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Analysis of the contribution and efficiency of the Santuario de la Naturaleza Yerba Loca, 33º S in protecting the regional vascular plant flora (Metropolitan and Fifth regions of Chile)

Análisis de la contribución y eficiencia del Santuario de la Naturaleza Yerba Loca, 33º S, en la protección de la flora vascular regional (regiones Metropolitana y Quinta de Chile)

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ABSTRACT

Santuario de la Naturaleza Yerba Loca (SN Yerba Loca), Metropolitan Region (MR), 33º S, Chile is analyzed for its conservation value and efficiency in protecting native vascular plants in a regional context. The reserve's flora of 500 species and subtaxa was evaluated for species richness, endemism, range size and marginally distributed taxa, using species-area analysis, and tendencies in the floras of the MR (1.434 species and subtaxa) and MR-Fifth regions (1,841 species and subtaxa) to set the regional pattern. The reserve (0.7 % of MR land area and 0.3 % MR-Fifth land area) contains 34 % of the MR and 27% of the MR-Fifth floras, and around 16-17 % of the mediterranean-climate area (regions IV-VIII) flora of central Chile. Veech's Relative Richness Index (RRI) revealed that SN Yerba Loca houses exaggerated richness in relation to its land area (28 % more species than expected from the regional model). However, endemism rates (35 % Continental Chile endemics, 22 % Mediterranean endemics, 3% MR-Vth endemics) are statistically lower than in the MR (44 %, 29 %, 9 %) and the MR-Vth (48 %, 31 %, 11 %) floras, and SN Yerba Loca houses proportionately fewer MR endemics (2 %) than the MR (6 %). Compared with the regional floras, the reserve contains statistically fewer marginally distributed species, and range size (median = five administrative regions) is significantly larger. The reserve's outstanding species richness compensates for its low endemism rates bringing the absolute number of endemics to 92 % of the regional expectation. Corresponding values for marginally distributed species are 81 % (northern limits), 63% (southern limits) and for median and shorter range taxa, 100 %. It is concluded that SN Yerba Loca is a highly efficient reserve from the point of view of vascular plant conservation, and represents an excellent conservation choice. SN Yerba Loca and MN El Morado (a second state protected area in the MR), conservatively, house 39 % of the native vascular plant flora of the MR (30 % of that of the MR-Fifth) on 0.9 % of MR land area. Our study emphasizes that relatively small land areas in central Chile can house significant amounts of biodiversity, and that moreover, the RM and RM-Fifth are areas of high species richness within the central Chilean biodiversity hotspot. The outstanding conservation value of SN Yerba Loca calls for a management plan designed to assure the integrity of the reserve under increasing pressures from the Metropolitan Region with six million inhabitants.

Key words: conservation efficiency, endemism, hotspot, protected area, mediterranean flora, species richness, SN Yerba Loca.

RESUMEN

Santuario de la Naturaleza Yerba Loca (SN Yerba Loca), 33ºS, un área protegida en la Región Metropolitana (RM) de Chile, es analizado en términos de su aporte a la conservación de la flora vascular y su eficiencia en un contexto regional. Se analizó la flora vascular nativa, compuesta por 500 taxa en terminos de riqueza de especies, endemismos, rango de distribución, y presencia de taxa con límites de distribución geográfica en la zona de estudio, empleando análisis de especie-área y en base de tendencias en las floras de la RM (1-434 especies y subtaxa) y RM-Quinta Región (1.841 especies y subtaxa). La reserva (de 0,7 % de la superficie de RM y 0,3 % de RM-Quinta Región) contiene el 34 % de la flora nativa de RM y el 27 % de RM-Quinta Región, y alrededor de 16-17 % de la flora mediterránea (regiones IV-VIII) de Chile central. El Índice de Riqueza Relativa (IRR) de Veech indica que SN Yerba Loca alberga una riqueza extraordinaria en relación a su superficie (28 % más especies de lo esperado del modelo regional). Sin embargo, los niveles de endemismo para SN Yerba Loca (35 % endémicos de Chile continental, 22 % endémicos de la zona mediterránea y 3 % endémicos a RM-Quinta Región) son estadísticamente más bajos que los niveles regionales (RM: 44, 29 y 9 %; RM-Quinta Región: 48, 31, y 11 %), y SN Yerba Loca alberga proporcionalmente menos taxas endemicos a RM (2 %) que RM (6 %). En comparasión con las floras regionales, SN Yerba Loca contiene menos especies marginalmente distribuidas, y los rangos geográficos para especies presentes en SN Yerba Loca (mediana = cinco regiones administrativas) son significativamente mayores que en las floras regionales. La riqueza destacada de la reserva compensa su bajo nivel de endemismos, con el número absoluto de taxas endemicos llegando al 92 % de la expectación regional. Valores correspondientes para especies con distribuciones marginales son 81 % (límites norte), 63 % (límites sur) y para taxas con rangos cortas, 100 %. Se concluye que SN Yerba Loca es una reserva muy eficiente desde el punto de vista de conservación de la flora vascular. SN Yerba Loca y MN El Morado (un segundo área protegida en RM) constituyen el 0,9 % de la superficie de RM. Albergan alrededor del 39 % de la flora de la RM (y 30 % de la flora de RM y RM-Quinta Región). Nuestro estudio indica que áreas pequeñas en Chile central pueden albergar mucha biodiversidad, y que RM y RM-Quinta Región son áreas de alta riqueza de especies dentro del "hotspot" Chile central de biodiversidad. El sobresaliente valor de SN Yerba Loca en lo respecto a la conservación exige un plan de manejo para asegurar la integridad de la reserva frente de presiones de la Región Metropolitana con seis millones de inhabitantes.

Palabras clave: eficiencia de conservación, endemismos, área protegida,"hotspot" flora , mediterránea, riqueza de especies, SN Yerba Loca.

INTRODUCTION

The conservation of biodiversity in a modern context (Heywood & Watson 1995) spans the gamut from the sustainable use of the components of biodiversity to strict preservation. Globally, protected areas are considered to constitute an important means for protecting biodiversity (Miller et al. 1995). Most national (and some private) protected areas combine the sustainable use of the components of biodiversity and biodiversity preservation. The protection and maintenance of biodiversity in the natural environment on the one hand, underpins recreation, while the use of protected areas for recreation permits biodiversity *per se* to be preserved through non-extractive sustainable use. At the landscape level, protected areas also can perform important ecological services, such as watershed protection, CO_2 sequestration (e.g. as in forests) and maintenance of carbon sinks (e.g., as in peat bogs).

Although the protection of biodiversity is now explicitly recognized as an objective of protected areas, many protected areas were set up prior to world concern about biodiversity, with scenic or wilderness value, or the protection of a select number of useful or charismatic species being the overriding criteria for their establishment (Armesto et al. 1998). For example, in India, protected areas of forest species have existed since the IV century (Groombridge 1992). Using data given in Groombridge (1992), around 60 % of all existing protected areas were established before the 1980s, which corresponds with the decade of accelarated global concern for biodiversity. It was in the late 80's that Wilson & Peters (1988) brought the notion of biodiversity to a wide field of scientists and others. The contracted form of biological diversity (biodiversity) was apparently coined by Walter G. Rosen in 1985 for the first planning meeting of the "National Forum on Biodiversity" held in Washington DC in September, 1986 (Heywood & Watson 1995). Gathering concern throughout the late 80's and early 90's eventually lead to the signing of the Convention on Biological Diversity which came into force in 1993. In Chile the establishment of protected areas dates to 1907, with the creation of the Reserva Nacional Malleco, followed by the Villarrica, Alto Bío-Bío and Llanquihue forest reserves created in 1912 (Benoit 1996). The first national park (still in existence), Parque Nacional Vicente Pérez Rosales, was created in 1926, with 10 new parks established between 1935-1945. Over the period 1945-1969, 52 additional national parks and forest reserves came into being. Of the 90-odd current protected areas in Chile, thus a very large number were created before 1980.

As biodiversity became a global concern, the notion of biodiversity conservation began to make its way into the hands of the decision makers (e.g., Muñoz et al. 1996). However, even today, new protected areas tend to be created more on the basis of a select group of species, or dominant species, rather than concern for adequate and efficient coverage of all species in a region. The early establishment of many protected areas on the basis of wild, scenic or utilitarian value, signifies that there can be no guarantee that a set of existing national parks and reserves protects all of a region's biodiversity. Nor can it be assumed that existing protected areas are efficient in terms of the amounts of biodiversity they protect. Given the latter, as a working hypothesis, individual protected areas should span the natural range of variation in the landscape, there being reserves with relatively low to relatively high levels of biodiversity: that is, some protected areas, by chance could house high levels of biodiversity, while others could contain low amounts.

In order to consolidate any national protected area system a first objective should be that of learning how much biodiversity is contained in existing protected areas. This information is fundamental for determining which species in the region of interest are protected and their level of protection. Secondly, individual protected areas should be evaluated for their relative conservation efficiency. This kind of information is essential to guide the right decisions when changes in the boundaries (reductions, amplifications) of existing protecting areas are contemplated. In this paper we outline and analyze the vascular plant flora of the Santuario de la Naturaleza Yerba Loca, Metropolitan Region, 33º S, Chile. The Santuario de la Naturaleza Yerba Loca is one of four protected areas managed by CONAF-Chile in the densely populated Metropolitan Region of Chile. Some 25 % of the land area of the Metropolitan Region is intensively used for agriculture and urban development; many semi-natural areas are today heavily subject to grazing (Arroyo et al. 2000). The Metropolitan Region occurs in the mediterranean-type climate area of central Chile (di Castri & Hajek 1976), known for its high levels of endemism and species richness (Arroyo & Cavieres 1997, Arroyo et al. 1999). Reflecting the latter, in a recent paper in Nature, central Chile (based on the original data provided by Arroyo et al. 1999 in Mittermeier et al. 1999) has been declared a "biodiversity hotspot for conservation priority" (Myers et al. 2000). Based on comprehensive floristic lists of the native flora for the Metropolitan Region and Metropolitan and Vth regions combined, we first determine the proportion of the regional floras contained in the Santuario de la Naturaleza Yerba Loca. We then employ a series of criteria designed to evaluate the conservation value of the reserve. Specifically we analyze the reserve's flora from the perspective of: (i) total number of vascular plants protected in relation to the physical size of the reserve; (ii) concentration and absolute numbers of endemic taxa; (iii) average range size of taxa; (iv) presence of marginally distributed species. For the purposes of our analysis, a highly efficient reserve is one in which: (i) a higher number of species in relation to the expected regional average for the reserve size are protected; (ii) the density of endemic species is high; (iii) the average range size of species is low, and (iv) marginally distributed species are well represented. Finally, we combine published floristic information for Monumento Nacional El Morado (a second protected area in the Metropolitan Region) with that for Santuario de la Naturaleza Yerba Loca and determine the proportion of the Metropolitan Region (and Metropolitan-Quinta Region combined) flora contained in the two protected areas.

MATERIAL AND METHODS

Study site

Santuario de la Naturaleza Yerba Loca (hereafter SN Yerba Loca) (Fig. 1) is located in the Municipality of Lo Barnechea to the NE of the city of Santiago. The area was decreed a "Nature Sanctuary" on 24 July, 1973 by the Chilean Council of National Monuments (Consejo Nacional de Monumentos Nacionales). As originally designated, the reserve covers 39,029 ha. However, only the 10,500 ha. of the reserve managed by the Corporación Nacional Forestal (CONAF) is considered here. The reserve is centered on the deeply-cut, northeast-southwest trending valleys of the Estero Yerba Loca running from the base of Cerro La Paloma, and Estero La Leonera, situated to the east and running into Estero Yerba Loca. It comprises steep mountainous territory located to the east of the Río San Francisco, from its junction with Estero Yerba Loca to the level of La Ermita. Estero Yerba Loca shows strong signs of heavily glaciation in the Pleistocene. Permanent glaciers are found today on Cerro La Paloma and Cerro Plomo. The reserve spans an altitudinal range of approximately 1,300 to 5,340 m. However, above 3,600 m vascular plants are essentially absent. Vegetation types include typical low-elevation mediterranean sclerophyllous scrub and succulent scrub (900-1,500 m), montane sclerophyllous woodland dominated by *Kageneckia angustifolia* (1,600-2,000 m), and high alpine vegetation (2,000-3,600 m). A significant extension of Andean wetlands (locally referred to as "vegas") is found on the eastern side of the reserve below Cerro La Parva. The upper reaches of Estero Yerba Loca below Cerro La Paloma contain one of the largest and best conserved extensions of high Andean cushion bog in the general area. The structure and ecology of the alpine vegetation of the Farellones–La Parva-Valle Nevado area immediately to the east, as described in Arroyo et al. (1981, 1982) and Cavieres et al. (2000), is typical of SN Yerba Loca. Details on the composition and ecology of montane sclerophyllous forest in the reserve can be found in Arroyo & Uslar (1993) and Peñaloza et al. (2001).

