology

The study of the flora and vegetation of the Reserve was carried out by field activities and bibliographic review. Field trips were done in February and November 2001, with intensive collection and 27 phytosociological surveys in nine sampling stations in the Peñuelas National Reserve. The area of each inventory was 4 m² for herbaceous vegetation, 25 m² for shrubs and 100 m² for forest species, within areas greater than the minimum area (Steubing et al., 2002). Aquatic and marsh vegetation were also included on the shores of Peñuelas lake. The phytosociological tables were processed according to the methodology proposed by Braun-Blanquet (1964, 1979), as explained in Ramírez & Westermeier (1976). The bibliographic review was based principally on the following works: Looser (1927, 1944), Rundel & Weisser (1975), Rodríguez (1979, 1982), ICSA (1980), Villaseñor (1980, 1986), Villaseñor & Serey (1980-1981), Balduzzi et al. (1981, 1982), Rodríguez & Calderón (1982), CONAF (1986, 1994), Zöllner et al. (1995), Elórtegui & Moreira (2002), Novoa et al. (2006), CONAF (2008) and Hauenstein et al. (2009).

The identification, nomenclature and geographical origin of each species was based on Muñoz (1966), Navas (1973, 1976, 1979), Hoffmann (1978, 1991), Marticorena & Quezada (1985), Matthei (1995), Hoffmann et al. (1998) and Marticorena & Rodríguez (1995, 2001, 2003, 2005). The International Plant Names Index (IPNI 2011) was used to update the scientific names and abbreviations. Life forms were determined according to the scheme proposed by Ellenberg & Mueller-Dombois (1966) and the state of conservation of the species was determined considering the proposals of Benoit (1989), updated by a meeting of experts in September 1997 (Baeza et al., 1998; Belmonte et al., 1998; Ravenna et al., 1998), and de Novoa et al. (2006) for the Orchidaceae. The degree of human disturbance of the site was determined on the basis of the proposal of Hauenstein et al. (1988) and the evaluation scale of González (2000), which consider phytogeographic origin (the ratio between native and introduced species), and life forms (Raunkiaer's biological forms) as measurements of this form of disturbance. The result was an inventory of the flora in the study area (table 2), containing all the above elements.

The vegetation units were determined using the maps produced by CONAF & CONAMA (1999) and specific cartography provided by CONAF (National Forest Corporation), Valparaiso Region. The definition and nomenclature of the vegetation units followed the proposal of Gajardo (1995). The vegetation units identified in the map for study were subsequently verified on the ground.

2.3 Results

Flora. The vascular flora recorded (table 2) included 420 species distributed as: 12 Pteridophytes (3.0%), 3 Gymnosperms (1.0%), 290 Dicotyledons (69.0%) and 115 Monocotyledons (27.0%) (figure 2). The phytogeographic origin (figure 3) indicates that 49.0% of the species (207 sp.) are native, 28.0% (118 sp.) endemic and 23.0% (95 sp.) introduced. The biological spectrum (life-forms; figure 4) was represented by 122 hemicryptophytes (29.0%), 112 therophytes (26.4%) corresponding to annual and biannual plants, 72 cryptophytes (17.1%) including hydrophytes and geophytes, 52 nanophanerophytes (shrubs) (12.4%), 38 phanerophytes (trees) (9.0%), 14 vines (3.3%), 5 chamaephytes (low shrubs) (1.4%), 4 parasites (1.0%) and only one epiphyte (0.2%).

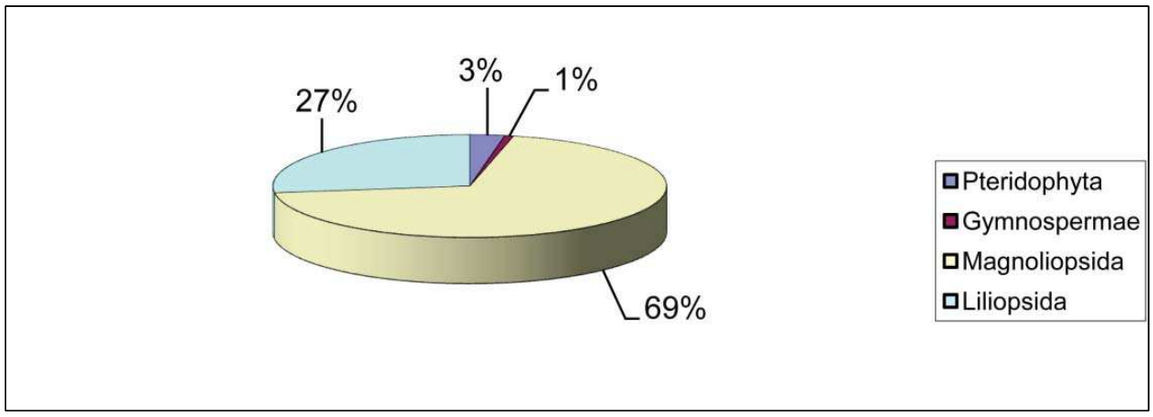


Fig. 2. Taxonomic distribution (%) of the flora in La Campana-Peñuelas Biosphere Reserve, Chile.

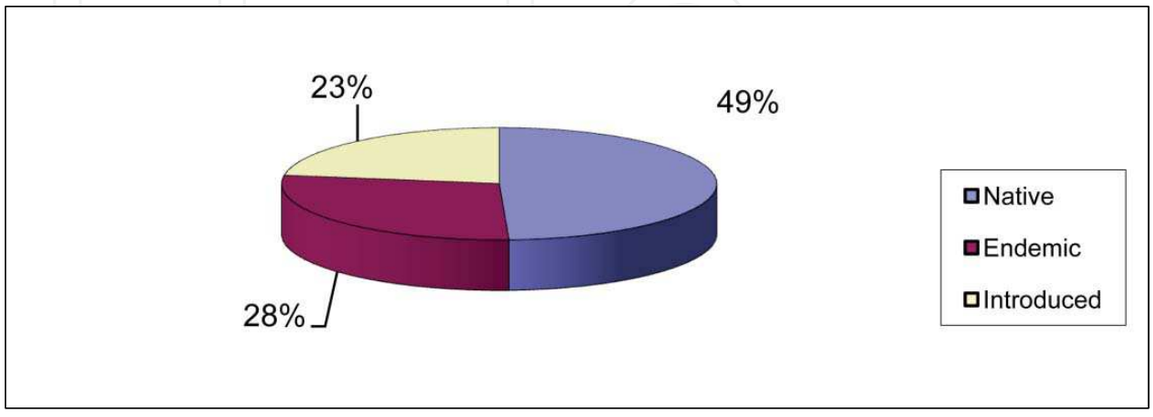


Fig. 3. Phytogeographic origin (%) of the flora in La Campana-Peñuelas Biosphere Reserve, Chile.

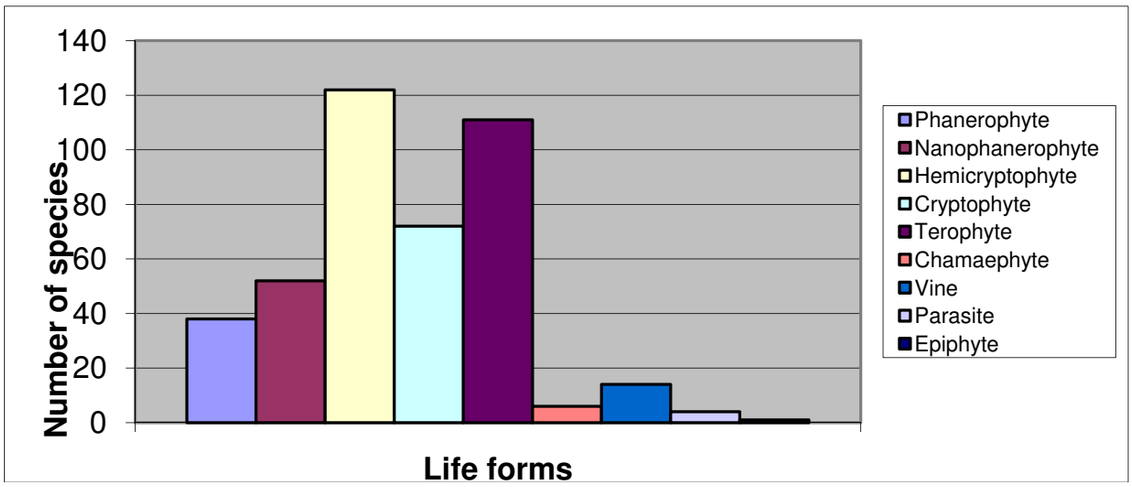


Fig. 4. Biological spectrum (life forms) of the flora in La Campana-Peñuelas Biosphere Reserve, Chile.

The state of conservation of the species (table 1), considering the total mentioned for the area, shows that the majority present no problems, with 18 species (4.5%) being identified as suffering from conservation problems. Of these, two are in the "Endangered" category, *Beilschmiedia miersii* (belloto del norte) and *Calydorea xiphioides* (tahay); 14 in the "Vulnerable" category, mainly species of bulbs (geophytes) such as *Herbertia lahue, Leucocoryne ixioides, L. violacescens* and *Phycella bicolor*; two in the "Rare" category, *Alstroemeria garaventae* and *A. zoellneri*; and just one species in the "Insufficiently known" category, *Blechnum cordatum*, of which a single specimen was recorded in the El Abrevadero sector.

Vegetation. The vegetation in the Reserve includes the following woody communities: sclerophyllous forest, hygrophilous forest, deciduous forest, thorny scrub and mixed sclerophyllous scrub. The herbaceous communities include: dry grassland, wet grassland, reed beds, sedge beds and the aquatic plant community. These communities are characterised as:

1. Peumo and boldo sclerophyllous forest. This is a woody formation typical of the region. This community corresponds to *Peumo-Cryptocaryetum albae* (Oberdorfer, 1960). Variants can be found with sclerophyllous scrub species (*Retanilla trinervia, Gochnatia foliolosa*), and one with Chilean palm tree (*Jubaea chilensis*). The average cover of the arboreal stratum is 70%, shrubs 35% and herbaceous 25%. The principal arboreal species are: *Cryptocarya alba*, *Peumus boldus, Persea lingue* and *Dasyphyllum excelsum*; shrubs are dominated by: *Retanilla trinervia, Schinus latifolia* and *Chusquea cumingii*,; creepers and lianas included: *Proustia pyrifolia, Lardizabala funaria* and *Cissus striata*; herbaceous vegetation comprised mainly: *Blechnum hastatum*, *Alonsoa meridionalis, Conyza floribunda* and *Anagallis arvensis.* The altitude ranges of this community is from 350 to 1,000 masl (Elórtegui & Moreira, 2002; Hauenstein et al., 2009).
2. Quillay and litre sclerophyllous forest. A more strongly xerophytic community than the first category described above, with cover between 40 and 90%. The principal arboreal species are: *Cryptocarya alba*, *Quillaja saponaria* and *Lithrea caustica*; shrubs: *Retanilla trinervia, Schinus latifolia, Colliguaja odorifera*, *Podanthus mitiqui* and *Escallonia pulverulenta;* and herbaceous species include: *Adiantum chilense, Solenomelus*

pedunculatus, Vulpia myuros, Alonsoa meridionalis, Conyza floribunda and *Anagallis arvensis*. The altitude range is from 500 to 1,050 masl. There is also a variant with *Jubaea chilensis*, in which *Aristeguietia salvia* and *Acacia caven* are also present (Elórtegui & Moreira, 2002; Hauenstein et al., 2009).