Floristic data

Knowledge of the flora of SN Yerba Loca was generated from an intensive field collecting program supplemented with a small number of previous literature and herbarium records (3 % taxa). Field work incompassed 92 man/woman days of collecting time spread across 31 separate collecting trips in the early spring to late autumn of 1998-2001 and covered the entire elevation range of vascular plants, all major watersheds, ranges and expositions as well as vegetation types in the reserve. All plant species occurring along the explored gradients and trajectories were collected and herbarium specimens prepared. Each plant collection was formally recorded in relation to georeferenced points (Garnmin GPS). So as to document the flora of the reserve, herbarium collections have been deposited at the University of Concepción (CONC) and Museo National de Historia Natural (SGO). The field effort resulted in more than 1,700 herbarium collections and their respective duplicates. The floristic lists for the Metropolitan Region and Metropolitan-Fifth regions combined were generated from the Chilean flora data base, University of Concepción (version 23 August, 2001). This constantly up-dated electronic data base contains distributional data at the level of Chile administrative regions and life-form data for all currently accepted species, subspecies and varieties in the Chilean flora. The only major modification to the data base affected was replacement of the existing set of names for

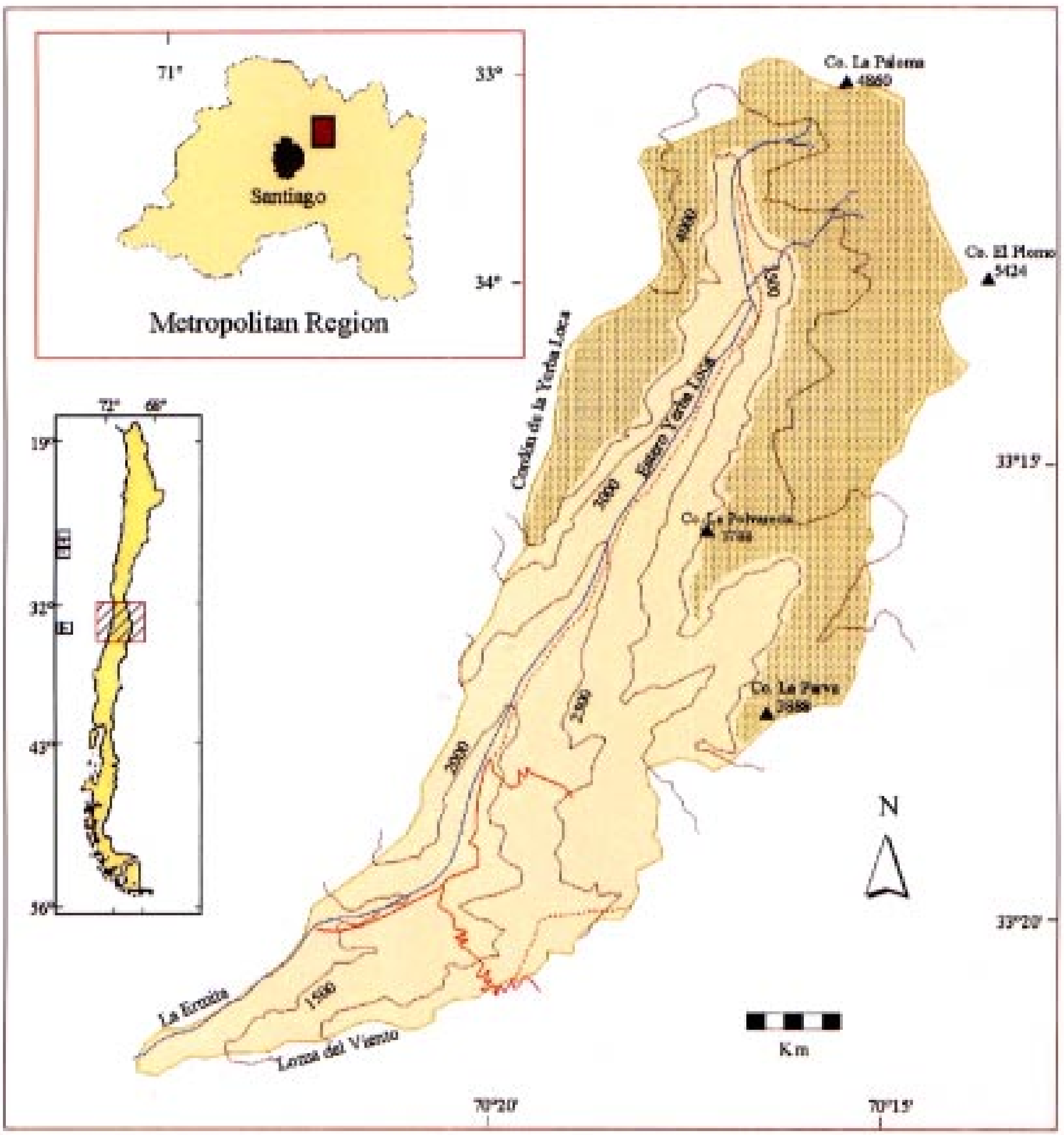

Fig. 1: Location of the Santuario de la Naturaleza Yerba Loca, Chile.

Ubicación del Santuario de la Naturaleza Yerba Loca, Chile.

the genus *Calceolaria* with a much reduced set of taxa recognized in the recent taxonomic revision of the genus by Ehrhart (2000). A few new taxa for the Metropolitan Region discovered in SN Yerba Loca were added to the regional lists. The regional lists can be considered fairly complete, since the Metropolitan and Vth regions are among the best explored in Chile.

Conservation criteria: species richness

In order to evaluate the species packing efficiency of a reserve, a measure of relative species richness is required that takes into account that species richness does not increase linearly with size of area. The efficiency of SN Yerba Loca in concentrating species richness was evaluated by comparing the number of species contained in the reserve in relation to the expected number of species for the reserve land area as predicted from a regional species-area curve. Previous work for a wider area of central Chile (mediterranean area in general) showed that species richness is strongly linearly correlated with area under the power function (Arroyo et al. 1995, Cowling et al. 1996). In order to evaluate the species richness capacity of SN Yerba Loca, we constructed a new species-area curve for the area comprising the Fifth and Metropolitan regions. The data used to construct the new curve comprised: (a) current estimates of species richness for the Fifth and Metropolitan Regions obtained from the Chilean species data base (see above); (b) species numbers for the Valparaíso area, Marga Marga Valley, Santiago Valley and Quebrada de La Plata as in Arroyo et al. (1995); (c) a published species list for Monumento Nacional El Morado (hereafter MN El Morado) (Teillier et al. 1994) and the new data for SN Yerba Loca, as presented herein. Inclusion of MN El Morado also allowed comparison of the species packing efficiency of SN Yerba Loca with that of a second protected area in the Metropolitan Region. For the species richness analysis, subtaxa were eliminated from the data sets for the Vth, Metropolitan Region, SN Yerba Loca and MN El Morado, so as to enable use of the floristic lists previously published in Arroyo et al. (1995) which correspond to species-level counts. Following Veech (2000), we calculated the Relative Richness Index (RRI) as per Bowers & McLaughlin (1982) for all data points used in constructing the regression line. RRI is obtained from the regression residuals expressed as a percentage of the expected number of species for the size of the land area of a reserve (c.f., Bowers & McLaughlin 1982, Veech 2000):

$$RRI = \frac{S_{obs} - S_{exp}}{S_{exp}} \times 100$$

where S_{obs} is observed species richness S_{exp} is expected species richness.

Conservation criteria: endemism

The efficiency of SN Yerba Loca in concentrating endemic taxa was evaluated by comparing levels of endemism in the reserve with those in the floras of the Metropolitan-Fifth regions combined and the Metropolitan Region. Four endemism categories were considered: (a) taxa restricted in distribution to continental Chile; (b) taxa restricted in distribution to administrative regions Fourth through Eigth; (b) taxa restricted in distribution to the Metropolitan and Vth regions combined; (c)

TABLE 1

Comparison of species richness (species and subtaxa) and life-form composition for the native vascular plant floras of the SN Yerba Loca, Metropolitan Region, 33º S, the Metropolitan and Fifth regions combined, and the Metropolitan Region, Chile

Comparación de la riqueza de especies (especies y subtaxa) y composición en términos de forma de vida de las floras vasculares nativas del SN Yerba Loca, Región Metropolitana, 33º S, regiones Metropolitana y Quinta combinadas, y la Región Metropolitana, Chile

	SN Yerba Loca		Metropolitan		Metropolitan-Fifth	
Life-form	n	%	n	%	n	%
Annual and biennials	105	21.0	301	21.0	361	19.6
Perennial herbs	278	55.6	801	55.8	1,038	56.4
Shrubs and subshrubs	109	21.8	295	20.6	394	21.4
Trees	8	1.6	37	2.6	48	2.6
Total native flora	500		1,434		1,841	

taxa restricted in distribution to the Metropolitan Region. Taxa (species, or subtaxa) restricted in distribution to continental Chile will be referred to as "Continental Chile endemics". Taxa restricted in distribution to Chile and the area described by administrative regions IV-VIII will be referred to as "Mediterranean endemics". These last administrative regions were chosen as a surrogate for the mediterranean-type climate region based on their close fit to the latitudinal limits of the mediterranean-climate area as defined by Van Husen (1967) (30-38º S) and the availability of accurate species lists at the level of Chile's administrative regions in the Chilean flora data base (University of Concepción). It should be noted that taxa endemic to the Metropolitan Region constitute a subset of the Metropolitan-Vth regions combined endemics, which in turn are a subset of the Mediterranean endemics. Mediterranean endemics comprise a subset of the Continental Chile endemics. Endemism status at the level of continental Chile was determined by consulting the geographical distributions of species in monographic treatments, and checking the recently published checklists for neighboring or geographically-close Argentina (Zuloaga et al. 1994, Zuloaga & Morrone 1996, 1999), Peru (Brako & Zarucchi 1993) and Ecuador (Jorgensen & León-Yáñez 1999). Subsets of mediterranean and regional endemics were obtained by filtering distributional information contained in the Chilean flora data base at the level of Chile's administrative regions. Statistical comparisons of endemism levels for SN Yerba Loca with the regional floras were made using the G-test of independence (Sokal & Rohlf 1995).

Conservation criteria: range size

In order to determine whether the constituent taxa in the SN Yerba Loca reserve are more narrowly distributed on average than species in the regional floras, we compared the range sizes of species and their subtaxa in the SN Yerba Loca, the Metropolitan-Fifth regions combined and the Metropolitan Region. The number of administrative regions occupied by each taxa in Chile was used as an index of range size. Following Matthei (1995) and Arroyo et al. (2000), the Vth and Metropolitan Regions were amalgamated into one composite region. The latter was considered appropriate so as to define a geographical unit that is more equivalent to the other 11 administrative regions in Chile, all of which span the breath of Chile from the Pacific Ocean to the Andean crest. Range size was calculated separately for the subsets of Continental Chile endemics, Mediterranean endemics and non-endemic native taxa. The subset of Metropolitan-Fifth regions combined and Metropolitan Region endemics were not considered in this analysis, in that all species on the criteria used here, have the same distributional ranges (one administrative region). Use of the number of administrative regions gives an approximate measure of range size, in that there is considerable variation in the size of the individual administrative regions in Chile. However, when comparisons are made for subsets of flora from the same general geographical area, as is the case here, this variation is of little relevance, in that species in the areas compared are drawn from the same regional species pool, and thus will be subject to the same level of error. The number of administrative regions occupied by a species in Chile is useful as a comparative measure of geographical range in the absence of more accurate distributional data, in that it provides a rough measure of the latitudinal range. Statistical comparisons of range size among the floras were made using the non-parametric Mann-Whitney U-test (Statistica Version 6.0, 1998 version).

Conservation criteria: marginally distributed species

We evaluated SN Yerba Loca's contribution to conserving marginally distributed species by considering presence in the reserve of species with northern and southern distributional limits found within the Metropolitan-Fifth regions combined, following the same criterion as used for range size for determining distributional limits. The percentages of marginally-distributed species in SN Yerba Loca were then compared with corresponding sets of data generated for the regional floras using the G-test of Independence (Sokal & Rohlf 1995). Subsets of species of different origins (endemic, non-endemic, etc.), as well as the entire native flora, were considered so as to detect differences between floristic components.

Conservation criteria: combined criteria

Proportional values provide a measure of the propensity of a local flora to contain species of a given category (for example endemic species). However, low proportional values for any given category of species, could be compensated by higher than average species richness. Absolute expected numbers of endemic species, numbers of species with marginal distributions and numbers of species with shorter than average distributions were estimated for an area the size of SN Yerba Loca, and compared with observed numbers in the reserve. For endemism, the expected number of species in the different endemism classes were obtained by multiplying the corresponding percentages found in the Metropolitan Region-Fifth regions combined by the expected number of species for SN Yerba Loca as obtained in the regression equation obtained under the procedures described in Material and Methods, section (a). A parallel procedure was employed for northern and southern distributional limits. For range size we first determined the proportion of species in the regional flora with median to lower range sizes, and then multiplied this number by the expected number of species for an area the size of SN Yerba Loca obtained from the regression. This number was compared for the observed number of taxa in SN Yerba Loca, having median and lower range sizes, as per in the regional flora. Because our range size and endemism data correspond to the species and subtaxa level, it was necessary to adjust the predicted species number of SN Yerba Loca as obtained from the regression, so as to account for subtaxa. This was achieved by multiplying the expected species number obtained in regression by the ratio (number of species + subtaxa) / number of species as in the observed data for SN Yerba Loca.

RESULTS

Species richness and life-form

The Appendix gives the full listing of native species found in SN Yerba Loca, along with life-form, endemism status and distribution according to administrative region. The identifications for eight species and one putative hybrid in the Appendix 1 (nine taxa in total) are tentative. Including the nine taxa, the native flora of SN Yerba Loca is comprised of 500 species and their subtaxa. The total number of species in the reserve is 488, excluding 11 varieties or subspecies in cases where species are represented by one or more varieties or subspecies (as in *Adesmia papposa, Adiantum chilense, Bromus setifolia, Calceolaria ascendens, Calceolaria corymbosa, Hypochaeris tenuifolia, Mustisia ilicifolia, M. subulata, Oxalis compacta, Sisyrinchium arenarium*), and one putative hybrid (*Cistanthe arenaria* x) (total de subtaxa = 12).

Table 1 compares species richness and the life-form composition for the native floras of SN Yerba Loca, the Metropolitan-Fifth regions combined and the Metropolitan Region. The native flora of the Metropolitan-Fifth regions combined stands at 1,841 species and subtaxa, with the Metropolitan Region housing 1,434 species and subtaxa. Disregarding subtaxa reduces these last numbers to 1,723 and 1,355 species, respectively. Eliminating the nine taxa of tentative identity in SN Yerba Loca (n = 491), it can be seen that the nature reserve conservatively contains an outstanding 34 % of all native vascular plant taxa reported for the Metropolitan Region and 27 % of all vascular plants known for the Metropolitan-Fifth regions combined. Present knowledge suggests that the entire mediterranean climate area as described by regions IV-VIII contains around 3,160 native species and subtaxa. Again, using a conservative estimate for SN Yerba Loca, it can be seen that SN Yerba Loca contains around 16 % of the entire flora of the mediterranean area of central Chile. The mediterranean region as defined here, contains 2,864 species when subtaxa are disregarded. Using a conservative estimate of 480 species for SN Yerba Loca (i.e., eliminating the tentatively identified species from the total species number of 488), SN Yerba Loca can be seen to house 17 % of the mediterranean region flora.

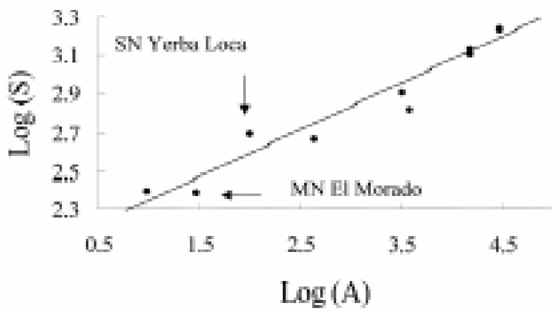

Fig. 2: Regional species-area relationship (power function) based on data for the Fifth and Metropolitan regions of Chile. Sources of floristic data are indicated in the Methods section. Regression equation: Log S = 2.109 + 0.234 Log A, $F_{1,7}$ = 99.718, $P < 0.001$, $R^2 = 0.934$. Data points for the two protected areas with available floristic lists are indicated by the arrows.

Relación regional entre riqueza de especies y área (función de potencia) basada en datos para las regiones Quinta y Metropolitana de Chile. Se indican las fuentes de los datos florísticos en la sección de Métodos. Ecuación de regresión: Log S = 2,109 + 0,234 Log A; $F_{1,7}$ = 99,718; P < 0,001; R^2 = 0,934. Los datos correspondientes a las dos áreas protegidas en la Región Metropolitana con listas florísticas disponibles están indicados con flechas.

Life-form composition in both regional floras is diverse (Table 1) and not significantly different (G = 0.532, NS). The life-form spectra of the SN Yerba Loca flora does not differ statistically from that of either regional flora (Metropolitan-Fifth regions: G = 1.140, $P < 0.05$; Metropolitan Region: G = 0.968, $P < 0.05$). This indicates that the reserve's flora is highly representative of the regional life-form spectrum.

Figure 2 depicts the regional species-area relationship. The log-log regression is highly significant ($F_{1,7} = 99.781$, $P < 0.001$, $R^2 = 0.934$), indicating that the curve can be used reliably as an indicator of the relationship between species richness and area. Table 2 gives values of the Relative Richness Index (RRI) for areas used in the analysis, ranked from high positive to low negative values. It can be seen that RRI for SN Yerba Loca ranks highest among all the areas compared, the reserve having an excess of 28 % species in relation to the model. On a regional scale, thus SN Yerba Loca supports outstanding species richness in relation to its land area. Of special note is the RRI value for MN Nacional El Morado. This reserve situated in the Andes in the Cajón de Maipo to the south of SN Yerba Loca, in contrast to SN Yerba Loca, is associated with a large negative RRI value, and thus is an area of low species richness for its particular land area. Other interesting asides are the higher intrinsic richness of the Metropolitan Region in comparison with the Fifth Region, and the very low intrinsic richness of the Santiago valley.

Endemism

Table 3 provides endemism levels for SN Yerba Loca and the regional floras. So as not to overestimate endemism levels, the 9 taxa of tentative identity have been placed in the non-endemic category (see Appendix 1). Endemism levels in the regional floras are high (44-48 %, continental Chile endemics; 29–31 %, Mediterranean endemics). Moreover significant numbers of species are strictly endemic to the regions under consideration (see Table 3). Continental Chile endemism levels are higher in the Metropolitan-Fifth regions combined than in the Metropolitan Region (G = 5.832, $P < 0.05$), however this pattern did not characterize the other endemism categories.

Of the 883 continental Chile endemics in the Metropolitan-Fifth regions combined, 173 (19.6 %) are found in SN Yerba Loca. Of the 575 Mediterranean endemics found there, 110 (19.1 %) occur in SN Yerba Loca. Sixteen of the 193 species endemic to the Metropolitan-Fifth regions combined (8.3 %) are found in the reserve. Corresponding figures in relation to the Metropolitan Region flora are 27.6 %, 26.1 %, and 12.1 % respectively. The reserve contains 11

TABLE 2

Values of the Relative Richness Index (RRI) for different areas in the Fifth and Metropolitan regions, central Chile, including the SN Yerba Loca and MN El Morado, based on the regression equation in Fig. 2. Data correspond to species numbers, disregarding subtaxa. High positive values of RRI indicate exaggerated species richness in relation to land area. Low negative values indicate low average richness in relation to land area

Valores del Índice de Riqueza Relativa (RRI) para diferentes áreas en las regiones Quinta y Metropolitana, Chile central, incluyendo el Santuario de la Naturaleza Yerba Loca y MN El Morado, basado en la ecuación de regresión en la Fig. 2. Los datos corresponden a riqueza de especies, sin contabilizar los subtaxa. Valores positivos altos de RRI indican áreas con una riqueza intrínseca exagerada con relación al área. Valores grandes negativos indican una riqueza muy baja con relación al área

Area	Species	Land area (km^2)*	Expected S	RRI
SN Yerba Loca	488	105	382	27.7
Fifth-Metropolitan regions	1,723	31,538	1,452	18.7
Quebrada de La Plata	249	10	220	13.2
Metropolitan Region	1,355	15,507	1,229	10.3
Fifth Region	1,276	16,031	1,231	3.0
Valparaíso area	799	3,300	856	-6.7
MN El Morado	245	30	285	-14.0
Marga Marga valley	457	450	537	-14.9
Santiago valley	654	4,000	895	-26.9

*Land area for the Fifth and Metropolitan regions as in CONAF-CONAMA-BIRF (1999)

TABLE 3

Comparison of endemism levels (expressed as a percentage of total native flora, including subtaxa) in the vascular plant floras of the SN Yerba Loca, Metropolitan Region, 33º S, the Metropolitan and Fifth regions combined, and the Metropolitana Region, Chile. Nine taxa with tentative identifications have been placed in the "non-endemic native" category. Percentages en all cases in relation to total flora

Comparación del nivel de endemismo (expresado en porcentaje del total de la flora nativa incluyendo subtaxa) en las floras vasculares del SN Yerba Loca, Región Metropolitana, 33º S, regiones Metropolitana y Quinta combinadas, y Región Metropolitana de Chile. Los nueve taxa con identificaciones tentativas han sido incluidos en la categoría de "nativa no endémica". Los porcentajes en todos los casos guardan relación con el tamaño de la flora total

Floristic component	SN Yerba Loca (n = 500)		Metropolitan (n = 1,434)		Metropolitan-Fifth (n = 1,841)	
	n	%	n	%	n	%
Continental Chile endemics	173	34.6	627	43.7	883	48.0
Mediterranean endemics	110	22.0	422	29.4	575	31.2
Metropolitan-Fifth endemics	16	3.2	132	9.2	193	10.5
Metropolitan endemics	11	2.2	91	6.3	91	4.9
Non-endemic natives	327	65.4	807	56.3	958	52.0

of the 91 (12.1 %) strictly Metropolitan Region endemics. Although high proportions of the endemic taxa found in the regional floras occur in SN Yerba Loca, the reserve's endemism levels are significantly lower than in the two regional floras: (a) Metropolitan-Fifth regions: continental Chile endemics: G = 28.800, P < 0.001; Mediterranean endemics: G = 16.883, P < 0.001; Metropolitan-Fifth endemics: G = 31.425, P < 0.001; (b) Metropolitan Region: continental Chile endemics: G =12.879, P < 0.001; Mediterranean endemics: G = 10.565, P < 0.001; Metropolitan-Fifth region endemics: G = 22.191, P < 0.001; Metropolitan Region endemics: G= 15.001, P < 0.001. Inclusion of the nine taxa with tentative identifications did not alter these tendencies. Overall, thus, SN Yerba Loca, is not an area outstanding for its concentration of endemic taxa.

Range size

Taxa occurring in the two regional floras may be distributed in one to 12 political regions with a median value of four regions in each case. In both regional floras, continental Chile endemics (range = 1-10, median = 3) and mediterranean endemics (range = 1-5, median = 2), as expected, have smaller geographical ranges than the overall flora, while non-endemic natives tend to have the largest distributions (range = 1-12; median = 5). Comparing SN Yerba Loca and the two regional floras, in all but one case (continental Chile endemics) the median values for range size were higher in SN Yerba Loca (total flora = 5, mediterranean endemics = 3, non-endemic natives = 6). Range size distribution was not normal, forcing the use of non-parametric statistics. Significant differences between SN Yerba Loca and the two regional floras were revealed, with range size always being larger in the SN Yerba Loca flora: (a) Metropolitan-Fifth regions combined: total native flora: Z = 6.534, P < 0.001; Continental Chile endemics: Z = 3.613, P < 0.001; Mediterranean endemics: Z = 9.138, P < 0.001; non-endemic natives: Z = 3.611, P = 0.005; (b) Metropolitan Region: total native flora: Z = 4.765, P < 0.001; continental Chile endemics: Z = 2.730, P < 0.01; Mediterranean endemics Z = 8.042, P < 0.001; and non-endemic natives: Z = 2.834, P = 0.005. Summarizing, in general the reserve contains proportionately more species with larger range sizes than the regional floras. The distribution of range sizes for the SN Yerba Loca and Metropolitan Region floras are shown in Fig. 3.

Marginally distributed species

Table 4 shows numbers of taxa in the Metropolitan-Fifth regions combined and the Metropolitan Region with northern and southern distributional limits, respectively, together with corresponding data for SN Yerba Loca. Marginal populations of a large number of species in both the Metropolitan Region and the Metropolitan-Fifth regions combined are found at the latitude of those regions (northern limits: 39-41 % - southern limits: 26-31 %; Table 4, Total flora),

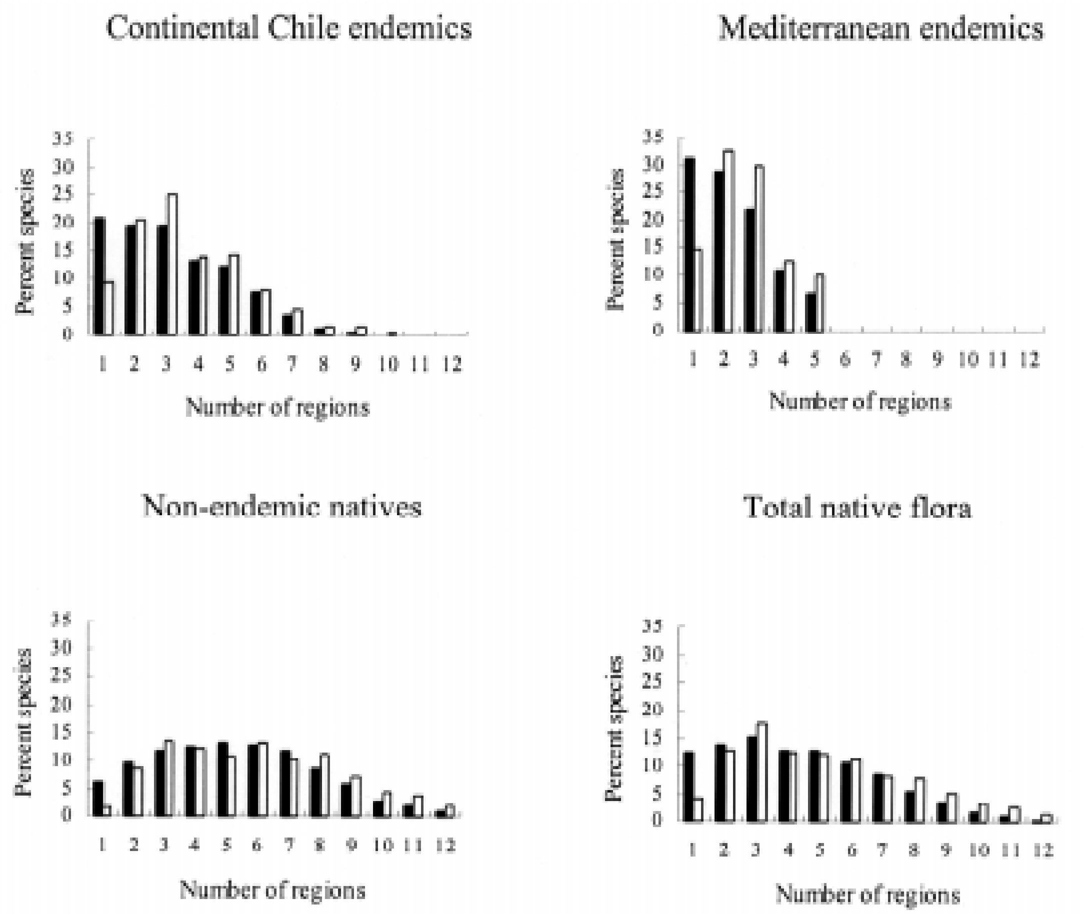

Fig. 3: Frequency distribution of range size for the flora of SN Yerba Loca, 33º S, Chile and the Metropolitan Region, Chile. Range size is represented as the number of administrative regions in which a species occurs: black bars = Metropolitan Region; white bars = SN Yerba Loca. See Table 4 for n values.