Species	**EC**	**Bibliographical source**
Alstroemeria garaventae	R	Ravenna et al. (1998)
Alstroemeria hookeri	V	Ravenna et al. (1998)
Alstroemeria zoellneri	R	Ravenna et al. (1998)
Beilschmiedia miersii	P	Benoit (1989)
Blechnum cordatum	IC	Baeza et al. (1998)
Blepharocalyx cruckshanksii	V	Benoit (1989)
Calydorea xyphioides	P	Ravenna et al. (1998)
Chloraea disoides	V	Ravenna et al. (1998), Novoa et al. (2006)
Chloraea heteroglossa	V	Ravenna et al. (1998), Novoa et al. (2006)
Conanthera trimaculata	V	Benoit (1989)
Eriosyce curvispina	V	Benoit (1989), Belmonte et al. (1998)
Herbertia lahue	V	Benoit (1989)
Jubaea chilensis	V	Benoit (1989)
Leucocoryne ixioides	V	Benoit (1989)
Leucocoryne violacescens	V	Benoit (1989)
Persea lingue	V	Benoit (1989),
Phycella bicolor	V	Benoit (1989)
Puya chilensis	V	Benoit (1989)

Table 1. Vascular plants with conservation problems of the La Campana-Peñuelas Biosphere Reserve (EC= condition of conservation, P= threatened, R= rare, V= vulnerable, IC= insufficiently known).

3. Temo and pitra hydrophilous laurifolious forest. Includes small remnants of forest associated with permanent watercourses and springs, present in the Vega del Alamo sector of RN Peñuelas. These are composed of hygrophilous species such as *Drimys winteri*, *Myrceugenia obtusa*, *Blepharocalyx cruckshanksii* and *Luma chequen*, and some creepers like *Lardizabala biternata* and *Cissus striata*, and correspond to the *Blepharocalyo-Myrceugenietum exsuccae* association (hualve or swamp forest) of myrtaceous plants in the central southern zone of Chile (Ramírez *et al*. 1996). These forests are included in the *Wintero-Nothofagetea* phytosociological class defined by Oberdorfer (1960). Other woody species present in this community were: *Maytenus boaria* and *Escallonia revoluta*, together with some creepers such as *Cissus striata* and *Lardizabala biternata*. The herbaceous stratum is scarce, probably due to the closed canopy, which hinders the penetration of

light; where present it is represented by *Uncinia trichocarpa* and ferns like *Blechnum hastatum* and *B. cordatum*. This community is found at 270 masl (Hauenstein et al., 2009).

4. Belloto hygrophilous laurifolious forest. This community is characterised by an arboreal stratum dominated by *Beilschmiedia miersii, Cryptocarya alba* and *Dasyphyllum excelsum*; there is an abundant shrub stratum dominated by *Azara celastrina, Chusquea cumingii, Adenopeltis serrata* and an abundance of creepers such as *Proustia pyrifolia, Lardizabala funaria* and *Bomarea salsilla*. It is found in low-lying areas, up to 500 masl (Elórtegui & Moreira, 2002).
5. Canelo hygrophilous laurifolious forest. The arboreal stratum, dominated by *Drimys winteri*; an abundant shrub stratum, with *Otholobium glandulosum, Escallonia myrtoidea, Maytenus boaria* and occasionally *Salix humboldtiana*; and in the herbaceous stratum, *Equisetum bogotense*. In altered sectors by human activities, cover may be diminished to as little as 30%. It is found at between 500 and 1,300 masl (Elórtegui & Moreira, 2002).
6. Deciduous roble forest. This community is characterised by a well differentiated arboreal stratum with *Nothofagus macrocarpa* and *Lomatia hirsuta*; a shrub stratum with *Azara petiolaris, Ribes punctatum, Schinus montanus, Berberis actinacantha* and *Aristotelia chilensis*; and an herbaceous stratum with, *Adiantum sulphureum, Loasa tricolor, Oxalis laxa* and *Alstroemeria zoellneri,* respectively. The cover is from 70 to 100% and it is found between 1,100 and 1,500 masl. At altitudes above 1,500 masl, a clear diminution may be seen in the tree and shrub cover, constituting a variant with other species such as *Schizanthus hookeri, Valeriana lepidota* and *Senecio anthemidiphyllus* (Elórtegui & Moreira, 2002) (photo 4).



Photo 4. *Nothofagus macrocarpa* forest in the sector of the Hill the Oak.

7. Espino thorny scrub. The dominant species in the community are espino (*Acacia caven* = *Vachellia caven*) and maitén (*Maytenus boaria*), with average cover of 50% and 10% respectively. It is characterised by the presence of a rich herbaceous stratum, especially *Agrostis capillaris, Leontodon saxatilis, Avena barbata, Bromus hordeaceus, Briza minor, B. maxima* and *Rhodophiala advena*, with clear predominance of forage graminids. This community is found around Peñuelas lake (Hauenstein et al., 2009) (photo 5).
8. Trevo thorny scrub. A little developed shrub community dominated by *Retanilla trinervia*, accompanied by shrub forms of *Lithrea caustica* and *Quillaja saponaria,* and by *Cuscuta chilensis*, an abundant, parasitic, herbaceous species. Average cover is above 70% and the community is found between 400 and 1,000 masl. It forms a variant with abundant presence of *Jubaea chilensis*, but only in the Ocoa sector (Elórtegui & Moreira, 2002).



Photo 5. *Acacia caven* steppe (hawthorn) in sectors near to the Peñuelas lake.

9. Chagual and quisco thorny scrub. An open community of succulents, with a shrub stratum of less than 4 m height, very diverse, with *Puya berteroana, Echinopsis chiloensis, Adesmia arborea, Aristeguietia salvia, Podanthus mitiqui, Retanilla trinervia* and occasionally *Puya chilensis*; the herbaceous stratum is poor, with *Helenium aromaticum, Vulpia myuros* and *Madia sativa*. Cover is very variable, between 10 and 80%, but generally not more than 40%. It is found at between 450 and 1,100 masl. It can also form a variant with abundant presence of *Jubaea chilensis*, but only in the Ocoa sector, with other species *Baccharis paniculata* and *Tristerix corymbosus* present (Elórtegui & Moreira, 2002) (photo 6).



Photo 6. *Jubaea chilensis* in the sector of Ocoa's Palms.

10. Chagualillo thorny scrub. A low, open shrub community, with two well differentiated strata: higher, with shrubs and succulents of 1-3 m in height, and lower, < 1 m. The higher stratum is dominated by *Puya coerulea, Eryngium paniculatum, Colliguaya odorifera, Retanilla ephedra* and *Calceolaria polifolia*; the lower by *Eriosyce curvispina, Tweedia birostrata, Gamochaeta americana, Senecio farinifer* and *Chorizanthe virgata*. Cover varies between 20 and 60%, and the altitude is above 1,100 masl. A variant may also be formed with presence of *Jubaea chilensis*, with very low cover, the individuals of Chilean palm tree being small and widely dispersed. These communities are found in certain high sectors of Cajón Grande, El Roble and Ocoa, and have cover $\pm$ 40% (Elórtegui & Moreira, 2002).
11. Mira and maicillo thorny scrub. A community with sparse distribution representing situations of sclerophyllous forest with severe disturbance in difficult environments for

plant life. The dominant species in the shrub stratum are *Gochnatia foliolosa, Baccharis rhomboidalis, B. linearis, Satureja gilliesii, Escallonia pulverulenta, Ageratina glechonophylla* and *Haplopappus velutinus*; in the herbaceous stratum, *Alstroemeria angustifolia, Solenomelus pedunculatus, Triptilion spinosum, Acaena pinnatifida* and *Azorella spinosa*. The community presents covers of 30 and 50%, at altitudes between 1,000 and 1,300 masl. It can also form a variant with *Jubaea chilensis*, with very low cover, between 1,000 and 1,200 masl. The differential character of this unit is given by the presence of *Vulpia myuros* and *Baccharis paniculata*, indicating a high level of degradation (Elórtegui & Moreira, 2002).

12. Mixed sclerophyllous scrub. This community is a mixture of species from the acacia steppe with sclerophyllous forest elements, such as *Quillaja saponaria, Schinus latifolia,* and *Cryptocarya alba*, together with shrub species, such as *Schinus polygama, Baccharis linearis, Berberis actinacantha, Eryngium paniculatum* and *Satureja gilliesii*. It may be characterised as open scrub of espino and romerillo (*Baccharis linearis*). The dominant woody species are *Acacia caven* with nearly 20% cover and *B. linearis* with 10%; these were followed by *Maytenus boaria*, *Quillaja saponaria* and *Schinus latifolia*; lower canopy comprises *Peumus boldus*, *Lithrea caustica*, *Escallonia pulverulenta* and the creeper *Muehlenbeckia hastulata*. The herbaceous stratum, with average cover 90%, was represented by the species *Agrostis capillaris*, *Avena barbata*, *Poa annua, Festuca sp*., *Bromus hordeaceus, Briza minor* and *Leontodon saxatilis* (Hauenstein et al., 2009).
13. Low altitude neneo scrub. A low, open community of dwarf shrubs (chamaephytes), principally *Mulinum spinosum, Chuquiraga oppositifolia, Viviania marifolia, Haplopappus ochagavianus, Ephedra chilensis* and a herbaceous stratum formed by *Phacelia secunda* and *Calceolaria campanae*. The cover is 10 to 40%; it is found on rocky substrates with variable exposure and gradient, above 1,750 masl, present only at the summits of La Campana and El Roble (Elórtegui & Moreira, 2002).
14. Dry grassland. The principal floral components of these grasslands were *Phyla canescens, Bromus hordeaceus, Agrostis capillaris, Hypochaeris radicata, Gamochaeta coarctata, Leontodon saxatilis, Rumex acetosella* and *Avena barbata*. They correspond to the *Bromo-Lolietum* community (Oberdorfer, 1960), and are found in the north-east sector of Peñuelas lake, at around 360 masl (Hauenstein et al., 2009).

15-16. Wet grasslands. There are two types. Apart from some of the species of the previous community, the first is distinguished by *Mentha pulegium* and reeds (*Juncus acutus*, *J. cyperoides*, *J. pallescens*), and corresponds to reedy wet grassland (*Juncetum acuti* ass. nov.). The second has marked presence of *Ludwigia peploides, Cotula coronopifolia*, *Distichlis spicata* and *Paspalum dilatatum*, corresponding to *Polygono-Ludwigietum peploidis* (Steubing et al. 1980). Both are found on the northern and southern plains close to Peñuelas lake, although *Polygono-Ludwigietum* occupies the strip closest to the water (Hauenstein et al., 2009).

17-18. Marsh communities. Two communities of marsh plants were identified, preferably located near the channel which flows into the eastern end of Peñuelas lake. The first, located closer to the water, corresponds to *Scirpetum californiae* (Ramírez & Añazco, 1982), the principal component being totora reed (*Schoenoplectus californicus*), accompanied by *Ludwigia peploides* and *Polygonum hydropiperoides*. The second community, found in a continuous strip a little further away from the water, corresponds to *Loto-Cyperetum eragrostidae* (San Martín et al., 1993), the principal species being *Cyperus eragrostis* and *Carex excelsa* (saw-sedges), accompanied by *Juncus pallescens*

and *J. acutus*; it is a perennial, marshy association, typically found in depressions and on the banks of watercourses, associated with totora reeds or the border of swamp forest with temo (*Blepharocalyx cruckschanksii*) and pitra (*Myrceugenia exsucca*) (Hauenstein et al., 2002; San Martín et al., 2002). In both communities (reed beds and sedge beds), due to the periodic flooding of the site, hydrophytic life forms dominate absolutely, such as typical helophytes (marsh or swamp plants) and hydrophytes (Hauenstein et al., 2009).

19. Aquatic communities. These communities consist principally of hydrophytic species, particularly *Azolla filiculoides*, a free-floating pteridophyte, constituting the *Lemo-Azolletum filiculoidis* association (Roussine & Negre, 1952); moreover the high frequency of *Hydrocotyle ranunculoides*, *H. modesta* and *Eleocharis exigua* allow the existence of *Hydrocotyletum* to be inferred (San Martín et al., 1993), however more censuses would be required to confirm this inference. For example, in the least overgrown part of the spring in the El Abrevadero sector of RN Lago Peñuelas, a small body of water is formed which is colonised by aquatic and marsh species such as: *Azolla filiculoides*, *Gunnera tinctoria*, *Juncus cyperoides*, *Carex excelsa*, *Eleocharis exigua*, *Polygonum hydropiperoides*, *Hydrocotyle modesta* and *H. ranunculoide*s (Hauenstein et al., 2009).

To resume, without considering the variants, 19 plant associations have been described for the Biosphere Reserve.