Distribución de frecuencias del tamaño de rango de las floras de SN Yerba Loca, 33º S, Chile y la Región Metropolitana, Chile. El tamaño del rango es representado por el número de regiones en la cual existe una especie: barras negras = Región Metropolitana; barras blancas = SN Yerba Loca. Ver Tabla 4 para los valores de n.

there being nevertheless significantly more northern than southern distributional limits in both cases (Metropolitan-Fifth: G = 37.003, P < 001; Metropolitan: G = 60.252, P < 0.001). Between 17-23 % of northern limit and 13-21 % of southern limit taxa in the two regional floras are found in SN Yerba Loca. These percentages tend to be slightly lower when only endemic taxa are considered, and somewhat higher when native non-endemic taxa are considered.

Comparing the two regional floras, for all floristic components, significant differences in relation to the proportion of northern limits are lacking. In contrast, for southern limits, the Metropolitan-Fifth regions combined exceed the Metropolitan Region, except in the case of the non-endemic natives (Total flora: G = 12.351, P < 001 - continental Chilean endemics: G = 8.709, P < 0.005 – Mediterranean endemics: G = 6.847, P < 0.01). The two regional floras thus show interesting structural differences, a feature that probably relates to the presence of proportionately more high elevation species in the Metropolitan Region flora.

Comparing the total native flora of SN Yerba Loca with the Metropolitan Region and the Metropolitan-Fifth regions combined, the proportions of marginally distributed taxa occurring in the reserve are significantly lower (Metropolitan-Fifth, total flora: northern limit: G = 37.209, P < 0.001 - southern limit: G = 50.441, P < 0.001; Metropolitan, total flora: northern limit: G = 28.017, P < 0.001 - southern limit: G = 21.462, P < 0.001). This situation is repeated for

TABLE 4

Comparison of numbers of taxa (species and their subtaxa) reaching their northern and southern distributional limits found in the Santuario de la Naturaleza Yerba Loca, Metropolitan Region, 33º S, the Metropolitan and Fifth regions combined, and the Metropolitana Region, Chile. Nine taxa with tentative identifications in SN Yerba Loca have not been included. Percentages calculated on the basis of the total for each floristic category

Comparación del número de taxa (especies y subtaxa) que alcanzan sus límites de distribución norte y sur en el Santuario de la Naturaleza Yerba Loca, Región Metropolitana, 33º S, regiones Metropolitana y Quinta combinadas, y Región Metropolitana de Chile. Los nueve taxa con identificaciones tentativas en SN Yerba Loca no han sido incluidas. Los porcentajes guardan relación con el total para cada categoría florísitica

	SN Yerba Loca		Metropolitan		Metropolitan-Fifth	
	n	%	n	%	n	%
Total native flora	491		1,434		1,841	
Northern limit	128	26.1	561	39.1	751	40.8
Southern limit	77	15.7	367	25.6	574	31.2
Continental Chile endemics	173		627		883	
Northern limit	52	30.1	286	45.6	405	45.9
Southern limit	47	27.2	235	37.5	398	45.1
Mediterranean endemics	110		422		575	
Northern limit	45	40.9	238	56.4	319	55.5
Southern limit	35	31.8	198	46.9	318	55.3
Non-endemic natives	318		807		958	
Northern limit	76	23.9	274	34.0	346	36.1
Southern limit	30	9.4	132	16.4	176	18.4

all categories of endemic taxa in both regional floras: (a): Metropolitan-Fifth: continental Chile endemics: northern limit: $G = 15.144$, $P < 0.001$ - southern limit: $G = 19.769$, $P < 0.001$; Mediterranean endemics: northern limit: $G = 7.835$, $P < 0.01$- southern limit: $G = 20.627$, $P < 0.001$; (b) Metropolitan: continental Chile endemics: northern limit: $G = 13.790$, $P < 0.001$- southern limit: $G = 6.492$, $P < 0.05$; Mediterranean endemics: northern limit: $G = 8.371$, $P < 0.005$ - southern limit: $G = 8.238$, $P < 0.005$. It also characterizes non-endemic native taxa: (a) Metropolitan-Vth: northern limit: $G = 16.711$, $P < 0.001$- southern limit: $G = 15.439$, $P < 0.001$; (b) Metropolitan: northern limit: $G = 11.073$, $P < 0.001$ - southern limit: $G = 9.488$, $P < 0.001$. Thus, although a considerable number of marginally distributed taxa are found in SN Yerba Loca, it may be concluded that the reserve concentrates proportionately fewer marginally distributed species than the regional floras.

Combined criteria

As explained earlier, relatively low proportions of endemics and marginally distributed species could be compensated for in absolute terms in a species-rich area such as SN Yerba Loca, such that the reserve becomes efficient from a conservation perspective on these criterion in addition to species richness. Table 5 compares expected and observed numbers of taxa combining the three criteria previously considered separately. Because our species richness predictions were based on a curve for the general geographical circumscription of the Fifth and Metropolitan regions, the endemism levels and other parameters used in the projections in Table 5 are necessarily those for the Metropolitan-Fifth regions combined. The expected number of species and subtaxa for SN Yerba Loca (extrapolated from the expected number of species) was 391. It can be seen (Table 5) that the high species richness of SN Yerba Loca brings the absolute number of Continental Chilean endemics quite close to the regional expectation (92 %), although the deficit tends to be larger in the more restricted endemism categories. For species with median or smaller ranges (Table 5) the observed number is equal to the regional expectation (100%). High species richness least compensates the number of species with northern or southern limits (81 and 63%, respectively). Overall, the high species richness in SN Yerba Loca goes along way to compensate for the lower contributions of categories of species considered here to have high conservation priority.

TABLE 5

Expected numbers of endemic taxa (species and their subtaxa), taxa with northern and southern limits and taxa with short (median or smaller) geographical ranges for an area the size of SN Yerba Loca, calculated from the regional regression and regional percentages (Metropolitan-Fifth regions combined), compared with the observed values for the reserve

Número esperado de taxa (especies y subtaxa) endémicos, con límites norte y sur, y con rangos de distribución cortos (mediana o menor) para un área del tamaño del SN Yerba Loca calculados en base de la regresión regional y los porcentajes al nivel regional (regiones Metropolitana y Quinta combinadas), comparados con los valores observados para la reserva

Component	Expected	Observed	O/E
Endemic species			
Continental Chile endemics	188	173	0.92
Mediterranean endemics	122	110	0.90
Metropolitan-Fifth endemics	41	16	0.39
Metropolitan endemics	19	11	0.58
Marginal distributions			
Northern limits	159	128	0.81
Southern limits	122	77	0.63
Median or smaller ranges	228	234	1.03

DISCUSSION

The native vascular flora of SN Yerba Loca of 500 native taxa, conservatively containing 27 and 34 % of the floras of the Metropolitan-Fifth regions combined and Metropolitan Region, respectively, and an estimate of 16-17 % of all species distributed in the Mediterranean-type climate area (Fourth to Eigth regions) is clearly very rich by any standard. The regional floras themselves, in the context of the central Chile hotspot, are also very rich. Squeo et al. (2001), for a total land area of 40,462 km^2, report a total of 1,478 species and subtaxa for the Fourth Region of which 53.5 % are continental Chile endemics. While the endemism levels (43.7-48.0 %) are slightly lower in the regional floras considered here, intrinsic species richness (1,434 species and subtaxa on a land area of 15,480 km^2 (RM) and 1841 species and subtaxa on 31,794 km^2 (RM-Fifth) is clearly much higher in the north-central part of the Mediterranean area than in the arid Fourth Region to the north. What is more relevant in the present context, however, is the efficiency of the SN Yerba Loca in concentrating species richness in relation to its land area. Reserves that contain a high number of species in relation to the amount of land area protected can be considered to have high conservation value (Margules et al. 1988, Araujo 1999). The use of regression residuals expressed as a percentage of expected species richness (standardized residuals - Veech 2000) (RRI) constitutes the only legitimate way to establish whether a given area is richer than expected, given that richness will be always be a function of size of area. Based on these principles, SN Yerba Loca was revealed to concentrate an outstanding number of species for its land area. Clearly, on the basis of the richness criterion and from a utilitarian point of view the reserve constitutes an excellent conservation choice with regard to vascular plants. In contrast to SN Yerba Loca, the RRI value for MN El Morado was strongly negative, indicating that this reserve has low efficiency in terms of concentrating species. These two contrasting situations support the hypothesis that protected areas established on the basis of wild and scenic value will span the gamut of situations from containing very high to low levels of species richness. Of course, we recognize that our sample size is very limited at this stage and that it would be convenient to perform this analysis on a broader set of protected areas – however, this is the only data available for the study area at this stage.

On face value, SN Yerba Loca could be considered a “hotspot” and MN El Morado a “coldspot” within the Metropolitan Region (c.f., Veech 2000). However it is important to separate a utilitarian view of the efficiency of a piece of land in concentrating richness, as has been the main focus of this paper and that of Veech (2000), from the issue of underlying intrinsic richness. The wide elevational range, presence of steep, opposite and mainly north-south facing valleys, and two large areas of wetlands undoubtedly contribute strongly to the high species richness in SN Yerba Loca. The low efficiency of MN El

Morado, on the other hand, reflects its higher average elevation, and the much lower elevational range covered by the reserve (Teillier et al. 1994). Bowers & McLaughlan (1982) studied the influence of area, elevational range (and collecting effort) for twenty local floristic lists in the state of Arizona, USA. These authors came to the conclusion that elevational range was a much better predictor of species richness than area. In their study, elevational range and collecting effort accounted for 77 % of the variation in species richness. If SN Yerba Loca were a fairly flat piece of land, undoubtedly it richness would descend considerably. While SN is clearly an excellent conservation choice in relation to the regional average for its land area, it would be unadvisable at this stage to assume that is a true hotspot within the Metropolitan Region. Likewise, MN El Morado might not be a cold spot in relation to other areas in the high Andes in the Metropolitan Region. Before any conclusion of exaggerated or lower than average intrinsic richness can be accepted, additional studies of areas covering similar elevational ranges in the Andes in the Metropolitan Region will be necessary. This brings home the related point that the detection of relative richness will always be conditioned by the data available. Each time a new area is added to the species-area regression, the RRI values of individual areas can expect to change somewhat. Clearly, access to a stable regression equation is essential for reaching solid conclusions. It is presently unknown how much raw floristic data will be necessary to produce a stable species-area relationship in central Chile.

We argued that a well placed reserve will be one that concentrates a high number of endemic taxa, high numbers of narrowly distributed species, and high numbers of species with marginal populations. Endemic taxa can be considered a region's unique biodiversity. Narrowly distributed species, whether endemic or not, in general will be more vulnerable to severe anthropogenic disturbances outside reserves, and thus will be more prone to extinction (Holsinger & Gottlieb 1991). Particularly, this will be the case if rarity is combined with limited range size (Gaston & Kunin 1997). The conservation of representative populations from a species entire geographic range is an ideal conservation target. In particular, it is probably true to say that marginal populations tend to be overlooked. Marginal populations can contain unusual genotypes, adapted to extreme conditions. Moreover, increasing attention is being given to marginal populations on account of the role such populations could play under global climatic change (Arroyo et al. 1993). While SN Yerba Loca excels in terms of efficiency in housing species, the reserve was found to be less notable in terms of concentrating outstanding numbers of endemic species, species with marginal distributions and species with smaller geographical ranges. Nevertheless, it was seen that the outstanding species richness in the reserve compensated the absolute numbers of species in these categories to a large extent, thus warranting the conclusion that SN Yerba Loca is also a fairly efficient reserve on the basis of these criteria. The generally lower percentages of endemic taxa in the reserve suggest that greater concentrations of endemic taxa will be found at lower elevations in central Chile. Undoubtedly, the large component of high alpine species in the reserve has a strong influence on all categories of endemism. In general, a large proportion of the high Andean flora is shared with eastern slopes of the Andes in Argentina, thus lowering the percentage of endemism rate of reserves situated in the high Andes (on the continental Chile criterion used here). For conservation assessments it would be preferable to eliminate the traditional endemism concept and replace it for some quantitative measure of the size of a species distribution (c.f., Gaston 1994). In this study a first step in that direction was taken by employing a crude measure of range size (number of administrative regions occupied). Range size measured this way was generally larger in the SN Yerba Loca flora than in the regional floras. Our results provide the first quantitative data suggesting that components of the high Andean flora have larger geographical ranges than low elevation species in central Chile. Such a tendency is not unexpected, given that the high alpine area of the Andes forms a fairly continuous corridor along which species can migrate with ease from north to south. To advance in this general area of southern South American biogeography, floristic data for Argentina organized in electronic form is badly needed.

Our study of SN Yerba Loca invites additional comments. That over a third of the native flora of the Metropolitan Region and over a quarter of that of the Metropolitan-Fifth regions combined were found in SN Yerba Loca on a land area equivalent to 0.7 and 0.3 % of the size of the regional areas suggests that relatively small land areas can house considerable plant biodiversity. These same data suggest relatively low turnover in the mediterranean flora of central Chile. In general mediterranean floras tend to be characterized by much local endemism (Cowling et al. 1996). The fairly large distributional ranges of the species in the two regional floras, added to what appears to be low floristic turnover, suggests that local endemism might be less evident in the Mediterranean-type climate flora of central Chile in comparison with most other Mediterranean-type climate areas. Indeed, the proportion of regional endemics with more local distributions, is not particularly high. Moreover, several genera that have not been revised taxonomically in recent times figure strongly among the more local endemics (e.g., *Viola*). Chilean botany has been characterized by an excess of synonyms as a result of the earlier naturalists sampling disjunct portions of continuous ranges and giving them specific epithets. Thus a number of the more local endemics could eventually turn out to be artifacts of taxonomy. This suggests the hypothesis that endemism in the Mediterranean area of central Chile might be more strongly conditioned by the strength of the Andean barrier than rapid local evolution or adaptation to particular edaphic conditions. Arroyo et al. (1995) previously showed that the oceanic climate of central Chile is associated with a strongly woody Mediterranean flora containing many signs of evolutionary conservatism. The Mediterranean-type climate area also has significantly fewer annual species compared with climatically-similar California (Arroyo et al. 1995). Additionally, in relative terms, it has already been shown that intrinsic species-richness in central Chile is lower than in other Mediterranean-type climate areas (Arroyo et al. 1995, Cowling et al. 1996). Demonstration of lower levels of local endemism would constitute another expression of evolutionary conservatism in the Chilean Mediterranean flora. Low turnover and the presence of fairly large geographic ranges in many species, of course, is positive from a conservation viewpoint, since many individual species found in a reserve like SN Yerba Loca will have a high chance of falling into existing protected areas beyond the Metropolitan Region. The latter is highly relevant for the conservation of the mediterranean-type climate flora of central Chile in general, where less than 5 % of the land area is contained in the state protected area system in comparison with 19 % for all of continental Chile (Arroyo & Cavieres 1997).

A long range objective of our present research efforts concerns determining what proportion of the Mediterranean flora of central Chile occurs in the national protected area system, and to what extent individual species' geographical ranges are covered. We are also engaged in detecting areas of high biodiversity content on the landscape outside existing reserves so as to allow objective decisions in central Chile insofar as the establishment of new protected areas is concerned (c.f., Castro-Parga et al. 1996, Williams 1996, Araujo 1999). These goals are being pursued at different spatial scales: individual political regions, climatic divisions with the Mediterranean area and Mediterranean area as a whole. In this context, some preliminary comments concerning the conservation status of the vascular plant flora of the Metropolitan Region can now be made. The Metropolitan Region contains four national protected areas: SN Yerba Loca, MN Nacional El Morado, Reserva Nacional Río Clarillo (all in the Andes) and Reserva Nacional Robleria de Loncha (in the Coast Range). These reserves comprise a mere 1.9 % of the area of the Metropolitan Region. Thus far (including the present results) reliable floristic surveys are available for two of the four protected areas. Table 6 amalgamates floristic information for SN Yerba Loca and MN El Morado, which together comprise 0.9 % of Metropolitan Region land area. Conservatively, 39 % of the known native vascular plant flora of the Metropolitan Region (and 30% of the flora of the

TABLE 6

Joint contribution of the floras of SN Yerba Loca and MN El Morado to the conservation of the native flora of the Metropolitan Region, Chile. The estimate does not take into account species of tentative identity in each reserve, and thus is conservative. See text for more details

Contribución en conjunto de las floras de SN Yerba Loca y MN El Morado a la conservación de la flora nativa de la Región Metropolitana, Chile. La estimación no toma en cuenta especies de identidad tentativa en cada reserva, y por lo tanto es conservativa. Ver texto para más detalles

Protected area	Number of species and subtaxa	Species (%)
SN Yerba Loca and MN El Morado, shared	171	30.6
SN Yerba Loca only	320	57.2
MN El Morado only	68	12.2
Total taxa in the two protected areas	559	
Percent MR flora in two reserves	39.0	

Metropolitan-Fifth regions combined) is contained in the two reserves. The remaining two Metropolitan Region reserves, which extend to lower elevations, undoubtedly will contain many lowland species not found in RN Yerba Loca and MN El Morado. However, many of the species in RN Río Clarillo found above 1300 m can be expected to be shared with one or more of the two inventoried reserved. All things being equal, it is likely that a good number of species found in the Metropolitan Region are not contained in any national protected area in the region.

Finally, a review of the species richness data (Arroyo et al. 2001) suggests that SN Yerba Loca contains many more native species than any other reserve (Bellotos de Melado, Fray Jorge and Talinay, Contulmo area) in central Chile studied to date. Outside of the mediterranean-type climate area, this trend also holds up. Parque Nacional Puyehue in the Tenth Region contains less than 300 native species (Muñoz 1980). Northern parks for which comprehensive species lists are available (Parque Nacional Pan de Azúcar, Rundel et al. 1966; Parque Nacional Llullaillaco, Arroyo et al. 1998) also exhibit lower richness. Parque Nacional Pan de Azúcar situated in the coastal desert, considered to be a floristically-rich area, contains 206 native vascular plants species in an area of 43,754 ha. Parque Nacional Llullaillaco in the hyper-arid sector of the northern Andes (24-25º S) contains less than 100 species in 262,000 ha. In making these comparisons, it must be recognized that the sample size is still very small: as mentioned earlier continental Chile has some 90-odd protected areas (Muñoz et al. 1996). Moreover, the protected areas for which species richness data is presently available vary enormously in size and include units that are much smaller than SN Yerba Loca (e.g., RN Bellotos del Melado). Thus it cannot be concluded at this stage that SN Yerba Loca ranks highest among all protected areas in Chile in terms of species richness in relation to area. Notwithstanding the latter, the reserve does contain a very large flora, and is very rich in relation to the regional average. It thus deserves special attention from a management perspective. Yearly, SN Yerba Loca is receiving increasing numbers of visitors from the Metropolitan Region, with a population of close to six million (2002 Census). Transhumance cattle herding was practiced in the area of the reserve before it was decreed a Nature Sanctuary; today cows and horses can still be found in the reserve which is only partially fenced off from surrounding lands. In our opinion, a concerted effort is needed to assure the integrity of SN Yerba Loca.

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APPENDIX 1

Native vascular plant flora (total number of species = 500) of the Santuario de la Naturaleza Yerba Loca, Metropolitan Region, 33º S, Chile: CCE: continental Chile endemic; MED: Mediterranean endemic (restricted to IV-VIII regions); MET-V: endemic to Metropolitan-Fifth regions combined; MET: endemic to Metropolitan Region; LF: life form (A = annual, B = biennial, H = perennial herb, S = subshrub, K = cactus, F = shrub, T = tree); DIS: distribution according to presence in administrative regions of continental Chile (A = Tenth Region, B = Twelve Region, C = Thirteenth Region)

Plantas vasculares nativas (número total de especies = 500) en el Santuario de la Naturaleza Yerba Loca, Región Metropolitana, 33º S, Chile: CCE: endémico a Chile continental; MET: endémico en la zona mediterránea (regiones IV-VIII); MET-V: endémico en las regiones Metropolitana-Quinta combinadas; MET: endémico en la Región Metropolitana; LF: forma de vida (A = hierba anual, B = hierba bianual, H = hierba perenne, S = subarbusto, K = cactus, F = arbusto, T = árbol); DIS: distribución según presencia en las regiones administrativas de Chile continental (A = Décima Region, B = Duodécima Región; C = Décimo tercera Región)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				T	*Acacia caven* (Molina) Molina	Mimosaceae	345M6789A
				H	*Acaena alpina* Poepp. ex Walp.	Rosaceae	5M6789A
				HS	*Acaena magellanica* (Lam.) Vahl	Rosaceae	12345M789ABC
				H	*Acaena patagonica* A.Marti. affin.	Rosaceae	(M)
				H	*Acaena pinnatifida* Ruiz et Pav.	Rosaceae	45M6789ABC
				H	*Acaena splendens* Hook. et Arn.	Rosaceae	45M67
■	■			H	*Adesmia brachysemeon* Phil.	Papilionaceae	M678
■	■			H	*Adesmia brevivexillata* Burkart	Papilionaceae	5M8
				A	*Adesmia capitellata* (Clos) Hauman	Papilionaceae	345M
■	■	■	■	H	*Adesmia codonocalyx* Grandjot	Papilionaceae	M
■	■			F	*Adesmia confusa* Ulibarri	Papilionaceae	45M6
				H	*Adesmia coronilloides* Gillies ex Hook. et Arn.	Papilionaceae	M7
				H	*Adesmia exilis* Clos	Papilionaceae	4M67
■	■	■	■	H	*Adesmia germainii* Phil.	Papilionaceae	M
				H	*Adesmia glomerula* Clos var. glomerula	Papilionaceae	M789
				F	*Adesmia gracilis* Meyen ex Vogel	Papilionaceae	4M7
■	■			H	*Adesmia longiseta* DC.	Papilionaceae	M68
■	■			H	*Adesmia montana* Phil.	Papilionaceae	4M
				H	*Adesmia papposa* (Lag.) DC. var. papposa	Papilionaceae	45M6789
				H	*Adesmia papposa* (Lag.) DC. var. radicifolia (Clos) M.N.Correa	Papilionaceae	45M678
■				A	*Adesmia tenella* Hook. et Arn. var. tenella	Papilionaceae	2345M6
				H	*Adiantum chilense* Kaulf. var. chilense	Adiantaceae	1345M6789ABC
				H	*Adiantum chilense* Kaulf. var. hirsutum Hook. et Grev.	Adiantaceae	12345M678
				H	*Adiantum scabrum* Kaulf.	Adiantaceae	5M6789A
				H	*Adiantum sulphureum* Kaulf.	Adiantaceae	45M6789AB
■	■			H	*Agoseris chilensis* (Less.) Greene	Compositae	45M6
				H	*Alonsoa meridionalis* (L.f.) Kuntze	Scrophulariaceae	45M678
■	■			H	*Alstroemeria ligtu* L. subsp. simsii (Spreng.) Ehr.Bayer	Alstroemeriaceae	5M67
■	■	■		H	*Alstroemeria pallida* Graham	Alstroemeriaceae	5M
■				H	*Alstroemeria revoluta* Ruiz et Pav.	Alstroemeriaceae	5M6789
■	■			H	*Alstroemeria umbellata* Meyen	Alstroemeriaceae	4M
				A	*Amsinckia calycina* (Moris) Chater	Boraginaceae	1245M6789ABC
				H	*Anagallis alternifolia* Cav. var. alternifolia	Primulaceae	2345M6789ABC
■	■			F	*Anarthrophyllum cumingii* (Hook. et Arn.) F.Phil.	Papilionaceae	45M67
				F	*Anarthrophyllum gayanum* (A.Gray) B.D.Jacks.	Papilionaceae	4M
■	■			H	*Anisomeria coriacea* D.Don	Phytolaccaceae	45M67
				H	*Antennaria chilensis* J.Remy	Compositae	45M78C
				H	*Apium prostratum* Labill. ex Vent.	Umbelliferae	234M8ABC
				H	*Arenaria digyna* D.F.K.Schltdl.	Caryophyllaceae	12345M6789ABC
				A	*Argemone hunnemannii* Otto et A.Dietr.	Papaveraceae	2345M67
■	■			H	*Argylia adscendens* DC. var. adscendens	Bignoniaceae	45M
				FT	*Aristotelia chilensis* (Molina) Stuntz	Elaeocarpaceae	45M6789AB
				H	*Armeria maritima* (Mill.) Willd.	Plumbaginaceae	45M6789ABC
				S	*Astragalus chamissonis* (Vogel) Reiche	Papilionaceae	345M6789