2.4 Discussion

Flora. When the general floral wealth of the area (420 species) is compared with other surveys done in protected wilderness areas in central Chile, we find for the Maule Region: RN Los Bellotos del Melado – 297 species (Arroyo et al., 2000); RN Los Ruiles – 139 species; RN Los Queules – 104 species (Arroyo et al., 2005). For the Metropolitan Region: Monumento Natural El Morado – 300 species (Teillier, 2003); RN Río Clarillo – approximately 600 species (Teillier et al., 2005). With the exception of the last, all others consist of considerably fewer species than recorded in the La Campana-Peñuelas Biosphere Reserve, demonstrating the floral wealth of this area.

The biological spectrum shows the predominance of therophytes, hemicryptophytes and cryptophytes over other life forms, which is consistent with the xeric conditions of the site, especially during summer, since therophytes (herbaceous plants with short life cycles, annuals or biannuals) and cryptophytes (geophytes or plants with enduring subterranean organs) represent this type of climate very well and are good environmental indicators. Meanwhile the abundance of hemicryptophytes is indicative of human intervention, since this life form accompanies man and corresponds to plants capable of surviving being trodden on and browsed by domestic animals (Cabrera & Willink, 1973; Ramírez, 1988; Grigera et al., 1996).

The general phytogeographic origin of the plants in the Reserve indicates that 23% are introduced species, 49% native and 28% endemic. This confirms the high value of this Biosphere Reserve as an area for the conservation of Chile's native and endemic flora. At the same time, when the relatively high percentage of allochthonous species is considered, and compared to the majority of the studies mentioned above where the values for allochthonous species do not exceed 20%, this would indicate a high level of human intervention in the study area. According to Hauenstein et al. (1988) and González (2000), a percentage distribution in which allochthonous plants reach values of between 20 and 30%

corresponds to the category of "moderate intervention". This high level of intervention is explained by the large flow of visitors and the presence of domestic animals at certain times of year, leading to the arrival of therophytes and hemicryptophytes which, as mentioned previously, correspond for the most part to fast-growing and strongly invasive plants. To this must be added the different soil structure in some sectors of RN Peñuelas under plantations of exotic species (*Pinus radiata*, *Eucalyptus globulus*) and the aggressive colonization by Australian acacias (*Acacia dealbata*, *A. melanoxylon*) (ICSA, 1980; CONAF, 1994).

Arroyo et al. (1995) indicate that the high percentage of endemic species is remarkable in all the protected wilderness areas of Chile's central zone, with values over 40%, which rise to 70% when native plants are included; introduced species thus do not exceed 30%. This is one of the characteristics which highlight the value of these areas as sites where our flora and vegetation units are preserved and protected (Luebert & Becerra, 1998; Hauenstein et al., 2009).

The high number of monocotyledons in the sector should also be noted, especially the abundance of bulb geophytes, which include the majority of species with conservation problems. It should be born in mind that these bear beautiful, brightly coloured flowers, and are especially important in the Bajo Los Lirios sector (CONAF, 1994, 2008; Hauenstein et al., 2009), where there are very brightly coloured and varied Orchidaceae, the Iridaceae, with lilies of the genera *Sisyrinchium* and *Olsynium*, and the tahay (*Calydorea xiphioides*) an "endangered" species which is very scarce throughout the central zone. There are other more frequent but no less beautiful species, like the lahue (*Herbertia lahue*), and flowers of the genera *Alstroemeria, Phycella, Rhodophiala* and *Calceolaria*, which are of aesthetic importance for recreation and use in gardening (Riedemann & Aldunate, 2001; Muñoz & Moreira, 2002).

Vegetation. The total phytosociology of the site consists of 19 plant associations, 6 of which are herbaceous, 7 scrub and 6 forest. With respect to the open espino scrub, also known as "espino or acacia steppe" (Pisano, 1956; CONAF, 1994), it should be made clear that strictly speaking it is not steppe but rather a savannah, as stated by Grau (1992), since the term steppe covers isolated vegetation with denuded surrounding soil and represents cold environments. Savannah on the other hand has isolated trees or thorny shrubs and a rich herbaceous stratum (Cabrera & Willink, 1973). This herbaceous stratum rich in forage species allows use of this type of community, at certain times of year, for grazing by domestic animals in RN Lago Peñuelas; this activity needs to be reviewed urgently by CONAF, since its effects on the biodiversity of the site are unknown.

The predominance of therophytes and geophytes in the biological spectrum of this plant formation is consistent with the climatic conditions and levels of precipitation in the area, since these life forms present morphological and physiological adaptations to the environmental conditions with extended periods of drought, and they are also important elements as food for wild fauna. The lower percentage of phanerophytes is explained by the low levels of precipitation in the area, and probably also the felling of native woody vegetation in the past. The scarcity of chamaephytes is due to the fact that this life form is adapted to conditions of low temperatures and greater altitude, such as are found only on El Roble and La Campana mountains (Cabrera & Willink, 1973; Ramírez, 1988; Grigera et al., 1996).

In the mixed sclerophyllous scrub, the important forms are the sclerophyllous phanerophytes and the therophytes; this also indicates the suitability of this type of plant formation to the climatic conditions of the area. The strong presence of hemicryptophytes indicates human alteration (Hauenstein et al., 1988). Numerous authors have carried out ecophysiological studies on mediterranean scrub species, explaining their ability to adapt to this type of environment, including Mooney & Kummerow (1971) on the drought response of *Flourensia thurifera, Kageneckia oblonga, Lithrea caustica* and *Proustia cinerea*; Montenegro et al. (1979) on the growth dynamic of *Colliguaja odorifera, Lithrea caustica, Satureja gilliesii* and *Retanilla trinervia*; Araya & Avila (1981) on the production of new shoots in scrub species affected by fire; and Avila et al. (1981) on the behaviour of herbaceous stratum species in scrub after a fire.

With respect to sclerophyllous forest, the predominance by phanerophytes and the importance of therophytes and hemicryptophytes are also consistent with the mediterranean climate of the area, since the species present adaptations which enable them to survive intense water stress, e.g. the presence of sclerophyllous leaves (Mooney & Kummerow, 1971), and the fires which are frequent in the area. For protection against fire, many develop a thick peridermis or a lignotuber, structures which enable them produce new shoots after a disaster (Araya & Avila, 1981). This community was classified by Oberdorfer (1960) in the class *Lithraeo causticae-Cryptocaryetea albae* and extends from 31° South to the limit of temperate territory (Aguilella & Amigo, 2001). There is no doubt that areas with this type of vegetation have been most affected by human action (Balduzzi et al., 1981, 1982).

At the same time, the remnants of hygrophilous forest, which requires conditions of greater humidity and precipitation, present absolute predominance of phanerophytes and nanophanerophytes (shrubs) over other life forms, indicating that the area would present high levels of rainfall, which is not the case. The explanation of the presence of this forest with hygrophilous characteristics at the site is based on the fact that it grows above a spring located in the Vega del Álamo sector, also known as the "abrevadero de caballos" [horse water-hole], which generates abundant water all year round, maintaining this community with azonal characteristics (Ramírez et al., 1996; Hauenstein et al., 2009).

The dry grassland is characterised by the predominance of hemicryptophytes, indicating strong human action, since these life forms are adapted to survive being trodden on and browsed by animals introduced by man; and of therophytes, indicating drought conditions (Hauenstein et al., 1988; Ramírez, 1988). In the wet grassland on the other hand, cryptophytes and hemicryptophytes predominate.

Reed beds are the most abundant and variable marsh associations in central-southern Chile, colonising marshes and banks of shallow lotic and lentic bodies of water (Ramírez & Añazco, 1982; Ramírez et al., 1987; San Martín et al., 1993). The same is true of sedge beds, which habitually accompany reed beds, forming a characteristic drier fringe. The principal species, *Cyperus eragrostis* and *Carex excelsa*, have sharp-edged leaves, from which their common name of "saw-sedges" derives (Hauenstein et al., 2002, 2005a).

The hydrophyte community corresponds to *Lemno-Azolletum*, characteristic of eutrophied aquatic environments (Palma et al., 1978); it is mentioned by Ramírez et al. (1987) as very abundant in lakes in Chile's central zone. Likewise, species such as *Hydrocotyle modesta* and

H. ranunculoides are indicators of organic contamination with nitrogen (Hauenstein et al., 2005b), which would corroborate the high trophic levels of Peñuelas lake; at the same time, this body of water and its associated flora form the habitat for a rich avifauna (Strang, 1983).

In this respect, Arroyo et al. (2005) propose, among other measures, the urgent need to complete inventories of flora of all the protected areas of central Chile; likewise they suggest analysing these areas at the scale of small polygons to evaluate their biological importance and vulnerability, elements which should form the basis for an integrated conservation strategy. Likewise, the findings of Armesto et al. (2002) and Simonetti (2004) are important, regarding the need to increase the number of protected areas, both public and private, to increase the size of existing areas, and to make use of the environment which surrounds them and which has suffered intervention, in order to create interconnectivity zones between them to serve as biological corridors. These units of conservation should consider representation of the different types of vegetation (Luebert & Becerra, 1998). Another interesting proposal is that of Elórtegui & Moreira (2002) for La Campana National Park, to zone areas for different types of use. In this context, Simonetti (1995) proposes the need for a model for planning the organization of these protected areas, linking the need to conserve natural resources with their sustainable use, which would be a basic support tool for defining which, where and how possible activities could be carried out, in such a way as would be compatible with conserving biodiversity.

3. Conclusions

The study reported here of the La Campana-Peñuelas Biosphere Reserve registered 420 species of vascular plants, of which 49% are of native origin, 28% correspond to endemic species and 23% to introduced species, respectively. Taxonomically, they are divided into 12 Pteridophytes, 3 Gymnosperms, 290 Dicotyledons (Magnoliopsida) and 115 Monocotyledons (Liliopsida), representing a high floral wealth. However, the percentage of allochthonous plants indicates a moderate degree of human disturbance. Eighteen species present conservation problems (2 Endangered, 13 Vulnerable, 2 Rare, 1 Insufficiently known). The vegetation at the site includes the presence of 19 plant communities, six of which are herbaceous, seven shrub and six arboreal. Important sectors exist of standing out in the Reserve such as: Los Lirios sector, which contains a high percentage of bulb species and numerous threatened species; the Vega del Álamo sector as a valuable remnant of hygrophilous forest; and the Ocoa sector due to the important presence of the endemic Chilean palm tree (*Jubaea chilensis*).

4. Appendix

Classification / Scientific name	Common name	Family	FV	OF	EC
PTERIDOPHYTA					
Adiantum chilense Kaulf. var. *hirsutum* Hook. et Grev.	Palito negro	Adiantaceae	Hc	N	
Adiantum excisum Kunze	Palito negro	Adiantaceae	Hc	N	
Adiantum scabrum Kaulf.	Palito negro	Adiantaceae	Hc	N	
Adiantum sulphureum Kaulf.	Palito negro	Adiantaceae	Hc	N	
Adiantum thalictroides Schlecht.	Palito negro	Adiantaceae	Hc	N	

Classification / Scientific name	Common name	Family	FV	OF	EC
Azolla filiculoides Lam.	Flor del pato	Azollaceae	Cr	N	
Blechnum cordatum (Desv.) Hieron	Costilla de vaca	Blechnaceae	Cr	N	**IC**
Blechnum hastatum Kaulf.	Palmilla	Blechnaceae	Hc	N	
Cheilanthes glauca (Cav.) Mett.	s.n.	Adiantaceae	Hc	N	
Cheilanthes hypoleuca (Kunze) Mett.	Doradilla	Adiantaceae	Hc	N	
Equisetum bogotense Kunth	Hierba del platero	Equisetaceae	Hc	N	
Notholaena tomentosa Desv.	s.n.	Adiantaceae	Hc	N	
GYMNOSPERMAE					
Cupressus macrocarpa Hartw.	Ciprés de Monterrey	Cupressaceae	F	I	
Ephedra chilensis C.Presl.	Pingo-pingo	Ephedraceae	Nf	N	
Pinus radiata D.Don	Pino insigne	Pinaceae	F	I	
MAGNOLIOPHYTA (ANGIOSPERMAE)					
MAGNOLIOPSIDA (Dicotyledoneae)					
Acacia caven (Molina) Molina	Espino	Mimosaceae	F	N	
Acacia dealbata Link	Aromo	Mimosaceae	F	I	
Acacia melanoxylon R.Br.	Aromo australiano	Mimosaceae	F	I	
Acaena pinnatifida Ruiz et Pav.	cadillo, pimpinela	Rosaceae	Hc	N	
Acrisione denticulata (Hook. et Arn.) B.Nord.	Palo de yegua	Asteraceae	Nf	E	
Adenopeltis colliguaya Bert.	Colliguay	Euphorbiaceae	Nf	N	
Adenopeltis serrata (W.T.Aiton) G.L.Webster	Colliguay macho	Euphorbiaceae	Nf	E	
Adesmia exilis Clos	Paramela	Fabaceae	Hc	E	
Adesmia tenella Hook. et Arn.	Trebillo	Fabaceae	Te	E	
Ageratina glechonophylla (Less.) R.M.King et H.Rob.	Barbón	Asteraceae	Nf	N	
Alonsoa meridionalis (L.f.) Kuntze	Ajicillo	Scrophulariaceae	Te	N	
Amsinckia calycina (Moris) Chater	Ortiguilla	Boraginaceae	Te	N	
Anagallis alternifolia Cav.	s.n.	Primulaceae	Hc	N	
Anagallis arvensis L.	Pimpinela azul	Primulaceae	Te	I	
Andeimalva chilensis (Gay) J.A.Tate	s.n.	Malvaceae	Nf	E	
Anemone decapetala Ard.	Centella	Ranunculaceae	Hc	N	
Anthemis cotula L.	Manzanillón	Asteraceae	Te	I	
Aristeguietia salvia (Colla) R.M.King et H.Rob.	Salvia macho	Asteraceae	Nf	E	
Aristolochia chilensis Bridges ex Lindl.	Oreja de zorro	Aristolochiaceae	Te	E	
Aristotelia chilensis (Molina) Stuntz	Maqui	Elaeocarpaceae	Nf	N	
Armeria maritima (Mill.) Willd.	s.n.	Plumbaginaceae	Hc	N	
Asteriscium chilense Cham. et Schltdl.	Anicillo	Apiaceae	Hc	N	
Astragalus berteroanus (Moris) Reiche	Yerba loca	Fabaceae	Te	N	
Azara celastrina D.Don	Lilén, corcolén	Flacourtiaceae	F	E	
Azara dentata Ruiz et Pav.	Corcolén	Flacourtiaceae	Nf	N	

Classification / Scientific name	Common name	Family	FV	OF	EC
Azara petiolaris (D.Don) I.M.Johnst.	Lilén, Corcolén	Flacourtiaceae	F	E	
Azara serrata Ruiz et Pav.	Lilén, Corcolén	Flacourtiaceae	F	E	
Azorella spinosa (Ruiz et Pav.) Pers.	Yerba santa	Apiaceae	Hc	N	
Baccharis linearis (Ruiz et Pav.) Pers.	Romerillo	Asteraceae	Nf	N	
Baccharis macraei Hook. et Arn.	Vautro	Asteraceae	Nf	N	
Baccharis paniculata DC.	Chilca	Asteraceae	Nf	N	
Baccharis rhomboidalis Remy	Vautro	Asteraceae	Nf	N	
Baccharis salicifolia (Ruiz et Pav.) Pers.	Chilca	Asteraceae	Nf	N	
Bahia ambrosioides Lag.	Manzanilla	Asteraceae	Nf	N	
Bartsia trixago L.	Belardia	Scrophulariaceae	Te	I	
Beilschmiedia miersii (Gay) Kosterm.	Belloto del norte	Lauraceae	F	E	**P**
Berberis actinacantha Mart.	Michay	Berberidaceae	Nf	E	
Blepharocalyx cruckshanksii (Hook. et Arn.) Nied.	Temo, Pitra, Picha	Myrtaceae	F	N	**V**
Bowlesia uncinata Colla	Barba de gato	Apiaceae	Te	N	
Brassica rapa L. ssp. *campestris* (L.) A.R.Clapham	Yuyo	Brassicaceae	Te	I	
Calandrinia compressa Schrad. ex DC.	s.n.	Portulacaceae	Te	N	
Calandrinia nitida (Ruiz et Pav.) DC.	s.n.	Portulacaceae	Te	N	
Calceolaria ascendens Lindl. ssp. *glandulifera*	Topa topa	Scrophulariaceae	Hc	E	
Calceolaria campanae Phil.	Topa topa	Scrophulariaceae	Hc	E	
Calceolaria corymbosa Ruiz et Pav.	Arguenita del cerro	Scrophulariaceae	Hc	E	
Calceolaria dentata Ruiz et Pav.	Capachito, topa-top	Scrophulariaceae	Hc	E	
Calceolaria glandulosa Poepp. ex Benth.	Capachito	Scrophulariaceae	Hc	E	
Calceolaria meyeniana Phil.	Capachito	Scrophulariaceae	Hc	E	
Calceolaria morisii Walp.	Capachito	Scrophulariaceae	Hc	E	
Calceolaria oreas Phil.	Capachito	Scrophulariaceae	Hc	E	
Calceolaria petioalaris Cav.	Capachito, topa-top	Scrophulariaceae	Hc	E	
Calceolaria polyfolia Hook.	Capachito	Scrophulariaceae	Nf	E	
Calceolaria purpurea Graham	Topa-topa	Scrophulariaceae	Hc	E	
Calceolaria thyrsiflora Graham	Hierba dulce	Scrophulariaceae	Hc	E	
Callitriche palustris L.	Huenchecó	Callitrichaceae	Cr	N	
Camissonia dentata (Cav.) Reiche	s.n.	Onagraceae	Te	N	
Capsella bursa-pastoris (L.) Medik.	Bolsa de pastor	Brassicaceae	Te	I	
Cardamine bonariensis Pers.	s.n.	Brassicaceae	Hc	N	
Cardionema ramosissimum (Weinm.) A.Nelson et J.F.Macbr.	Dicha	Caryophyllaceae	Hc	N	
Carduus pycnocephalus L.	Cardilla	Asteraceae	Te	I	
Centaurea melitensis L.	Cizaña, abrepuño	Asteraceae	Te	I	
Centaurea solstitialis L.	Cardo amarillo	Asteraceae	Te	I	

Classification / Scientific name	Common name	Family	FV	OF	EC
Cerastium fontanum Baumg.	Cerastio	Caryophyllaceae	Te	I	
Cestrum parqui L'Hér.	Palqui	Solanaceae	Nf	N	
Chaetanthera linearis Poepp. ex Less.	s.n.	Asteraceae	Te	E	
Chaetanthera microphylla (Cass.) Hook. et Arn.	s.n.	Asteraceae	Te	E	
Chenopodium album L.	Quinguilla	Chenopodiaceae	Te	I	
Chorizante virgata Benth.	Sanguinaria	Polygonaceae	Hc	E	
Chuquiraga oppositifolia D.Don	Hierba blanca	Compositae	Nf	N	
Cirsium vulgare (Savi) Ten.	Cardo negro	Asteraceae	Hc	I	
Cissus striata Ruiz et Pav.	Pilpilvoqui	Vitaceae	Ft	N	
Cistanthe grandiflora Lindl.	Pata de guanaco	Portulacaceae	Hc	E	
Citronella mucronata (Ruiz et Pav.) D.Don	Naranjillo	Icacinaceae	F	E	
Clarkia tenella (Cav.) F.H.Lewis et M.E.Lewis	Huasita	Onagraceae	Te	N	
Colletia hystrix Clos	Crucero	Rhamnaceae	Nf	N	
Colliguaja odorifera Molina	Colliguay	Euphorbiaceae	Nf	E	
Conium maculatum L.	Cicuta	Apiaceae	Te	I	
Convolvulus arvensis L.	Correhuela	Convolvulaceae	Hc	I	
Convolvulus chilensis Pers.	Correhuela rosada	Convolvulaceae	Hc	E	
Conyza sumatrensis (Retz.) E.Walker	s.n.	Asteraceae	Te	N	
Corrigiola squamosa Hook. et Arn.	Hierba del niño	Caryophyllaceae	Hc	N	
Cotula australis (Sieber ex Spreng.) Hook.f.	s.n.	Asteraceae	Te	I	
Cotula coronopifolia L.	Botón de oro	Asteraceae	Hc	I	
Crassula closiana (Gay) Reiche	Flor de piedra	Crassulaceae	Te	N	
Crinodendron patagua Molina	Patagua	Elaeocarpaceae	F	E	
Cryptantha aprica (Phil.) Reiche	s.n.	Boraginaceae	Te	E	
Cryptocarya alba (Molina) Looser	Peumo	Lauraceae	F	E	
Cuscuta chilensis Ker Gawl.	Cabello de ángel	Convolvulaceae	Fp	N	
Cyclospermum laciniatum (DC.) Constance	Capuchilla	Apiaceae	Te	N	
Cynara cardunculus L.	Cardo penquero	Asteraceae	Hc	I	
Dasyphyllum excelsum (DC.) Cabrera	Palo santo, Tayú	Compositae	F	E	
Dichondra sericea Sw.	Oreja de ratón	Convolvulaceae	Hc	N	
*Diplolepis menziesii*J.H.Schult.	Voquicillo	Asclepiadaceae	Ft	E	
Dipsacus sativus (L.) Honck.	Carda	Dipsacaceae	Te	N	
Drimys winteri J.R.Forst. et G.Forst.	Canelo	Winteraceae	F	N	
Echinopsis chiloensis (Colla) Friedrich et G.D.Rowley	Quisco	Cactaceae	Nf	E	
Eccremocarpus scaber Ruiz et Pav.	Chupa-chupa	Bignoniaceae	Ft	N	
Erigeron fasciculatus Colla	s.n.	Asteraceae	Hc	N	
Eriosyce curvispina (Bertero ex Colla) Katt.	Quisquito	Cactaceae	Nf	E	**V**
Erodium botrys (Cav.) Bertol.	Alfilerillo	Geraniaceae	Te	I	
Erodium cicutarium (L.) L'Hér. ex Aiton	Alfilerillo	Geraniaceae	Te	I	

Classification / Scientific name	Common name	Family	FV	OF	EC
Erodium malacoides (L.) L'Hér. ex Aiton	Alfilerillo	Geraniaceae	Te	I	
Erodium moschatum (L.) L'Hér. ex Aiton	Alfilerillo	Geraniaceae	Te	I	
Eryngium paniculatum Cav. et Dombey ex Delaroche	Cardoncillo	Apiaceae	Hc	N	
Escallonia myrtoidea Bertero ex DC.	Lun	Escalloniaceae	F	E	
Escallonia pulverulenta (Ruiz et Pav.) Pers.	Corontillo	Escalloniaceae	F	E	
Escallonia revoluta (Ruiz et Pav.) Pers.	Lun	Escalloniaceae	Nf	N	
Escallonia rubra (Ruiz et Pav.) Pers.	Siete camisas	Escalloniaceae	Nf	N	
Eschscholzia californica Cham.	Dedal de oro	Papaveraceae	Hc	I	
Eucalyptus globulus Labill.	Eucalipto	Myrtaceae	F	I	
Euphorbia klotzschii Oudejans	Pichoguilla	Euphorbiaceae	Te	N	
Euphorbia peplus L.	Pichoga	Euphorbiaceae	Te	I	
Fabiana imbricata Ruiz et Pav.	Pichi	Solanaceae	Nf	N	
Facelis retusa (Lam.) Sch. Bip.	s.n.	Asteraceae	Te	N	
Flourensia thurifera (Molina) DC.	Maravilla de campo	Asteraceae	Nf	E	
Fuchsia magellanica Lam.	Chilco	Onagraceae	Nf	N	
Fumaria capreolata L.	Flor de la culebra	Fumariaceae	Te	I	
Fumaria densiflora DC.	Flor de la culebra	Fumariaceae	Te	I	
Galium aparine L.	Lengua de gato	Rubiaceae	Te	I	
Galium hypocarpium (L.) Endl. ex Griseb.	Relbún	Rubiaceae	Hc	N	
Galium trichocarpum DC.	s.n.	Rubiaceae	Hc	E	
Gamochaeta coarctata (Willd.) Kerguélen	Nafalium	Asteraceae	Te	N	
Geranium berteroanum Colla	Core-core	Geraniaceae	Hc	N	
Geranium core-core Steud.	Core-core	Geraniaceae	Hc	N	
Glandularia laciniata (L.) Schnack et Covas	Hierba del incornio	Verbenaceae	Hc	N	
Gnaphalium cheiranthifolium Lam.	Vira-vira	Asteraceae	Hc	N	
*Gochnatia foliolosa (*D.Don) D.Don ex Hook. et Arn.	Mira-mira	Asteraceae	Hc	E	
Gunnera tinctoria (Molina) Mirb.	Nalca	Gunneraceae	Cr	N	
Haplopappus linifolius(Phil.) Reiche	s.n.	Asteraceae	C	N	
Haplopappus ochagavianus Phil.	s.n.	Asteraceae	C	N	
Haplopappus poeppigianus (Hook. et Arn.) A.Gray	s.n.	Asteraceae	C	N	
Haplopappus velutinus Remy ssp. *illinitus*	Buchú	Asteraceae	C	N	
Helenium aromaticum (Hook.) L.H.Bailey	Manzanilla	Asteraceae	Te	N	
Hydrocotyle modesta Cham. et Schlecht.	Sombrero de agua	Apiaceae	Cr	N	
Hydrocotyle ranunculoides L.f.	Sombrero de agua	Apiaceae	Cr	N	
Hypochaeris glabra L.	Hierba del chancho	Asteraceae	Te	I	
Hypochaeris radicata L.	Hierba del chancho	Asteraceae	Hc	I	
Hypochaeris scorzonerae (DC.) F. Muell.	Escorzonera	Asteraceae	Hc	E	