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				H	*Astragalus darumbium* (Bertero ex Colla) Clos	Papilionaceae	M6
				H	*Astragalus looseri* I.M.Johnst.	Papilionaceae	45M6
■	■	■	■	HK	*Austrocactus spiniflorus* (Phil.) F.Ritter	Cactaceae	M
■	■			T	*Azara petiolaris* (D.Don) I.M.Johnst.	Flacourtiaceae	45M678
				S	*Azorella madreporica* Clos	Umbelliferae	345M679
				H	*Azorella trifoliolata* Clos	Umbelliferae	34M89ABC
■				F	*Baccharis confertifolia* Colla var. confertifolia	Compositae	345M
				F	*Baccharis linearis* (Ruiz et Pav.) Pers. subsp. linearis	Compositae	345M6789A
■	■			F	*Baccharis paniculata* DC.	Compositae	45M78
				H	*Baccharis pingraea* DC.	Compositae	2345M6789A
■	■			F	*Baccharis poeppigiana* DC. subsp. poeppigiana	Compositae	45M
				F	*Baccharis sagittalis* (Less.) DC.	Compositae	1345M6789AB
				H	*Barneoudia balliana* Britton	Ranunculaceae	4M
				H	*Barneoudia chilensis* Gay	Ranunculaceae	45M
				H	*Barneoudia major* Phil. var. major	Ranunculaceae	5M6
				H	*Belloa chilensis* (Hook. et Arn.) J.Remy	Compositae	M678
■				F	*Berberis actinacantha* Mart.	Berberidaceae	245M6789
				F	*Berberis empetrifolia* Lam.	Berberidaceae	45M6789ABC
				F	*Berberis montana* Gay	Berberidaceae	5M6789A
				H	*Blechnum hastatum* Kaulf.	Blechnaceae	45M6789A
				A	*Bowlesia incana* Ruiz et Pav.	Umbelliferae	245M678
				H	*Bowlesia tropaeolifolia* Gillies et Hook.	Umbelliferae	1245M6789ABC
■	■			A	*Bowlesia uncinata* Colla	Umbelliferae	45M678
				A	*Bromus berterianus* Colla	Gramineae	12345M6789
				H	*Bromus burkartii* Muñoz	Gramineae	M9
				AH	*Bromus catharticus* Vahl	Gramineae	12345M6789ABC
				H	*Bromus cebadilla* Steud.	Gramineae	1245M6789AC
				H	*Bromus lithobius* Trin.	Gramineae	45M789ABC
				H	*Bromus setifolius* J.Presl var. brevifolius Nees	Gramineae	345M6789BC
				H	*Bromus setifolius* J.Presl var. pictus (Hook.f.) Skottsb.	Gramineae	MC
				H	*Bromus setifolius* J.Presl var. setifolius	Gramineae	34M678C
				FT	*Buddleja globosa* Hope	Buddlejaceae	1345M6789A
				H	*Caiophora coronata* (Gillies ex Arn.) Hook. et Arn.	Loasaceae	2345M8
■	■			H	*Caiophora espigneira* (Gay) Urb. et Gilg	Loasaceae	M67
				H	*Calandrinia affinis* Gillies ex Arn.	Portulacaceae	45M67
				H	*Calandrinia caespitosa* Gillies ex Arn.	Portulacaceae	345M79C
■				A	*Calandrinia compressa* Schrad. ex DC.	Portulacaceae	145M6789A
				A	*Calandrinia monandra* (Ruiz et Pav.) DC.	Portulacaceae	5M6789AC
■	■			H	*Calceolaria arachnoidea* Graham subsp. nubigena (Poepp.) Ehrhart	Scrophulariaceae	45M6
■	■			F	*Calceolaria ascendens* Lindl. subsp. ascendens	Scrophulariaceae	45M
■	■			F	*Calceolaria ascendens* Lindl. subsp. glandulifera (Witasek) Ehrhart	Scrophulariaceae	45M6
■	■			H	*Calceolaria corymbosa* Ruiz & Pavon subsp. mimuloides (Clos) Ehrhart	Scrophulariaceae	45M
■	■			H	*Calceolaria corymbosa* Ruiz & Pavon subsp. santiagina Ehrhart	Scrophulariaceae	5M6
				H	*Calceolaria filicaulis* Clos subsp. luxurians (Witasek) Ehrhart	Scrophulariaceae	45M6
■				H	*Calceolaria glandulosa* Poepp. ex Benth. subsp. glandulosa	Scrophulariaceae	345M67
■	■			F	*Calceolaria hypericina* Poepp. ex Benth.	Scrophulariaceae	45M6
■	■			F	*Calceolaria meyeniana* Phil. subsp. meyeniana	Scrophulariaceae	5M67
■	■			H	*Calceolaria nudicaulis* Benth.	Scrophulariaceae	5M6
■	■			H	*Calceolaria petioalaris* Cav.	Scrophulariaceae	45M67
■	■			S	*Calceolaria polifolia* Hook.	Scrophulariaceae	45M
■	■	■		H	*Calceolaria purpurea* Graham	Scrophulariaceae	5M
■	■			F	*Calceolaria segethii* Phil.	Scrophulariaceae	45M
■	■			F	*Calceolaria thyrsiflora* Graham	Scrophulariaceae	5M67
				A	*Callitriche antarctica* Engelm. ex Hegelm.	Callitrichaceae	MC
				A	*Callitriche lechleri* (Hegelm.) Fassett	Callitrichaceae	5M689AC
				A	*Callitriche terrestris* Raf. subsp. turfosa (Bertero ex Hegelm.) Bacigalupo	Callitrichaceae	25M6789AB
■	■			H	*Calopappus acerosus* Meyen	Compositae	45M67
				H	*Caltha sagittata* Cav.	Ranunculaceae	4M6789ABC
■	■			A	*Calycera sessiliflora* Phil. var. sessiliflora	Calyceraceae	45M
				H	*Cardamine cordata* Barnéoud var. cordata	Cruciferae	4M689A

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				H	*Cardamine glacialis* (G.Forst.) DC.	Cruciferae	34M78ABC
				H	*Carex andina* Phil.	Cyperaceae	45M789C
				H	*Carex atropicta* Steud.	Cyperaceae	345MBC
				H	*Carex banksii* Boott	Cyperaceae	5M6789ABC
				H	*Carex macloviana* d'Urv. var. thermarum (Phil.) Kük.	Cyperaceae	5M78
				H	*Carex nebularum* Phil.	Cyperaceae	M8
■				H	*Carex setifolia* Kunze ex Kunth var. berteroana (E.Desv.) Gunckel	Cyperaceae	45M679
■				S	*Centaurea chilensis* Hook. et Arn. var. chilensis	Compositae	345M6
				H	*Cerastium humifusum* Cambess.	Caryophyllaceae	245M
				F	*Cestrum parqui* L'Hér.	Solanaceae	12345M6789A
■	■	■		H	*Chaetanthera apiculata* (J.Remy) F.Meigen	Compositae	5M
				A	*Chaetanthera euphrasioides* (DC.) F.Meigen	Compositae	45M67
■	■			A	*Chaetanthera flabellata* D.Don	Compositae	5M7
■				A	*Chaetanthera glabrata* (DC.) F.Meigen	Compositae	2345M
■	■			S	*Chaetanthera glandulosa* J.Remy	Compositae	45M
■				A	*Chaetanthera linearis* Poepp. ex Less. var. linearis	Compositae	345M6
				H	*Chaetanthera lycopodioides* (J.Remy) Cabrera	Compositae	45M
				A	*Chaetanthera microphylla* (Cass.) Hook. et Arn.	Compositae	5M678
■				A	*Chaetanthera moenchioides* Less.	Compositae	245M6789
				H	*Chaetanthera pentacaenoides* (Phil.) Hauman	Compositae	M
■	■			A	*Chaetanthera planiseta* Cabrera	Compositae	4M
				A	*Chaetanthera pusilla* (D.Don) Hook. et Arn.	Compositae	4M
■	■	■	■	H	*Chaetanthera renifolia* (J.Remy) Cabrera	Compositae	M
				H	*Cheilanthes glauca* (Cav.) Mett.	Adiantaceae	45M6789AB
				H	*Cheilanthes hypoleuca* (Kunze) Mett.	Adiantaceae	2345M6789
				H	*Chenopodium ambrosioides* L.	Chenopodiaceae	12345M6789A
				A	*Chenopodium frigidum* Phil.	Chenopodiaceae	1234M
				A	*Chenopodium philippianum* Aellen	Chenopodiaceae	45M67
■				S	*Chiropetalum berterianum* Schltdl. var. berterianum	Euphorbiaceae	345M79
				H	*Chloraea disoides* Lindl. var. picta (Phil. ex Kraenzl.) M.N.Correa	Orchidaceae	4M6
■	■			S	*Chorizanthe paniculata* Benth.	Polygonaceae	45M6
				F	*Chuquiraga oppositifolia* D.Don	Compositae	45M67
■				HF	*Cissarobryon elegans* Kunze ex Poepp.	Vivianiaceae	5M6789
				A	*Cistanthe arenaria* (Cham.) Carolin ex Hershk.	Portulacaceae	345M6789
				A	*Cistanthe arenaria* (Cham.) Carolin ex Hershk. (hybrid x ?)	Portulacaceae	(M)
				H	*Cistanthe frigida* (Barnéoud) Peralta	Portulacaceae	345M
■				H	*Cistanthe grandiflora* (Lindl.) Schltdl.	Portulacaceae	12345M678
				A	*Clarkia tenella* (Cav.) F.H.Lewis et M.R.Lewis subsp. tenella	Onagraceae	45M6789A
				F	*Colletia hystrix* Clos	Rhamnaceae	345M6789AB
				F	*Colliguaja integerrima* Gillies et Hook.	Euphorbiaceae	45M67BC
■				F	*Colliguaja odorifera* Molina	Euphorbiaceae	2345M67
■	■			F	*Colliguaja salicifolia* Gillies et Hook.	Euphorbiaceae	45M78
				A	*Collomia biflora* (Ruiz et Pav.) Brand	Polemoniaceae	5M6789ABC
				H	*Colobanthus lycopodioides* Griseb.	Caryophyllaceae	MC
				H	*Colobanthus quitensis* (Kunth) Bartl.	Caryophyllaceae	12345M789ABC
■				H	*Convolvulus chilensis* Pers.	Convolvulaceae	2345M68
				H	*Convolvulus demissus* Choisy	Convolvulaceae	4M7
■	■			H	*Conyza arabidifolia* J.Remy	Compositae	5M6
				AH	*Conyza floribunda* Kunth	Compositae	45M6789A
				H	*Cortaderia araucana* Stapf var. araucana	Gramineae	45M6789AB
				F	*Corynabutilon bicolor* (Phil. ex K.Schum.) Kearney	Malvaceae	4M
■	■			F	*Corynabutilon ceratocarpum* (Hook. et Arn.) Kearney	Malvaceae	5M6
				AH	*Cristaria dissecta* Hook. et Arn. var. dissecta	Malvaceae	12345M6
■	■			A	*Cryptantha alfalfalis* (Phil.) I.M.Johnst.	Boraginaceae	M6
■	■			H	*Cryptantha alyssoides* (A.DC.) Reiche	Boraginaceae	5M67
				H	*Cryptantha capituliflora* (Clos) Reiche	Boraginaceae	45M
■				A	*Cryptantha glomerata* Lehm. ex Fisch. et C.A.Mey. subsp. glomerata	Boraginaceae	1245M68
■				AH	*Cryptantha involucrata* (Phil.) Reiche	Boraginaceae	34M
■				A	*Cryptantha linearis* (Colla) Greene	Boraginaceae	245M67
■				A	*Cuscuta chilensis* Ker-Gawl.	Cuscutaceae	12345M6789A

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				H	*Cynanchum chilense* (Phil.) Malme	Asclepiadaceae	45M6
				S	*Cynanchum nummulariifolium* Hook. et Arn. var. nummulariifolium	Asclepiadaceae	45M6789A
				H	*Cystopteris fragilis* (L.) Bernh. var. apiiformis (Gand.) C.Chr.	Woodsiaceae	145M6789ABC
				A	*Deschampsia airiformis* (Steud.) Benth.	Gramineae	M9A
				H	*Deschampsia cespitosa* (L.) P.Beauv. var. cespitosa	Gramineae	4M79BC
■				A	*Deschampsia looseriana* Parodi	Gramineae	45M6789
				A	*Descurainia cumingiana* (Fisch. et C.A. Mey) Prantl. var. glabrescens (Speg.) O.E.Schulz	Cruciferae	MA
■	■			B	*Descurainia erodiifolia* Prantl ex Reiche	Cruciferae	5M7
				B	*Descurainia pimpinellifolia* (Barnéoud) O.E.Schulz	Cruciferae	345M
				H	*Deyeuxia breviaristata* Wedd. affin.	Gramineae	(M)
				H	*Deyeuxia chrysostachya* E.Desv.	Gramineae	45M
				H	*Deyeuxia curvula* Wedd. affin.	Gramineae	(M)
				H	*Deyeuxia erythrostachya* E.Desv. var. erythrostachya	Gramineae	M678AC
■				H	*Dioscorea humifusa* Poepp. var. humifusa	Dioscoreaceae	45M789
■	■			H	*Dioscorea saxatilis* Poepp.	Dioscoreaceae	45M67
■	■			H	*Diposis bulbocastanum* DC.	Umbelliferae	45M6
				F	*Discaria nana* (Clos) Benth. et Hook.f. ex Weberb.	Rhamnaceae	45M6789
				FT	*Discaria trinervis* (Gillies ex Hook. et Arn.) Reiche	Rhamnaceae	345M6789B
				H	*Draba gilliesii* Hook. et Arn.	Cruciferae	45M789ABC
				H	*Draba pusilla* F.Phil.	Cruciferae	4M67C
				F	*Eccremocarpus scaber* Ruiz et Pav.	Bignoniaceae	5M6789A
■				TK	*Echinopsis chiloensis* (Colla) Friedrich et G.D.Rowley	Cactaceae	245M67
				H	*Eleocharis albibracteata* Nees et Meyen ex Kunth	Cyperaceae	1234M789ABC
				H	*Eleocharis macrostachya* Britton	Cyperaceae	45M9AC
				H	*Elymus angulatus* J.Presl	Gramineae	2345M6789ABC
				F	*Ephedra chilensis* K.Presl	Ephedraceae	2345M6789
				F	*Ephedra frustillata* Miers	Ephedraceae	MC
				H	*Epilobium barbeyanum* H.Lév.	Onagraceae	345M678
				H	*Epilobium glaucum* Phil.	Onagraceae	45M6789ABC
				H	*Equisetum bogotense* Kunth	Equisetaceae	145M6789AB
				H	*Erigeron andicola* DC.	Compositae	4M6789BC
				S	*Erigeron gilliesii* (Hook. et Arn.) Cabrera	Compositae	M6789C
				H	*Erigeron leptopetalus* Phil.	Compositae	34M78C
■				HK	*Eriosyce aurata* (Pfeiff.) Backeb. var. aurata	Cactaceae	345M
■	■			HK	*Eriosyce curvispina* (Bertero ex Colla) Katt. var. curvispina	Cactaceae	45M67
				H	*Eryngium paniculatum* Cav. et Dombey ex F.Delaroche	Umbelliferae	45M6789A
				F	*Escallonia alpina* Poepp. ex DC. var. carmelitana (Meyen) Acevedo et Kausel	Escalloniaceae	5M678
■	■			F	*Escallonia illinita* K.Presl var. illinita	Escalloniaceae	45M678
				FT	*Escallonia myrtoidea* Bertero ex DC.	Escalloniaceae	45M678
				F	*Escallonia virgata* (Ruiz et Pav.) Pers.	Escalloniaceae	M789ABC
				H	*Euphorbia collina* Phil. var. collina	Euphorbiaceae	4M7
				F	*Fabiana imbricata* Ruiz et Pav.	Solanaceae	345M6789A
				A	*Facelis retusa* (Lam.) Sch.Bip.	Compositae	245M689
				H	*Festuca acanthophylla* E.Desv.	Gramineae	145M67
				H	*Festuca magellanica* Lam.	Gramineae	4M789BC
				H	*Festuca purpurascens* Banks et Sol. ex Hook.f.	Gramineae	M89ABC
■				H	*Galium araucanum* Phil.	Rubiaceae	45M6789ABC
				H	*Galium eriocarpum* Bartl. ex DC.	Rubiaceae	45M678
				H	*Galium gilliesii* Hook. et Arn. subsp. gilliesii	Rubiaceae	45M6
				H	*Galium hypocarpium* (L.) Endl. ex Griseb. subsp. hypocarpium	Rubiaceae	245M6789AB
■	■			H	*Galium leptum* Phil.	Rubiaceae	4M
				S	*Galium philippianum* Dempster	Rubiaceae	45M6
				S	*Galium suffruticosum* Hook. et Arn.	Rubiaceae	345M67
				H	*Gamochaeta chamissonis* (DC.) Cabrera	Compositae	5M789ABC
				H	*Gamochaeta polybotrya* (Phil.) Cabrera	Compositae	M8AC
				H	*Gamochaeta spiciformis* (Sch.Bip.) Cabrera	Compositae	5M789ABC
				F	*Gaultheria pumila* (L.f.) D.J.Middleton var. leucocarpa (DC.) D.J.Middleton	Ericaceae	M789ABC
				A	*Gayophytum humile* A.Juss.	Onagraceae	34M67
				AH	*Gentiana sedifolia* Kunth	Gentianaceae	1234M6789C
				H	*Gentianella ottonis* (Phil.) Muñoz	Gentianaceae	4M7