Classification / Scientific name	Common name	Family	FV	OF	EC
Kageneckia oblonga Ruiz et Pav.	Bollén	Rosaceae	F	E	
Lactuca serriola L.	Lechuguilla	Asteraceae	Te	I	
Lamiun amplexicaule L.	Gallito	Lamiaceae	Te	I	
Lardizabala biternata Ruiz et Pav.	Cóguil	Lardizabalaceae	Ft	N	
Lardizabala funaria (Molina) Looser	Cóguil	Lardizabalaceae	Ft	E	
Lathyrus berteroanus Colla	Clarincillo, arvejilla	Fabaceae	Hc	N	
Lathyrus magellanicus Lam.	Clarincillo, arvejilla	Fabaceae	Hc	N	
Leontodon saxatilis Lam.	Chinilla	Asteraceae	Hc	I	
Lepidium spicatum Desv.	s.n.	Brassicaceae	Hc	N	
Leucheria cerberoana Remy	s.n.	Asteraceae	Te	N	
Linum chamissonis Schied.	Nanco	Linaceae	Hc	N	
Linum macraei Benth.	Nanco	Linaceae	Hc	E	
Linum usitatissimum L.	Lino, linaza	Linaceae	Te	I	
Lithrea caustica (Molina) Hook. et Arn.	Litre	Anacardiaceae	F	E	
Loasa tricolor Ker Gawl.	Ortiga caballuna	Loasaceae	Te	N	
Loasa triloba Dombey ex Juss.	Ortiga blanca	Loasaceae	Te	N	
Lobelia excelsa Bonpl.	Tabaco del diablo	Campanulaceae	Nf	E	
*Lobelia polyphylla*Hook. et Arn.	Tupa	Campanulaceae	Nf	E	
Logfia gallica (L.) Coss. et Germ.	s.n.	Asteraceae	Te	I	
Lomatia hirsuta (Lam.) Diels ex J.F.Macbr.	Radal	Proteaceae	F	N	
Lotus subpinnatus Lag.	Porotillo	Fabaceae	Te	N	
Ludwigia peploides (Kunth) P.H.Raven ssp. *montevidensis*	Pasto de la rana	Onagraceae	Cr	N	
Luma chequen F.Phil.	Chequén, luma	Myrtaceae	F	E	
Lupinus microcarpus Sims	Arvejilla	Fabaceae	Te	N	
Lycium chilense Miers ex Bertero	Coralillo	Solanaceae	Nf	N	
Lythrum hyssopifolia L.	Hierba del toro	Lythraceae	Te	I	
Madia sativa Molina	Melosa, pegajosa	Asteraceae	Te	N	
Malesherbia linearifolia (Cav.) Pers.	s.n.	Malesherbiaceae	Hc	E	
Malesherbia sp.	s.n.	Malesherbiaceae	Hc	E	
Malva nicaensis All.	Malva	Malvaceae	Te	I	
Margyricarpus pinnatus (Lam.) Kuntze	Perlilla	Rosaceae	C	N	
Marrubium vulgare L.	Toronjil cuyano	Lamiaceae	Hc	I	
Matricaria chamomilla L.	Manzanilla	Asteraceae	Te	I	
Maytenus boaria Molina	Maitén	Celastraceae	F	N	
Medicago arabica (L.) Huds.	Hualputra	Fabaceae	Te	I	
Medicago polymorpha L.	Hualputra	Fabaceae	Te	I	
Melilotus indicus (L.) All.	Trevillo	Fabaceae	Te	I	
Mentha pulegium L.	Poleo	Lamiaceae	Hc	I	
Microseris pygmaea D.Don	s.n.	Asteraceae	Te	N	
Misodendrum linearifolium DC.	Injerto	Misodendraceae	Fp	N	
Monnina sp.	s.n.	Polygalaceae	Nf	N	

Classification / Scientific name	Common name	Family	FV	OF	EC
Muehlenbeckia hastulata (Sm.) I.M.Johnst.	Voqui negro	Polygonaceae	F	N	
Mulinum spinosum (Cav.) Pers.	Neneo	Umbelliferae	Nf	N	
Mutisia acerosa Poepp. ex Less.	Romerillo	Asteraceae	Nf	N	
Mutisia ilicifolia Cav.	Clavel del aire	Asteraceae	Ft	E	
Mutisia latifolia D.Don	Clavel del campo	Asteraceae	Ft	E	
Mutisia rosea Poepp. ex Less.	Clavel del campo	Asteraceae	Ft	E	
Mutisia subulata Ruiz et Pav.	Hierba del jote	Asteraceae	Ft	N	
Myrceugenia exsucca (DC.) O.Berg	Pitra, petra	Myrtaceae	F	N	
Myrceugenia obtusa (DC.) O.Berg	Arrayán, rarán	Myrtaceae	F	E	
Myriophyllum aquaticum (Vell.) Verdc.	Pinito de agua	Haloragaceae	Cr	N	
Nasturtium officinale R.Br.	Berro	Brassicaceae	Hc	I	
Nicotiana acuminata (Graham) Hook.	Tabaco del campo	Solanaceae	Te	N	
Nothofagus macrocarpa(A.DC.) F.M.Vázquez et R.A.Rodr.	Roble	Nothofagaceae	F	E	
Oenothera acaulis Cav.	Diego de la noche	Onagraceae	Hc	N	
Oenothera affinis Spach	Diego de la noche	Onagraceae	Te	N	
Otholobium glandulosum (L.) J.W.Grimes	Culén	Fabaceae	Nf	N	
Oxalis articulata Savign.	Culle	Oxalidaceae	Cr	N	
Oxalis corniculata L.	Vinagrillo	Oxalidaceae	Hc	I	
Oxalis laxa Hook. et Arn.	Culle	Oxalidaceae	Te	N	
Oxalis megalorrhiza Jacq.	Vinagrillo	Oxalidaceae	Hc	N	
Oxalis micrantha Bertero ex Colla	Vinagrillo	Oxalidaceae	Hc	N	
Oxalis perdicaria (Molina) Bertero	Flor de la perdiz	Oxalidaceae	Cr	N	
Oxalis rosea Jacq.	Culle, vinagrillo	Oxalidaceae	Te	E	
Persea lingue Nees.	Lingue	Lauraceae	F	N	**V**
Peumus boldus Molina	Boldo	Monimiaceae	F	E	
Phacelia circinata Jacq.	Té de burro	Hydrophyllaceae	Hc	N	
Phacelia secunda J.F.Gmel.	Té de burro	Hydrophyllaceae	Hc	N	
Phyla canescens (Kunth) Greene	Hierba de la Virgen	Verbenaceae	Hc	N	
Plagiobothrys procumbens A.Gray	s.n.	Boraginaceae	Te	N	
Plantago hispidula Ruiz et Pav.	s.n.	Plantaginaceae	Te	N	
Plantago lanceolata L.	Siete venas	Plantaginaceae	Hc	I	
Podanthus mitiqui Lindl.	Mitique	Asteraceae	Nf	E	
Polygonum hydropiperoides Michx.	Duraznillo	Polygonaceae	Hc	N	
Polygonum persicaria L.	Duraznillo	Polygonaceae	Te	I	
Populus deltoides Bartram ex Marshall	Alamo americano	Salicaceae	F	I	
Populus nigra L.	Alamo negro	Salicaceae	F	I	
Porliera chilensis Johnst.	Guayacán	Zygophyllaceae	Nf	E	
Proustia pyrifolia DC.	Voqui blanco	Asteraceae	Ft	E	
Quillaja saponaria Molina	Quillay	Rosaceae	F	E	
Quinchamalium chilense Molina	Quinchamalí	Santalaceae	Hc	N	
Ranunculus chilensis DC.	Ranúnculo	Ranunculaceae	Te	N	
Ranunculus muricatus L.	Centella, huante	Ranunculaceae	Hc	I	

Classification / Scientific name	Common name	Family	FV	OF	EC
Rapistrum rugosum (L.) All.	Falso yuyo	Brassicaceae	Te	I	
Retanilla ephedra(Vent.) Brongn.	Retamilla	Rhamnaceae	Nf	E	
Retanilla trinervia (Guillies et Hook.) Hook. et Arn.	Trevo, tebo	Rhamnaceae	Nf	E	
Rhaphithamnus spinosus (Juss.) Moldenke	Arrayán macho	Verbenaceae	F	N	
Ribes punctatum Ruiz et Pav.	Zarzaparrilla	Grossulariaceae	Nf	N	
Robinia pseudoacacia L.	Falsa acacia	Fabaceae	F	I	
Rosa moschata Herrm.	Mosqueta, coral	Rosaceae	Nf	I	
Rubus ulmifolius Schott	Zarzamora, mora	Rosaceae	Nf	I	
Rumex acetosella L.	Vinagrillo	Polygonaceae	Hc	I	
Rumex conglomeratus Murray	Romaza	Polygonaceae	Hc	I	
Rumex crispus L.	Romaza	Polygonaceae	Hc	I	
Rumex pulcher L.	Romaza	Polygonaceae	Hc	I	
Sagina apetala Ard.	s.n.	Caryophyllaceae	Te	I	
Salix babylonica L.	Sauce llorón	Salicaceae	F	I	
Salix humboldtiana Willd.	Sauce amargo	Salicaceae	F	N	
Sanicula crassicaulis Poepp. ex DC.	Pata de leon	Apiaceae	Hc	N	
Satureja gilliesii (Graham) Briq.	Menta de árbol	Lamiaceae	Nf	E	
Schinus latifolia (Gillies ex Lindl.) Engler	Molle	Anacardiaceae	F	E	
Schinus montana (Phil.) Engler	Litrecillo	Anacardiaceae	F	E	
Schinus polygama (Cav.) Cabrera	Huingán, borocoi	Anacardiaceae	Nf	N	
Schizanthus hookeri Gillies ex Graham	Mariposita	Solanaceae	Hc	N	
Schizanthus litoralis Phil.	Pajarito, mariposita	Solanaceae	Te	E	
Schizanthus pinnatus Ruiz et Pav.	Mariposita	Solanaceae	Te	E	
Schizanthus tricolor Grau et E.Gronbach	Mariposita	Solanaceae	Te	N	
Senecio adenotrichius DC.	s.n.	Asteraceae	Hc	N	
Senecio anthemidiphyllus Remy	Senecio	Asteraceae	Nf	E	
Senecio farinifer Hook. et Arn.	Senecio	Asteraceae	Nf	E	
Senecio aff. macratus Kunze	Senecio	Asteraceae	Nf	N	
Senna candolleana (Vogel) H.S.Irwin et Barneby	Quebracho	Caesalpiniaceae	F	N	
Silene gallica L.	Calabacillo	Caryophyllaceae	Te	I	
Silybum marianum (L.) Gaertn.	Cardo blanco	Asteraceae	Te	I	
Solanum furcatum Dunal ex Poir.	Yerba mora	Solanaceae	Te	N	
Solanum tomatillo (J.Remy) F.Phil.	Tomatillo	Solanaceae	Te	N	
Soliva sessilis Ruiz et Pav.	Dicha	Asteraceae	Te	N	
Sonchus asper (L.) Hill.	Ñilhue	Asteraceae	Te	I	
Sonchus oleraceus L.	Ñilhue	Asteraceae	Te	I	
Sophora macrocarpa Sm.	Mayu	Fabaceae	F	E	
Sphacele salviae (Lindl.) Briq.	Salvia	Lamiaceae	Nf	E	
Spergularia media (L.) C.Presl ex Griseb.	Tiqui-tiqui	Caryophyllaceae	Te	I	
Stachys albicaulis Lindl.	Hierba Santa Rosa	Lamiaceae	Hc	E	

Classification / Scientific name	Common name	Family	FV	OF	EC
Stachys grandidentata Lindl.	Toronjilcillo	Lamiaceae	Hc	E	
Stellaria chilensis Pedersen	Quilloi-quilloi	Caryophyllaceae	Hc	N	
Stellaria media (L.) Cirillo	Quilloi-quilloi	Caryophyllaceae	Te	I	
Stenandrium dulce (Cav.) Nees	Hierba de la piñada	Acanthaceae	Hc	N	
Teucrium bicolor Sm.	Oreganillo	Lamiaceae	Nf	E	
Torilis nodosa (L.) Gaertn.	s.n.	Apiaceae	Te	I	
Trifolium dubium Sibth.	Trebillo	Fabaceae	Te	I	
Trifolium polymorphum Poir.	Trébol	Fabaceae	Hc	N	
Trifolium subterraneum L.	Trébol subterráneo	Fabaceae	Cr	I	
Triptilion spinosum Ruiz et Pav.	Siempre viva	Asteraceae	Hc	N	
Tristerix aphyllus (Miers ex DC.) Tiegh. ex Barlow et Wiens	Quintral del quisco	Loranthaceae	Fp	E	
Tristerix corymbosus (L.) Kuijt	Quintral del álamo	Loranthaceae	Fp	N	
Tropaeolum azureum Miers.	Violeta del campo	Tropaeolaceae	Ft	E	
Tropaeolum ciliatum Ruiz et Pav.	Pajarito	Tropaeolaceae	Ft	E	
Tropaeolum tricolor Sweet	Soldadito, relicario	Tropaeolaceae	Ft	E	
Tweedia birostrata (Hook. et Arn.) Hook. et Arn.	Zahumerio	Asclepiadaceae	Ft	E	
Urtica urens L.	Ortiga	Urticaceae	Te	I	
Valeriana lepidota Clos	Valeriana	Valerianaceae	Cr	E	
Valeriana verticillata Clos	Valeriana	Valerianaceae	Hc	N	
Verbascum virgatum Stokes	Raspa la choica	Scrophulariaceae	Te	I	
Verbena bonariensis L.	Verbena	Verbenaceae	Hc	N	
Veronica anagallis-aquatica L.	No me olvides	Scrophulariaceae	Cr	I	
Veronica arvensis L.	Verónica	Scrophulariaceae	Te	I	
Vicia magnifolia Clos	Arvejilla	Fabaceae	Te	N	
Vicia mucronata Clos	Arvejilla	Fabaceae	Te	N	
Vicia nigricans Hook. et Arn.	Arvejilla	Fabaceae	Te	N	
Vicia sativa L.	Arvejilla, clarincillo	Fabaceae	Te	I	
Viola sp.	Violeta del campo	Violaceae	Te	N	
Viviania marifolia Cav.	Te de burro	Vivianiaceae	Nf	N	
LILIOPSIDA (Monocotyledoneae)					
Agrostis capillaris L.	Chépica	Poaceae	Hc	I	
Aira caryophyllea L.	s.n.	Poaceae	Te	I	
Alisma plantago-aquatica L.	Llantén de agua	Alismataceae	Cr	I	
Alstroemeria angustifolia Herb.	Lirio del campo	Alstroemeriaceae	Cr	E	
Alstroemeria garaventae Ehr.Bayer	Lirio del campo	Alstroemeriaceae	Cr	E	**R**
Alstroemeria hookeri Lodd. ssp. *recumbens*	Lirio del campo	Alstroemeriaceae	Cr	N	**V**
Alstroemeria ligtu L. ssp. *simsii*	Lirio del campo	Alstroemeriaceae	Cr	E	
Alstroemeria pulchra Sims ssp. *pulchra*	Lirio del campo	Alstroemeriaceae	Cr	E	

Classification / Scientific name	Common name	Family	FV	OF	EC
Alstroemeria revoluta Ruiz et Pav.	Lirio del campo	Alstroemeriaceae	Cr	E	
Alstroemeria zoellneri Ehr.Bayer	Lirio del campo	Alstroemeriaceae	Cr	E	**R**
Avena barbata Pott ex Link	Teatina	Poaceae	Te	I	
Bipinnula mystacina Lindl.	Orquídea	Orchidaceae	Cr	E	
Bipinnula plumosa Lindl.	Orquídea	Orchidaceae	Cr	E	
Bomarea salsilla Mirb.	Bomarea	Alstroemeriaceae	Ft	N	
Brachystele unilateris (Poir.) Schltr.	Orquídea	Orchidaceae	Cr	E	
Briza maxima L.	Tembladera	Poaceae	Te	I	
Briza minor L.	Pasto perdiz	Poaceae	Te	I	
Bromus catharticus Vahl	Pasto lanco	Poaceae	Hc	N	
Bromus hordeaceus L.	Bromo, cebadilla	Poaceae	Te	I	
Calydorea xiphioides (Poepp.) Espinosa	Tahay, violeta	Iridaceae	Cr	E	**P**
Carex excelsa Poepp. ex Kunth	Cortadera	Cyperaceae	Cr	N	
Carex setifolia Kunze ex Kunth	Cortadera	Cyperaceae	Cr	N	
Carex sp.	s.n.	Cyperaceae	Cr	N	
Chascolytrum subaristatum (Lam.) Desv.	Tembladera	Poaceae	Te	N	
Chloraea barbata Lindl.	Orquídea	Orchidaceae	Cr	E	
Chloraea bletioides Lindl.	Lengua de loro	Orchidaceae	Cr	E	
Chloraea chrysantha Poepp.	Orquídea	Orchidaceae	Cr	E	
Chloraea cylindrostachya Poepp.	Orquídea	Orchidaceae	Cr	N	
Chloraea disoides Lindl. var. *picta*	Orquídea	Orchidaceae	Cr	N	**V**
Chloraea galeata Lindl.	Orquídea	Orchidaceae	Cr	E	
Chloraea heteroglossa Rchb. f.	Orquídea	Orchidaceae	Cr	E	**V**
Chloraea incisa Poepp.	Orquídea	Orchidaceae	Cr	E	
Chloraea multiflora Lindl.	Orquídea	Orchidaceae	Cr	E	
Chloraea virescens (Willd.) Lindl.	Orquídea	Orchidaceae	Cr	N	
Chusquea cumingii Nees	Coligüe, quila	Poaceae	Nf	E	
Conanthera bifolia Ruiz et Pav.	Pajarito del campo	Tecophilaeaceae	Hc	E	
Conanthera campanulata (D.Don) Lindl.	Flor de la viuda	Tecophilaeaceae	Hc	E	
Conanthera trimaculata (D.Don) F.Meigen	Flor de la viuda	Tecophilaeaceae	Hc	E	**V**
Cynodon dactylon (L.) Pers.	Pasto bermuda	Poaceae	Hc	I	
Cynosurus echinatus L.	Cola de zorro	Poaceae	Te	I	
Cyperus eragrostis Lam. var. *compactus*	Cortadera	Cyperaceae	Cr	N	
Cyperus eragrostis Lam. var. *eragrostis*	Cortadera	Cyperaceae	Cr	N	
Dioscorea parviflora Phil.	Papa cimarrona	Dioscoreaceae	Cr	N	
Dioscorea saxatilis Poepp.	Papa cimarrona	Dioscoreaceae	Cr	N	
Distichlis spicata (L.) Greene	Pasto salado	Poaceae	Cr	N	
Echinochloa colonum (L.) Link	Hualcacho	Poaceae	Te	N	
Eleocharis pachycarpa E.Desv.	Rume	Cyperaceae	Hc	N	
Eleocharis radicans (Poir.) Kunth	Rume	Cyperaceae	Hc	N	
Elodea potamogeton (Bertero) Espinosa	Luchecillo	Hydrocharitaceae	Cr	N	
Eragrostis virescens J.Presl.	s.n	Poaceae	Te	N	
Festuca sp.	Coirón	Poaceae	Hc	N	

Classification / Scientific name	Common name	Family	FV	OF	EC
Gastridium phleoides (Nees et Meyen) C.E.Hubb.	s.n	Poaceae	Te	I	
Gavilea venosa (Lam.) Garay et Ormd.	Orquídea	Orchidaceae	Cr	N	
Gavilea leucantha Poepp. et Endl.	Orquídea	Orchidaceae	Cr	N	
Gavilea longibracteata (Lindl.) Sparre ex L.E.Navas	Orquídea	Orchidaceae	Cr	E	
Gilliesia graminea Lindl.	Junquillo	Alliaceae	Cr	N	
Herbertia lahue (Molina) Goldblat	Lahue	Iridaceae	Cr	N	**V**
Hordeum chilense Roem. et Schult.	Cebadilla	Poaceae	Hc	N	
Hordeum murinum L.	Cebadilla	Poaceae	Te	I	
Isolepis cernua (Vahl) Roem. et Schult.	s.n	Cyperaceae	Cr	N	
Jubaea chilensis Baill.	Palma de coquitos	Arecaceae	F	E	**V**
Juncus acutus L.	Junquillo	Juncaceae	Hc	N	
Juncus bufonius L.	Junquillo	Juncaceae	Te	I	
Juncus cyperoides Laharpe	Junco	Juncaceae	Hc	N	
Juncus imbricatus Laharpe	Junquillo	Juncaceae	Cr	N	
Juncus pallescens Lam.	Junco	Juncaceae	Hc	N	
Juncus stipulatus Nees et Meyen	Junco	Juncaceae	Hc	N	
Lemna valdiviana Phil.	Lenteja de agua	Lemnaceae	Cr	N	
Leucocoryne ixioides (Sims) Lindl.	Huilli	Alliaceae	Cr	E	**V**
Leucocoryne violacescens Phil.	Huilli	Alliaceae	Cr	E	**V**
Lolium multiflorum Lam.	Ballica italiana	Poaceae	Te	I	
Lolium perenne L.	Ballica inglesa	Poaceae	Hc	I	
Luzula racemosa Desv.	Lúzula	Juncaceae	Cr	N	
Melica longiflora Steud.	s.n	Poaceae	Hc	E	
Melica violacea Cav.	s.n	Poaceae	Te	N	
Nassella chilensis (Trin.) E.Desv.	Coironcillo	Poaceae	Hc	E	
Nassella gigantea (Steud.) M.Muñoz	s.n	Poaceae	Hc	N	
Nassella manicata (Desv.) Barkworth	s.n	Poaceae	Hc	N	
Nothoscordum gramineum (Sims) Beauverd	Huilli de perro	Alliaceae	Cr	N	
Olsynium junceum (E.Mey. ex C.Presl) Goldblatt	Huilmo, ñuño	Iridaceae	Cr	N	
Oziroe biflora (Ruiz et Pav.) Speta	Cebolleta	Hyacinthaceae	Cr	N	
Pasithea caerulea (Ruiz et Pav.) D.Don	Azulillo	Anthericaceae	Cr	N	
Paspalum dilatatum Poir.	Chépica gigante	Poaceae	Cr	N	
Paspalum vaginatum Sw.	Chépica	Poaceae	Cr	N	
Phleum pratense L.	s.n	Poaceae	Hc	I	
Phycella bicolor Herb.	Añañuca	Amaryllidaceae	Cr	E	**V**
Phycella ignea (Lindl.) Lindl.	Añañuca de fuego	Amaryllidaceae	Cr	E	
Piptochaetium montevidense (Spreng.) Parodi	s.n	Poaceae	Hc	N	
Piptochaetium panicoides (Lam.) Desv.	s.n	Poaceae	Hc	N	
Piptochaetium stipoides (Trin. et Rupr.) Hackel	s.n	Poaceae	Te	N	