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
■				H	*Geranium commutatum* Steud.	Geraniaceae	M7A
				H	*Geranium core-core* Steud.	Geraniaceae	12345M6789ABC
				H	*Geranium sessiliflorum* Cav.	Geraniaceae	1M789ABC
■				H	*Geranium submolle* Steud.	Geraniaceae	5M689C
				A	*Gilia crassifolia* Benth.	Polemoniaceae	2345M6
				A	*Gilia laciniata* Ruiz et Pav.	Polemoniaceae	12345M6789AB
				HS	*Glandularia laciniata* (L.) Schnack et Covas	Verbenaceae	5M6789
				HS	*Glandularia sulphurea* (D.Don) Schnack et Covas	Verbenaceae	345M9
				A	*Gnaphalium aldunateoides* J.Remy	Compositae	M689
				H	*Gnaphalium cheiranthifolium* Lam.	Compositae	45M6789A
■	■			A	*Gnaphalium diminutivum* Phil.	Compositae	M6
■	■			A	*Gnaphalium perpusillum* Phil.	Compositae	4M
■	■			H	*Gnaphalium puberulum* DC.	Compositae	5M6
■				A	*Gnaphalium ulophyllum* Hook. et Arn.	Compositae	45M789A
■				F	*Gochnatia foliolosa* (D.Don) D.Don ex Hook. et Arn. var. foliolosa	Compositae	45M6789
				F	*Guindilia trinervis* Gillies ex Hook. et Arn.	Sapindaceae	45M67(8)
■	■			F	*Gymnophyton isatidicarpum* (K.Presl ex DC.) Mathias et Constance	Umbelliferae	45M6
				F	*Haplopappus anthylloides* Meyen et Walp.	Compositae	M67
				H	*Haplopappus arbutoides* J.Remy	Compositae	45M67
				F	*Haplopappus rotundifolius* H.M.Hall	Compositae	5M
■	■	■	■	F	*Haplopappus schumannii* (Kuntze) G.Br. et W.D.Clark	Compositae	M
				F	*Haplopappus scrobiculatus* (Nees) DC.	Compositae	45M6789
■	■			F	*Haplopappus uncinatus* Phil.	Compositae	45M67
				AH	*Helenium aromaticum* (Hook.) L.H.Bailey	Compositae	45M67
■				AB	*Helenium urmenetae* (Phil.) Cabrera var. urmenetae	Compositae	234M
				A	*Heliotropium paronychioides* A.DC.	Boraginaceae	45M6789A
■				A	*Homalocarpus dichotomus* (Poepp. ex DC.) Mathias et Constance	Umbelliferae	345M6
■	■			A	*Homalocarpus nigripetalus* (Clos) Mathias et Constance	Umbelliferae	45M
■	■			H	*Hordeum chilense* Roem. et Schult.	Gramineae	124M68C
				H	*Hordeum comosum* J.Presl	Gramineae	2345M6789C
				H	*Hydrocotyle modesta* Cham. et Schltdl.	Umbelliferae	5M6A
				H	*Hydrocotyle ranunculoides* L.f.	Umbelliferae	45M6789A
				H	*Hypochaeris tenuifolia* (Hook. et Arn.) Griseb. var. clarionoides (J.Remy) Bortiri	Compositae	45M
				H	*Hypochaeris tenuifolia* (Hook. et Arn.) Griseb. var. tenuifolia	Compositae	5M679C
■				H	*Hypochaeris thrincioides* (J.Remy) Reiche	Compositae	45M678A
				H	*Juncus arcticus* Willd. var. andicola (Hook.) Balslev	Juncaceae	234M8A
				A	*Juncus bufonius* L.	Juncaceae	2345M6789ABC
				H	*Juncus cyperoides* Laharpe	Juncaceae	45M6789ABC
				H	*Juncus stipulatus* Nees et Meyen	Juncaceae	12345M6789ABC
				F	*Junellia scoparia* (Gillies et Hook.) Botta	Verbenaceae	45M6
				F	*Junellia spathulata* (Gillies et Hook.) Moldenke var. spathulata	Verbenaceae	45M67
■	■			T	*Kageneckia angustifolia* D.Don	Rosaceae	45M67
■	■			T	*Kageneckia oblonga* Ruiz et Pav.	Rosaceae	45M678
				S	*Laretia acaulis* (Cav.) Gillies et Hook.	Umbelliferae	345M67
■				H	*Lathyrus subandinus* Phil.	Papilionaceae	5M789
■	■	■	■	H	*Lepidium reichei* Phil. ex Reiche	Cruciferae	M
				A	*Lepidium strictum* (S.Watson) Rattan	Cruciferae	1235M789A
■	■			H	*Leucheria bridgesii* Hook. et Arn.	Compositae	45M6
				H	*Leucheria congesta* D.Don	Compositae	45M
■	■			H	*Leucheria hieracioides* Cass.	Compositae	5M67
				H	*Leucheria landbeckii* (Phil.) Reiche	Compositae	45M6
				H	*Leucheria rosea* Less.	Compositae	5M67
				H	*Leucheria salinae* (J.Remy) Hieron. subsp. zoellneri Crisci	Compositae	4M6
■				A	*Leucheria tenuis* Less.	Compositae	5M69
■				H	*Leucheria viscida* (Bertero ex Colla) Crisci	Compositae	4M6789
■				H	*Leucocoryne alliacea* Miers ex Lindl.	Alliaceae	45M6789
■	■			H	*Leucocoryne ixioides* (Sims) Lindl.	Alliaceae	45M678
				H	*Lilaeopsis macloviana* (Gand.) A.W.Hill	Umbelliferae	12345M89ABC
				A	*Limosella australis* R.Br.	Scrophulariaceae	245M6789ABC
■				T	*Lithrea caustica* (Molina) Hook. et Arn. var. caustica	Anacardiaceae	45M6789

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
■	■			A	*Loasa floribunda* Hook. et Arn. var. floribunda	Loasaceae	45M
■				A	*Loasa micrantha* Poepp.	Loasaceae	M6789
■	■			A	*Loasa pallida* Gillies ex Arn.	Loasaceae	45M
■	■			A	*Loasa prostrata* Gillies ex Arn.	Loasaceae	45M6
■	■			H	*Loasa sigmoidea* Urb. et Gilg	Loasaceae	45M7
				H	*Lobelia oligophylla* (Wedd.) Lammers	Campanulaceae	12345M6789ABC
■				A	*Lotus subpinnatus* Lag.	Papilionaceae	2345M6789A
				A	*Lupinus microcarpus* Sims	Papilionaceae	12345M6789A
				H	*Luzula racemosa* Desv.	Juncaceae	45M6789ABC
				F	*Lycium chilense* Miers ex A.DC. var. chilense	Solanaceae	45M67
■				A	*Madia chilensis* (Nutt.) Reiche	Compositae	45M6789AC
				A	*Madia sativa* Molina	Compositae	345M6789ABC
■				H	*Malacothamnus chilensis* (Gay) Krapov.	Malvaceae	345M67
				A	*Malesherbia humilis* Poepp. var. humilis	Malesherbiaceae	2345M7
■	■			S	*Malesherbia linearifolia* (Cav.) Pers.	Malesherbiaceae	45M6
				T	*Maytenus boaria* Molina	Celastraceae	345M6789ABC
■	■			H	*Melica argentata* E.Desv.	Gramineae	45M67
				HF	*Melosperma andicola* Benth.	Scrophulariaceae	45M678
				H	*Menonvillea hookeri* Rollins	Cruciferae	M67
				A	*Microsteris gracilis* (Hook.) Greene	Polemoniaceae	145M6789ABC
				A	*Mimulus glabratus* Kunth	Scrophulariaceae	12345M6789ABC
				AH	*Mimulus luteus* L. var. luteus	Scrophulariaceae	345M6789AB
				H	*Mirabilis prostrata* (Ruiz et Pav.) Heimerl	Nyctaginaceae	2345M67
				A	*Montia fontana* L.	Portulacaceae	45M678AC
				H	*Montiopsis andicola* (Gillies ex Hook. et Arn.) D.I.Ford	Portulacaceae	45M678
				A	*Montiopsis capitata* (Hook. et Arn.) D.I.Ford	Portulacaceae	1345M678
				H	*Montiopsis cistiflora* (Gillies ex Arn.) D.I.Ford	Portulacaceae	4M6789
				A	*Montiopsis cumingii* (Hook. et Arn.) D.I.Ford	Portulacaceae	1245M
■				A	*Montiopsis demissa* (Phil.) D.I.Ford	Portulacaceae	1345M
				H	*Montiopsis gilliesii* (Hook. et Arn.) D.I.Ford	Portulacaceae	45M7
				H	*Montiopsis potentilloides* (Barnéoud) D.I.Ford	Portulacaceae	45M
■	■			A	*Montiopsis ramosissima* (Hook. et Arn.) D.I.Ford	Portulacaceae	45M6
■	■			H	*Montiopsis sericea* (Hook. et Arn.) D.I.Ford	Portulacaceae	45M7
■				A	*Montiopsis trifida* (Hook. et Arn.) D.I.Ford	Portulacaceae	12345M
■	■			A	*Moscharia pinnatifida* Ruiz et Pav.	Compositae	45M678
				F	*Muehlenbeckia hastulata* (Sm.) I.M.Johnst. var. hastulata	Polygonaceae	345M6789A
				SF	*Mulinum spinosum* (Cav.) Pers. var. spinosum	Umbelliferae	345M6789B
				F	*Mutisia acerosa* Poepp. ex Less.	Compositae	45M678
■				F	*Mutisia cana* Poepp.	Compositae	345M
■	■			F	*Mutisia ilicifolia* Cav. var. decandolleana (Phil. ex Reiche) Cabrera	Compositae	45M7
■	■			F	*Mutisia ilicifolia* Cav. var. ilicifolia	Compositae	45M678
■	■			S	*Mutisia rosea* Poepp. ex Less.	Compositae	45M678
				F	*Mutisia sinuata* Cav.	Compositae	345M67
■	■			S	*Mutisia subulata* Ruiz et Pav. f. rosmarinifolia (Poepp. et Endl.) Cabrera	Compositae	45M678
				S	*Mutisia subulata* Ruiz et Pav. f. subulata	Compositae	45M6789
				A	*Myosurus apetalus* Gay	Ranunculaceae	4MC
				F	*Nardophyllum lanatum* (Meyen) Cabrera	Compositae	345M6
				HS	*Nassauvia aculeata* (Less.) Poepp. et Endl. var. aculeata	Compositae	5M6789
				F	*Nassauvia axillaris* (Lag.) D.Don	Compositae	45M
				H	*Nassauvia lagascae* (D.Don) F.Meigen var. lagascae	Compositae	45M679AC
■	■	■	■	H	*Nassauvia looseri* Cabrera	Compositae	M
				H	*Nassauvia pinnigera* D.Don	Compositae	5M67
				H	*Nassauvia pyramidalis* Meyen	Compositae	M678
				H	*Nassella chilensis* (Trin.) E.Desv.	Gramineae	245M6789
				H	*Nastanthus spathulatus* (Phil.) Miers var. spathulatus	Calyceraceae	M67
				A	*Nicotiana acuminata* (Graham) Hook. var. acuminata	Solanaceae	345M678
				A	*Nicotiana corymbosa* J.Remy	Solanaceae	2345M7
■				A	*Nicotiana miersii* J.Remy var. miersii	Solanaceae	345M
■				H	*Oenothera acaulis* Cav.	Onagraceae	45M6789A
■	■			H	*Olsynium philippii* (Klatt) Goldblatt subsp. philippii	Iridaceae	45M6