Classification / Scientific name	Common name	Family	FV	OF	EC
Placea ornata Miers	Macaya	Amaryllidaceae	Cr	E	
Poa annua L.	Pasto piojillo	Poaceae	Te	I	
Potamogeton pusillus L.	Huiro	Potamogetonaceae	Cr	N	
Puya berteroana Mez.	Chagual	Bromeliaceae	Hc	N	
Puya chilensis Molina	Chagual, cardón	Bromeliaceae	Hc	N	**V**
Puya coerulea Lindl.	Chagual chico	Bromeliaceae	Hc	E	
Rhodophiala advena (Ker Gawl.) Traub.	Añañuca	Amaryllidaceae	Cr	E	
Rostraria cristata (L.) Tzvelev	s.n	Poaceae	Te	I	
Schoenoplectus californicus (C.A.Mey.) Soják	Totora, estoquilla	Cyperaceae	Cr	N	
Scirpus asper J.Presl et C.Presl	s.n	Cyperaceae	Cr	N	
Setaria parviflora (Poir.) Kerguélen	s.n	Poaceae	Hc	N	
Sisyrinchium arenarium Poepp.	Huilmo, ñuño	Iridaceae	Hc	E	
Sisyrinchium chilense Hook.	Huilmo, ñuño	Iridaceae	Hc	E	
Sisyrinchium cuspidatum Poepp.	Huilmo, ñuño	Iridaceae	Hc	E	
Solenomelus pedunculatus (Guillies ex Hook.) Hochr.	Maicillo	Iridaceae	Hc	N	
Solenomelus segethii (Phil.) Kunze	Clavelillo	Iridaceae	Hc	N	
Stipa sp.	Flechilla	Poaceae	Hc	N	
Tecophilaea violiflora Bertero ex Colla	Violeta hojas largas	Tecophilaeaceae	Hc	N	
Tillandsia usneoides L.	Barba de viejo	Bromeliaceae	Fe	N	
Trichopetalum plumosum (Ruiz et Pav.) J.F.Macbr.	Flor de la plumilla	Anthericaceae	Cr	N	
Tristagma bivalve (Lindl.) Traub	s.n	Alliaceae	Cr	N	
Typha angustifolia L.	Vatro	Typhaceae	Cr	N	
Uncinia trichocarpa C.A.Mey.	Clin clin	Cyperaceae	Hc	N	
Vulpia bromoides (L.) Gray	Pasto sedilla	Poaceae	Te	I	
Vulpia myuros (L.) C.C.Gmel.	Pasto sedilla	Poaceae	Te	I	

Table 2. Checklist of the flora of La Campana-Peñuelas Biosphere Reserve (FV = life form, OF = geographic origin, EC = condition of conservation, F = phanerophyte, Nf = nanophanerophyte, Hc = hemicryptophyte, Cr= cryptophyte, C = chamaephyte, Te= terophyte, Fe= epiphyte, Ft= vine, Fp= parasite, N = native, I = introduced, P = threatened, R= rare, V = vulnerable, IC = insufficiently known).

5. Acknowledgements

Thanks to the staff and park wardens of CONAF, Valparaiso Region, for their support in field activities and for facilitating the photographies, bibliographic and cartographic information.

6. References

Aguilella, A.; Amigo, J. (2001). Vegetation transects in central-southern Chile. In: Gómez-Mercado, T. & Mota-Poveda, J. eds. *Vegetación y cambios climáticos*. Spain. University of Almería. pp. 87-101.

Araya, S. & Avila, G. (1981). New shoot production in shrubs affected by fire in "Chilean scrub". *Anales del Museo de Historia Natural de Valparaíso* 14:99-105.

Armesto, J.; Papic, C. & Pliscoff, P. (2002). Importance of small wilderness areas for the conservation of biodiversity in native forest. *Ambiente y Desarrollo* 18:44-50.

Arroyo, MTK.; Cavieres, L.; Marticorena, C. & Muñoz, M. (1995). Convergence in the mediterranean floras of central Chile and California: Insights from comparative biogeography. In: Arroyo, MTK.; Fox, M. & Zedler, P. eds. *Ecology and biogeography of mediterranean ecosystems in Chile, California, and Australia*. New York. Springer-Verlag. pp. 43-88.

Arroyo, MTK.; Matthei, O.; Marticorena, C.; Muñoz, M.; Pérez, F. & Humaña, AM. (2000). The vascular plant flora of the Bellotos del Melado National Reserve, VII Region, Chile: a documented checklist. *Gayana Botánica* 57:117-139.

Arroyo, MTK.; Matthei, O.; Muñoz-Schick, M.; Armesto, JJ.; Pliscoff, P.; Pérez, F. & Marticorena, C. (2005). Flora of four National Reserves in the Coastal Range of the VII Region (35°-36° S), Chile, and its role in the protection of regional biodiversity. In: Smith-Ramírez, C.; Armesto, JJ. & Valdovinos C. eds. *Historia, biodiversidad y ecología de los bosques costeros de Chile*. Santiago, Chile. Editorial Universitaria. pp. 225-244.

Avila, G.; Aljaro, ME. & Silva, B. (1981). Observations in the herbaceous stratum of scrub after fire. *Anales Museo de Historia Natural de Valparaíso* 14:107-113.

Baeza, M.; Barrera, E.; Flores, J.; Ramírez, C. & R. Rodríguez. 1998. Conservation categories of native Chilean Pteridophyta. *Boletín Museo Nacional de Historia Natural, Chile* 47: 23-46.

Balduzzi, A.; Serey, I.; Tomaselli, R. & Villaseñor, R. (1981). New phytosociological observations on the mediterranean type of climax vegetation of central Chile. *Atti Istituto Botanico Laboratori Crittogamico di Pavia*, serie 6, 14:93-112.

Balduzzi A.; Tomaselli, R.; Serey, I. & Villaseñor, R. (1982). Degradation of the mediterranean type of vegetation in central Chile. *Ecología Mediterránea* 8:223-240.

Belmonte, E.; Faúndez, L.; Flores, J.; Hoffmann, A.; Muñoz, M. & Teillier, S. (1998). Conservation categories of native Chilean cactaceae. *Boletín Museo Nacional de Historia Natural, Chile* 47:69-89.

Benoit, IL. ed. 1989. *Red book of Chilean terrstrial flora*. Santiago, Chile. CONAF. 157 pp.

Braun-Blanquet, J. (1964). *Plant sociology – features of phytosociology.* Wien. Springer Verlag. 865 pp.

Braun-Blanquet, J. 1979. *Phytosociology. Basis for the study of plant communities*. Madrid. Blume. 686 pp.

Cabrera, AL. & Willink, A. (1973). *Biogeography of Latin America.* Washington D.C. Biology Series, Monograph N° 13, Regional Program for Scientific and Technological Development, Departament of Scientific Affairs, General Secretariat of the Organization of American States. 120 pp.

Cavieres, LA.; Mihoc, M.; Marticorena, A.; Marticorena, C.; Matthei, O. & Squeo, FA. (2001). Determination of priority areas for conservation: Parsimony Analysis of Endemicity (PAE) in the flora of the IV (Coquimbo) Region. In: Squeo FA, G Arancio, JR Gutiérrez eds. *Libro rojo de la flora nativa y de los sitios prioritarios para su conservación: Región de Coquimbo. La Serena, Chile.* University of La Serena. pp. 159-170.

CONAF (Corporación Nacional Forestal). (1986). *Management plan, Lago Peñuelas Forest Reserve.* Santiago, Chile. National Forest Corporation. Working Document N° 77. 20 pp.

CONAF (Corporación Nacional Forestal). (1992). *National Parks and Natural Monuments of Chile*. Santiago, Chile. National Forest Corporation. 2 pp.

CONAF (Corporación Nacional Forestal). (1994). *Report on the floral wealth of the Bajo los Lirios sector. Lago Peñuelas National Reserve.* Santiago, Chile. National Forest Corporation. Technical Bulletin u/n. 15 pp.

CONAF (Corporación Nacional Forestal). (2008). *Biosphere Reserve La Campana-Peñuelas (Offer of Extension).* Document bases MAB Program - UNESCO. National Forest Corporation, Region of Valparaiso, Chile. 188 pp.

CONAF & CONAMA (Corporación Nacional Forestal, CL - Comisión Nacional del Medio Ambiente, CL). (1999). *Register and evaluation of Chilean native vegetation resources.* Regional Report, Fifth Region. Santiago, Chile. Project CONAF-CONAMA-BIRF. 141 pp.

DI Castri, F. & Hajek, E. (1976). *Bioclimatology of Chile.* Santiago, Chile. Catholic University of Chile. 128 pp.

Ellenberg, H. & Mueller-Dombois, D. (1966). A key to Raunkiaer plant life forms with revised subdivisions. *Ber. Geob. Inst. ETH Stiftung Rubel, Zurich* 37:56-73.

Elórtegui, S. & Moreira-Muñoz, A. eds. (2002). *La Campana National Park: Origin of a Biosphere Reserve in central Chile.* Santiago, Chile. Taller La Era. 176 pp.

Gajardo, R. (1995). *Chile's natural vegetation. Classification and distribution.* Santiago, Chile. Editorial Universitaria. 165 pp.

González, A. (2000). *Evaluation of vegetation resources in the Budi river basin, current situation and proposals for management*. Degree Thesis in Natural Resources. Temuco, Chile. Faculty of Sciences, Catholic University of Temuco. 110 pp.

Grau, J. (1992). The central zone of Chile. In: Grau, J. & Zizka, G. eds. Chilean wild flora. *Palms, special volume* 19: 1-154.

Grigera, D.; Brion, C.; Chiapella, JO. & Pillado, MS. (1996). Plant life forms as indicators of environmental factors. *Medio Ambiente* 13:11-29.

Hauenstein, E.; Ramírez, C.; Latsague, M. & Contreras, D. (1988). Phytogeographic origin and biological spectrum as a means for measuring the degree of human intervention in plant communities. *Medio Ambiente* 9:140-142.

Hauenstein, E.; González, M.; Peña, F. & Muñoz, A. (2002). Classification and characterization of the flora and vegetation coastal wetlands of Toltén (IX Region, Chile). *Gayana Botánica* 59:87-100.

Hauenstein, E.; González, M.; Peña-Cortés, F. & Muñoz-Pedreros, A. (2005a). Plant diversity in coastal wetlands of the Araucanía Region. In: Smith-Ramírez, C.; Armesto, JJ. & Valdovinos, C. eds. *Historia, biodiversidad y ecología de los bosques costeros de Chile.* Santiago, Chile. Editorial Universitaria. pp. 197-205.

Hauenstein, E.; González, M.; Peña-Cortés, F. & Falcón, L. (2005b). Indicator plants for eutrophisation in lakes of southern Chile. In: Vila, I. & Pizarro, J. eds. *Eutrofización de lagos y embalses.* Iberoamerican Programme of Science and Technology for Development Desarrollo (CYTED – University of Chile). Santiago, Chile. Patagonia Impresores. pp. 119-133.

Hauenstein, E.; Muñoz-Pedreros, A.; Yáñez, J.; Sánchez, P.; Möller, P.; Guiñez, B. & Gil, C. (2009). Flora and vegetation of the Peñuelas Lake National Reserve. Biosphere Reserve, Region of Valparaiso, Chile. *BOSQUE* 30(3): 159-179.

Hoffmann, A. (1978). *Wild flora of Chile, central zone.* 1st ed. Santiago, Chile. Claudio Gay Foundation. 255 pp.

Hoffmann, A. (1991). *Wild flora of Chile, Araucana zone.* 2nd ed. Santiago, Chile. Claudio Gay Foundation. 257 pp.

Hoffmann, A.; Arroyo, MK.; Liberona, F.; Muñoz, M. & Watson, J. (1998). *High Andean plants in the wild flora of Chile.* Santiago, Chile. Claudio Gay Foundation. 281 pp.

ICSA (Ingenieros Consultores Asociados S.A.). (1980). S*tudy of proposals for integrated development potential of the Lago Peñuelas Forest Reserve.* Santiago, Chile. ICSA-CONAF. 187 pp.

IPNI (International Plant Names Index). (2011). The International Plant Names Index. Consulted 10 Jul 2011. Available at http://www.ipni.org/

Koeppen, W. (1931). The earth's climate. Berlin. Outline of climatology. 182 pp.

Koeppen, W. (1948). *Climatology.* Mexico. Economic Culture Fund. 350 pp.

Looser, G. (1927). *Nothofagus, Cyttaria* and *Myzodendron* on El Roble mountain. *Revista Chilena de Historia Natural* 31: 288-290.

Looser, G. (1944). Phytosociological notes on the Quintero region. *Revista Universitaria* 29: 27-33.

Luebert, F. & Becerra, P. (1998). Plant representativeness of the National System for State-Protected Wilderness Areas (SNASPE) in Chile. *Ambiente y Desarrollo* 14(2):62-69.

Luebert, F. & Pliscoff, P. (2006). *Bioclimate and vegetation synopsis of Chile*. Santiago, Chile. Editorial Universitaria. 307 pp.

Marticorena, C. & Quezada, M. (1985). Catalogue of the vascular flora of Chile. *Gayana Botánica* 42:1-155.

Marticorena, C & Rodríguez, R. eds. (1995). *Flora of Chile. Vol. 1. Pteridophyta- Gymnospermae.* Concepción, Chile. University of Concepción. 351 pp.

Marticorena, C. & Rodríguez, R. eds. (2001). *Flora of Chile. Vol. 2(1) .Winteraceae-Ranunculaceae.* Concepción, Chile. University of Concepción. 99 pp.

Marticorena, C & Rodríguez, R. eds. (2003). *Flora of Chile. Vol. 2(2). Berberidaceae-Betulaceae.* Concepción, Chile. University of Concepción. 93 pp.

Marticorena, C. & Rodríguez, R. eds. (2005). *Flora of Chile.Vol. 2(3). Plumbaginaceae - Malvaceae*. Concepción, Chile. University of Concepción. 128 pp.

Marticorena, C.; Von Bohlen, C.; Muñoz, M. & Arroyo, MK. (1995). Dicotyledons. In: Simonetti, JA. & Arroyo, MK.; Spotorno, AE. & Lozada, E. eds. *Biological diversity of Chile*. Santiago, Chile. Artegrama. pp. 77-89.

Matthei, O. (1995). *Manual of the weeds which grow in Chile.* Santiago, Chile. Alfabeta Impresores. 545 pp.

Mittermeier, RA.; Myers, N.; Thomsen, JB.; Da Fonseca, GA. & Olivieri, S. (1998). Biodiversity hotspots and major tropical wilderness area: approaches to setting conservation priorities. *Conservation Biology* 12:516-520.

Montenegro, G.; Aljaro, ME. & Kummerow, J. (1979). Growth dynamics of Chilean matorral shrubs. *Botanical Gazette* 140:114-119.

Mooney, HA. & Kummerow, J. (1971). The comparative water economy of representative evergreen sclerophyll and drought deciduous shrubs of Chile. *Botanical Gazette* 132:246-252.

Muñoz, C. (1966). *Synopsis of Chilean flora.* 2nd ed. Santiago, Chile. University of Chile. 500 pp.

Muñoz, M. & Moreira, A. (2003). *Alstroemerias de Chile: diversidad, distribución y conservación*. Santiago, Chile. Taller La Era. 139 pp.

Myers, N.; Mittermeier, RA.; Mittermeier, CG.; Da Fonseca, GA. & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.

Navas, ME. (1973). *Flora of the Santiago basin, Chile. Vol I.* Santiago, Chile. University of Chile. 299 pp.

Navas, ME. (1976). *Flora of the Santiago basin, Chile. Vol II.* Santiago, Chile. University of Chile. 559 pp.

Navas, ME. (1979). *Flora of the Santiago basin, Chile. Vol III*. Santiago, Chile. University of Chile. 509 pp.

Novoa, P.; Espejo, J.; Cisternas, M.; Rubio, M. & Dominguez, E. (2006). *Field guide to Chilean orchids*. Concepción, Chile. Corporación Chilena de la Madera. 120 pp.

Oberdorfer, E. (1960). *Plant sociology studies in Chile – A comparison with Europe.* Weinheim. Cramer. 208 pp.

Oltremari, J. (2002). *Protected areas and the conservation of biological diversity*. Santiago, Chile. Catholic University of Chile. 11 pp.

Palma, B.; San Martín, C.; Rosales, M.; Zúñiga, L. & Ramírez, C. (1978). Spatial distribution of aquatic and marsh flora and vegetation of the Marga-Marga river in central Chile. *Anales del Instituto de Ciencias del Mar y Limnología Universidad Nacional Autónoma de México* 14(2):125-132.

Pisano, E. (1956). Scheme for the classification of plant communities in Chile. *Agronomía* 2:30-33.

Ramírez, C. (1988). Life forms, phytoclimates and plant formations. *El Arbol Nuestro Amigo* 4:33-37.

Ramírez, C. & Añazco, N. (1982). Seasonal variations in the development of *Scirpus californicus, Typha angustifolia* and *Phragmites communis* in Valdivian swamps, Chile. *Agro Sur* 10:111-123.

Ramírez, C. & Westermeier, R. (1976). Study of the spontaneous vegetation of the Botanic Garden of the Austral University of Chile (Valdivia), as an example of phytosociological tabulation. *Agro Sur* 4:93-105.

Ramírez, C.; San Martín, C. & San Martín, J. (1996). Floral structure of the swamp forests of central Chile. In: Armesto, JJ.; Arroyo, MK. & Villagrán, C. eds. *Ecología de los bosques nativos de Chile*. Santiago, Chile. Editorial Universitaria. pp. 215-234.

Ramírez, C.; San Martín, J.; San Martín, C. & Contreras, D. (1987). Floral and vegetation study of El Peral lake, Fifth Region, Chile. *Revista Geográfica de Valparaíso* 18:105-120.

Ravenna, P.; Teillier, S.; Macaya, J.; Rodríguez, R. & Zöllner, O. (1998). Conservation categories of Chilean native bulb plants. *Boletín Museo Nacional de Historia Natural, Chile* 47:47-68.

Riedemann, P. & Aldunate, G. (2001). *Native flora of ornamental value, identification and propagation. Chile, central zone.* Santiago, Chile. Andrés Bello. 566 p.

Rodríguez, A. (1979). Plant formations of the Campanita Range. *Boletín Informativo Instituto Geográfico Militar Chile,* IV Trimestre 1979: 11-31.

Rodríguez, A. (1982). Principal plant formations of La Campana National Park. *Boletín Informativo Instituto Geográfico Militar Chile*, I Trimestre 1982: 11-31.

Rodríguez, A. & Calderón, F. (1982). Determination of plant structures on La Campana mountain. *Boletín Informativo Instituto Geográfico Militar Chile*, II Trimestre 1982: 29-47.

Roussine, N. & Negre, R. (1952). *Plant groupings of mediterranean France*. Montpellier. CNRS. 297 pp.

Rundel, P. & Weisser, P. (1975). La Campana, a new National Park in Central Chile. *Biological Conservation* 8: 35-46.

San Martín, C.; Medina, R.; Ojeda, P. & Ramírez, C. (1993). Plant biodiversity in the Río Cruces Nature Sanctuary (Valdivia, Chile). *Acta Botanica Malacitana* 18:259-279.

San Martín, C.; Ramírez, C. & Rubilar, H. (2002). Ecophysiology of saw-sedge marshes in Valdivia, Chile. *Ciencia e Investigación Agraria* 29:171-179.

Simonetti, JA. (1995). Biological diversity: something more than names, something more than numbers. In: Simonetti, JA.; Arroyo, MK.; Spotorno, AE. & Lozada, E. eds. *Diversidad biológica de Chile*. Santiago, Chile. Artegrama. pp. 1-4.

Simonetti, JA. (2004). Connect to conserve. *Ambiente y Desarrollo* 20:2-4.

Strang, C. (1983). The birds of Peñuelas lake. *Chile Forestal* 95:20-22.

Steubing, L.; Ramírez, C. & Alberdi, M. (1980). Energy content of water and bog plant associations in the region of Valdivia (Chile). *Vegetatio* 43:153-161.

Steubing, L.; Godoy, R. & Alberdi, M. (2002). *Plant ecology methods*. Valdivia, Chile. University texts collection, Austral University of Chile. 345 pp.

Teillier, S. (2003). Flora of the El Morado Natural Monument: *Addenda et Corrigenda*. *Gayana Botánica* 60:94-101.

Teillier, S.; Aldunate, G.; Riedemann, P. & Niemeyer, H. (2005). *Flora of the Río Clarillo National Reserve. Guide to species identification.* Santiago, Chile. Impresos Socías. 367 pp.

Villaseñor, R. (1980). Physionomic and floral units of the La Campana National Park. *Anales del Museo de Historia Natural de Valparaíso* 13:65-70.

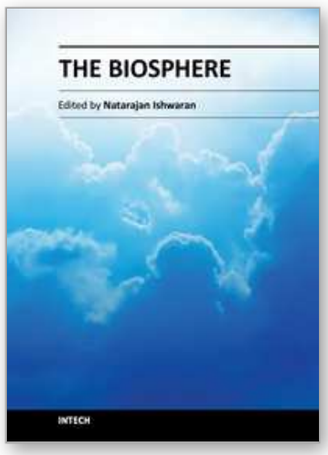
Villaseñor, R. (1986). *Guide to the recognition of the most frequent tree and shrub species in La Campana National Park. Valparaíso, Chile.* CONAF – University of Playa Ancha. 190 pp.

Villaseñor, R. & Serey, I. (1980-1981). Phytosociological study of the vegetation of La Campana mountain (La Campana National Park) in central Chile. *Atti Ist. Bot. Lab. Critt. Univ. Pavia* 6:69-91.

Weber, C. (1986). Conservation and rational use of nature in protected areas. *Ambiente y Desarrollo* 2:165-181.

WWF. & IUCN. (1997). *Centres of plant diversity: a guide and strategy for their conservation. The Americas.* IUCN Publications Units, Cambridge, United Kingdom Vol. 3.

Zöllner, O.; Olivares, M. & Varas, ME. (1995). The genus *Fumaria* L. (Fumariaceae) in the central zone of Chile. *Anales del Museo de Historia Natural de Valparaíso* 23: 21-31.



The Biosphere

Edited by Dr. Natarajan Ishwaran

ISBN 978-953-51-0292-2
Hard cover, 302 pages
Publisher InTech
Published online 14, March, 2012
Published in print edition March, 2012

In this book entitled "The Biosphere", researchers from all regions of the world report on their findings to explore the origins, evolution, ecosystems and resource utilization patterns of the biosphere. Some describe the complexities and challenges that humanity faces in its efforts to experiment and establish a new partnership with nature in places designated as biosphere reserves by UNESCO under its Man and the Biosphere (MAB) Programme. At the dawn of the 21st century humanity is ever more aware and conscious of the adverse consequences that it has brought upon global climate change and biodiversity loss. We are at a critical moment of reflection and action to work out a new compact with the biosphere that sustains our own wellbeing and that of our planetary companions. This book is a modest attempt to enrich and enable that special moment and its march ahead in human history.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Enrique Hauenstein (2012). Wealth of Flora and Vegetation in the La Campana-Peñuelas Biosphere Reserve, Valparaiso Region, Chile, The Biosphere, Dr. Natarajan Ishwaran (Ed.), ISBN: 978-953-51-0292-2, InTech, Available from: http://www.intechopen.com/books/the-biosphere/richness-of-flora-and-vegetation-of-the-biosphere-reserve-la-campana-pe-uelas-region-of-valparaiso-c

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Phone: +385 (51) 770 447
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Phone: +86-21-62489820
Fax: +86-21-62489821

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