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				H	*Olsynium scirpoideum* (Poepp.) Goldblatt subsp. scirpoideum	Iridaceae	2345M6789
				H	*Oreopolus glacialis* (Poepp.) Ricardi	Rubiaceae	M6789ABC
				H	*Osmorhiza berteroi* DC.	Umbelliferae	45M6789ABC
				A	*Oxalis alfalfalis* Phil. affin.	Oxalidaceae	(M)
				H	*Oxalis cinerea* Zucc.	Oxalidaceae	5M6
				AH	*Oxalis compacta* Gillies ex Hook. et Arn. subsp. berteroana (Barnéoud) Lourteig	Oxalidaceae	45M6
				H	*Oxalis compacta* Gillies ex Hook. et Arn. subsp. compacta	Oxalidaceae	345M67
				H	*Oxalis hypsophila* Phil.	Oxalidaceae	1234M
■	■			S	*Oxalis incana* Phil.	Oxalidaceae	M67
■	■			S	*Oxalis lineata* Gillies ex Hook. et Arn.	Oxalidaceae	5M68
				A	*Oxalis micrantha* Bertero ex Colla	Oxalidaceae	245M6789A
				H	*Oxalis penicillata* Phil.	Oxalidaceae	5M
■				A	*Oxalis rosea* Jacq.	Oxalidaceae	45M6789A
				A	*Oxalis san-romanii* Phil.	Oxalidaceae	34M6
				H	*Oxalis squamata* Zucc.	Oxalidaceae	M67
■	■			H	*Oxalis succulenta* Barnéoud	Oxalidaceae	4M
				H	*Oxychloe bisexualis* Kuntze affin.	Juncaceae	(M)
				H	*Pasithea caerulea* (Ruiz et Pav.) D.Don var. caerulea	Hemerocallidaceae	2345M6789A
				H	*Patosia clandestina* (Phil.) Buchenau	Juncaceae	2345M789
				A	*Pectocarya linearis* (Ruiz et Pav.) DC.	Boraginaceae	345M68
				H	*Perezia carthamoides* (D.Don) Hook. et Arn.	Compositae	45M67
				H	*Perezia nutans* Less.	Compositae	5M6789
■	■			H	*Perezia poeppigii* Less.	Compositae	45M67
				A	*Phacelia brachyantha* Benth.	Hydrophyllaceae	45M6C
				A	*Phacelia cumingii* (Benth.) A.Gray	Hydrophyllaceae	12345M6
				H	*Phacelia secunda* J.F.Gmel.	Hydrophyllaceae	145M6789ABC
				H	*Phleum alpinum* L.	Gramineae	45M789ABC
				H	*Phycella herbertiana* Lindl.	Amaryllidaceae	M67
■	■			H	*Phycella scarlatina* Ravenna	Amaryllidaceae	4M
				H	*Phylloscirpus acaulis* (Phil.) Goetgh. et D.A.Simpson	Cyperaceae	1234M789
■	■			H	*Placea arzae* Phil.	Amaryllidaceae	5M6
				A	*Plagiobothrys calandrinioides* (Phil.) I.M.Johnst.	Boraginaceae	M7C
				A	*Plagiobothrys myosotoides* (Lehm.) Brand	Boraginaceae	15M6789
				H	*Plantago barbata* G.Forst. subsp. barbata	Plantaginaceae	345M6789ABC
				H	*Plantago grandiflora* Meyen	Plantaginaceae	5M678
■				A	*Plantago hispidula* Ruiz et Pav.	Plantaginaceae	12345M68
■	■	■	■	H	*Poa acinaciphylla* E.Desv.	Gramineae	M
				H	*Poa bonariensis* (Lam.) Kunth	Gramineae	2345M89
				H	*Poa holciformis* J.Presl	Gramineae	45M6789
				H	*Poa resinulosa* Nees et Steud.	Gramineae	MC
				H	*Poa rigidifolia* Steud.	Gramineae	MABC
■	■			F	*Podanthus mitiqui* Lindl.	Compositae	45M678
				A	*Polemonium micranthum* Benth.	Polemoniaceae	45MBC
				H	*Polygala salasiana* Gay	Polygalaceae	34M6789BC
■	■	■	■	H	*Polygonum bowenkampii* Phil.	Polygonaceae	M
■				S	*Polygonum sanguinaria* J.Remy	Polygonaceae	45M8B
				H	*Polypogon australis* Brongn.	Gramineae	12345M6789AB
				H	*Polystichum andinum* Phil.	Dryopteridaceae	M789ABC
■	■			FT	*Porlieria chilensis* I.M.Johnst.	Zygophyllaceae	45M6
				H	*Pozoa coriacea* Lag.	Umbelliferae	45M6789
				F	*Proustia cuneifolia* D.Don f. cuneifolia	Compositae	145M678
■				F	*Proustia ilicifolia* Hook. et Arn. f. baccharoides (D.Don ex Hook. et Arn.) Fabris	Compositae	345M
				H	*Pteromonnina pterocarpa* (Ruiz et Pav.) B.Eriksen	Polygalaceae	345M
				H	*Puya alpestris* (Poepp.) Gay	Bromeliaceae	45M6789
■				T	*Quillaja saponaria* Molina	Rosaceae	45M6789
				H	*Quinchamalium chilense* Molina	Santalaceae	12345M6789AB
■	■			H	*Quinchamalium parviflorum* Phil.	Santalaceae	4M7
				H	*Ranunculus peduncularis* Sm. var. peduncularis	Ranunculaceae	45M6789ABC
				A	*Reyesia parviflora* (Phil.) Hunz.	Solanaceae	234M
				H	*Rhodophiala rhodolirion* (Baker) Traub	Amaryllidaceae	M67

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				F	*Ribes cucullatum* Hook. et Arn.	Saxifragaceae	5M689ABC
■	■			F	*Ribes polyanthes* Phil.	Saxifragaceae	M8
				F	*Ribes punctatum* Ruiz et Pav.	Saxifragaceae	45M6789A
				H	*Rorippa austroamericana* Mart.-Lab.	Cruciferae	5MA
				H	*Rytidosperma pictum* (Nees et Meyen) Nicora var. pictum	Gramineae	45M6789AC
				H	*Rytidosperma violaceum* (E.Desv.) Nicora	Gramineae	5M6789
				H	*Rytidosperma virescens* (E.Desv.) Nicora	Gramineae	45M6789ABC
				H	*Salpiglossis sinuata* Ruiz et Pav.	Solanaceae	45M6789A
				H	*Sanicula crassicaulis* Poepp. ex DC.	Umbelliferae	45M6789A
				H	*Sanicula graveolens* Poepp. ex DC.	Umbelliferae	45M6789B
■	■			F	*Schinus montana* (Phil.) Engler	Anacardiaceae	5M6
■				FT	*Schinus polygama* (Cav.) Cabrera var. parviflora (Marchand) F.A.Barkley	Anacardiaceae	345M789A
				A	*Schizanthus grahamii* Gillies ex Hook.	Solanaceae	M678
				AB	*Schizanthus hookeri* Gillies ex Graham	Solanaceae	45M6789
■				A	*Schizanthus pinnatus* Ruiz et Pav.	Solanaceae	45M6789A
■	■	■		A	*Schizopetalon dentatum* (Barnéoud) Gilg et Muschl.	Cruciferae	5M
				H	*Scirpus asper* J.Presl et K.Presl var. asper	Cyperaceae	1234M7
				H	*Scirpus deserticola* Phil.	Cyperaceae	1234M
				H	*Scirpus macrolepis* Phil.	Cyperaceae	4MC
■	■			AB	*Scyphanthus elegans* Sweet	Loasaceae	45M678
■	■			H	*Senecio adenotrichius* DC.	Compositae	45M
■	■			H	*Senecio bustillosianus* J.Remy var. bustillosianus	Compositae	5M6
				S	*Senecio clarioneifolius* J.Remy	Compositae	45M67
				S	*Senecio crithmoides* Hook. et Arn.	Compositae	45M7
■	■	■		S	*Senecio davilae* Phil.	Compositae	5M
				S	*Senecio donianus* Hook. et Arn.	Compositae	45M
				F	*Senecio eruciformis* J.Remy var. eruciformis	Compositae	45M78
■	■			S	*Senecio farinifer* Hook. et Arn.	Compositae	45M7
				H	*Senecio fistulosus* Poepp. ex Less. var. fistulosus	Compositae	45M6789AB
				F	*Senecio francisci* Phil.	Compositae	45M67
				S	*Senecio laetevirens* Phil.	Compositae	5M
				S	*Senecio linariifolius* Poepp. ex DC. var. heliophytoides (Phil.) Reiche	Compositae	M79AB
				SF	*Senecio microphyllus* Phil.	Compositae	45M67
■	■			S	*Senecio pentaphyllus* Phil.	Compositae	M6
				H	*Silene chilensis* (Naudin) Bocquet	Caryophyllaceae	4M6789AC
				H	*Sisymbrium berteroanum* Phil. affin.	Cruciferae	(M)
				S	*Sisymbrium philippianum* I.M.Johnst. affin.	Cruciferae	(M)
				H	*Sisyrinchium arenarium* Poepp. subsp. adenostemon (Phil.) Ravenna	Iridaceae	5M
				H	*Sisyrinchium arenarium* Poepp. subsp. arenarium	Iridaceae	45M6789BC
				H	*Sisyrinchium striatum* Sm.	Iridaceae	45M6789
				A	*Solanum furcatum* Dunal ex Poir. var. furcatum	Solanaceae	12345M6789AB
				F	*Solanum ligustrinum* Lodd.	Solanaceae	45M678A
■	■			H	*Solaria miersioides* Phil.	Alliaceae	M78
				H	*Solenomelus segethii* (Phil.) Kuntze	Iridaceae	45M6789AC
				H	*Solidago chilensis* Meyen	Compositae	1345M6789AB
				H	*Stachys albicaulis* Lindl.	Labiatae	5M6789
■				H	*Stachys philippiana* Vatke	Labiatae	45M89
				H	*Stellaria chilensis* Pedersen	Caryophyllaceae	1245M6789A
				H	*Stemodia durantifolia* (L.) Sw. var. chilensis (Benth.) C.C.Cowan	Scrophulariaceae	345M6789
				H	*Stipa brevipes* E.Desv.	Gramineae	MBC
				H	*Stipa chrysophylla* E.Desv. var. chrysophylla	Gramineae	12345M67C
				H	*Stipa pogonathera* E.Desv.	Gramineae	2345M7
				H	*Stipa speciosa* Trin. et Rupr.	Gramineae	12345M78
				H	*Taraxacum gilliesii* Hook. et Arn.	Compositae	MC
				F	*Tetraglochin alatum* (Gillies ex Hook. et Arn.) Kuntze	Rosaceae	345M678
■				F	*Teucrium bicolor* Sm.	Labiatae	45M6789A
				H	*Thlaspi magellanicum* Comm. ex Poir.	Cruciferae	5M78BC
■	■			F	*Trevoa quinquenervia* Gillies et Hook.	Rhamnaceae	45M67
				H	*Trifolium polymorphum* Poir.	Papilionaceae	2345M678A
■	■			A	*Triptilion capillatum* (D.Don) Hook. et Arn.	Compositae	45M6

APPENDIX 1 (continuation)

CCE	MED	MET-V	MET	LF	Species	Family	Distribution
				H	*Trisetum caudulatum* Trin. var. caudulatum	Gramineae	M78
				H	*Trisetum cumingii* (Nees ex Steud.) Parodi ex Nicora var. cumingii	Gramineae	M7AC
				H	*Trisetum lasiolepis* E.Desv.	Gramineae	M9AC
				H	*Trisetum preslei* (Kunth) E.Desv. var. preslei	Gramineae	34M
■				H	*Tristagma bivalve* (Lindl.) Traub	Alliaceae	45M6789
				H	*Tristagma nivale* Poepp. f. nivale	Alliaceae	4M689C
■				H	*Tristerix aphyllus* (Miers ex DC.) Tiegh. ex Barlow et Wiens	Loranthaceae	345M6
				H	*Tristerix verticillatus* (Ruiz et Pav.) Barlow et Wiens	Loranthaceae	345M678A
				H	*Tropaeolum polyphyllum* Cav.	Tropaeolaceae	45M67
■	■			H	*Tropaeolum sessilifolium* Poepp. et Endl.	Tropaeolaceae	45M6
■				H	*Tropaeolum tricolor* Sweet	Tropaeolaceae	2345M6789A
■				S	*Tweedia birostrata* (Hook. et Arn.) Hook. et Arn.	Asclepiadaceae	245M678
				HS	*Urtica mollis* Steud.	Urticaceae	245M679ABC
■	■			H	*Valeriana bridgesii* Hook. et Arn.	Valerianaceae	45M6
■	■			F	*Valeriana graciliceps* Clos	Valerianaceae	5M67
				H	*Valeriana hornschuchiana* Walp.	Valerianaceae	5M67
■	■			H	*Valeriana lepidota* Clos	Valerianaceae	5M6
■	■	■	■	H	*Valeriana radicalis* Clos	Valerianaceae	M
n				S	*Valeriana stricta* Clos	Valerianaceae	345M67
■				H	*Valeriana vaga* Clos	Valerianaceae	345M
■	■			H	*Valeriana verticillata* Clos	Valerianaceae	5M7
				H	*Vicia vicina* Clos. affin.	Papilionaceae	(M)
				H	*Viola atropurpurea* Leyb.	Violaceae	5M67
				H	*Viola canobarbata* Leyb.	Violaceae	4M6
				A	*Viola domeykoana* Gay	Violaceae	4M6
■	■	■	■	H	*Viola germainii* Sparre	Violaceae	M
				H	*Viola montagnei* Gay var. montagnei	Violaceae	345M6
				H	*Viola philippii* Leyb. var. philippii	Violaceae	M7
■				A	*Viola pusilla* Poepp.	Violaceae	345M678
■				A	*Viola rhombifolia* Leyb.	Violaceae	345M
				A	*Viola subandina* J.M.Watson	Violaceae	M678
				F	*Viviania marifolia* Cav.	Vivianiaceae	345M678
				F	*Viviania ovata* Phil.	Vivianiaceae	5M678
				S	*Wendtia gracilis* Meyen	Ledocarpaceae	45M6789B
				H	*Werneria pygmaea* Gillies ex Hook. et Arn.	Compositae	12345M
				H	*Zoellnerallium andinum* (Poepp.) Crosa	Alliaceae	45M6