

Red List of Chilean Terrestrial Flora



Chilean Forest Service
(CONAF)

**REPUBLIC OF CHILE
MINISTRY OF AGRICULTURE
CHILEAN FOREST SERVICE**

RED BOOK ON CHILEAN TERRESTRIAL FLORA

(Part One)

**IVAN BENOIT C.
EDITOR**

1989

COVER

Photograph by: Adriana Hoffmann

Garra de León (*Leontochir ovallei* Phil.) Endemic of a small area in the Atacama region. The restricted distribution and collection of its showy red flowers have led this plant to the brink of extinction.

RED BOOK ON CHILEAN TERRESTRIAL FLORA
(Part One)

This book corresponds to an updated
edition of the proceedings of the Symposium
"Chilean Threatened Native Tree and Shrub Flora".

organized by the

CHILEAN FOREST SERVICE
and held on August 27-30, 1985,
in Santiago
CHILE

The following proposals are also included:

- Threatened Plant Sites and Vegetation Types in Chile. A. Proposal.
- Proposal to modify the conservation status classification of 15 tree and shrub species pursuant to data provided by the study "Technical Files on Specific Sites Where Threatened Woody Species Occur".
- The conservation Status of Chilean Succulent Plants: A Preliminary Assessment.
- Threatened Chilean Continental Pteridophyta.
- Chilean Geophyte Monocotyledon : Taxonomic Synopsis and Conservation Status.

Red Book on Chilean Terrestrial Flora (Part One)

This book was published in Spanish under the title
"Libro Rojo de la Flora Terrestre en Chile (Primera Parte)".

This book may be reproduced whole or in part,
by any means, only for educational, non-profit purposes,
provided that the source is mentioned.

Any further information may be requested from:

CORPORACION NACIONAL FORESTAL (CONAF)
Av. Bulnes 285, Santiago de Chile
Telephone : (562) 699 1257; (562) 699 2833
Telex : 240001 CONAF CL
Fax : (562) 715881

To quote this publication:

BENOIT, I.L (Ed.) Red Book of Chilean Terrestrial
Fauna (Part One) 151 p. CONAF. Santiago, Chile.
1989.

Translated into English by Julio C. Saavedra

Printed in Chile by Impresora Creces Ltda.
Manuel Montt. 1922 - - Santiago de Chile

TABLE OF CONTENTS

	Page
FOREWORD _____	1
OPENING SPEECH _____	3
CONCLUSIONS _____	5
AGREEMENTS _____	8
RECOMMENDATIONS _____	12
COMPLEMENTARY RECOMMENDATIONS _____	19
CONAF'S CHILEAN NATIVE FLORA PROTECTION AND RESTORATION PROGRAM _____	21
LEGISLATION ON PROTECTION OF CHILEAN NATIVE TREE AND SHRUB FLORA _____	43

ANNEXES

ANNEX 1. Definition of Conservation Status Categories and criteria for determining such status _____	59
ANNEX 2. National listing of tree and shrub species classified under the category of "ENDANGERED" and researchers encharged with writing monographs on such species _____	65
ANNEX 3. Species affected by conservation problems at regional level and sites with plant communities of interest _____	66
ANNEX 4. Listing of native tree and shrub species classified under the categories ENDANGERED, VULNERABLE and RARE by families. _____	81
ANNEX 5. National listing of native tree and shrub species classified under the categories of ENDANGERED, VULNERABLE and RARE by SNASPE Unit (s) where their presence has been detected _____	83
ANNEX 6. List of researchers and specialists participating at the Symposium on Endangered Native Tree and Shrub Flora. _____	89
ANNEX 7. Roster of participants from CONAF and other non-university institutions _____	92

PROPOSALS

1 Threatened Plant Sites and Vegetation Types in Chile. A proposal _____	97
2 Proposal to Modify the Conservation Status Classification of 15 Tree and Shrub Species Pursuant to Data Provided by the "Technical Files on Specific Sites where Threatened Woody Species Occur" _____	105
3 The Conservation Status of Chilean Succulent Plants: A Preliminary Assessment _____	107
4 Threatened Continental Chilean Pteridophyta _____	121
5 Chilean Geophyte Monocotyledons: Taxonomic Synopsis and Conservation Status _____	140

The Chilean Forest Service (CONAF) expresses its deepfelt gratitude to each and everyone of the specialists who accepted our invitation to take part in this symposium, as it was they who made the high-level of this meeting possible.

CONAF also thanks those authors whose proposals to the scientific community enrich this publication.

SANTIAGO, November 1989.

This book has been published with the financial support of the Forestry Division of CMPC (Compañía Manufacturera de Papeles y Cartones S.A.).



FORESTAL
MININCO S.A.
Una empresa CMPC



forestal
crecex



FORVERSA
FORESTAL RIO VERGARA S.A.

FOREWORD

The Symposium on Threatened Chilean Native Tree and Shrub Flora contributed greatly to expanding knowledge on our flora, particularly that which is presently affected by conservation problems.

This important event, organized by the Chilean Forest Service (CONAF) through its Protected Wild lands Department, brought together in Santiago renowned specialists and researchers on our flora working with universities from Arica (Universidad de Tarapacá) to Punta Arenas (Universidad de Magallanes), from August 27 to August 30, 1985. CONAF experts with experience and knowledge on the subject also attended this symposium, both from national headquarters and the regional offices, as well as representatives of public institutions (CONICYT, General Comptrollership of the Republic, DIPROREN) and private institutions (Comité Pro Defensa de la Fauna y Flora - CODEFF).

The Proceedings of this Symposium, including the agreements and conclusions arrived at by the specialists, have the value of representing a consensus opinion, achieved for the first time at a national level, regarding the plant species which present a more pressing conservation status and call for urgent attention to prevent their extinction. These Proceedings also constitute valuable reference material on the conservation status of native tree and shrub species classified under the categories of ENDANGERED, VULNERABLE and RARE. This publication also presents information regarding legislation on protection of Chilean native tree and shrub species and the actions undertaken by CONAF to cope with the problems affecting our native flora through its Chilean Native Flora Protection and Restoration Program.

IVAN CASTRO
Executive Director
Chilean Forest Service

**OPENING SPEECH
SYMPOSIUM ON THREATENED CHILEAN NATIVE TREE AND
SHRUB FLORA**

Authorities, Ladies and Gentlemen,

As Executive Director of the Chilean Forest Service, I am honored to welcome, on behalf of the Ministry of Agriculture and the Service I head, the participants to this Symposium on Threatened Chilean Native Tree and Shrub Flora.

It is a great honor for our Service to organize this meeting, first of its kind in Chile, and rewarding to see the enthusiasm it has generated.

This event is part of the efforts made by the Service to safeguard Chile's natural heritage, efforts which should increase day to day in response to the pressing problems posed by the increasingly fast depletion of our natural resources and, particularly, because of the risk of losing genetic material.

This symposium falls in line with the purposes set forth by the United Nations' World Charter for Nature, dating from 1980, which states that "every life form is unique and deserves to be respected, whatever its immediate usefulness for man. Furthermore, the population of each species must be kept at a level which is at least sufficient to guarantee its survival; likewise, the necessary habitat to that end must be preserved".

This event is also Chile's response to the conclusions and recommendations put forth at the IX World Forest Congress, held in Mexico in July 1985 and which, as regards native flora, stated: "Forest genetic resources have been severely affected in many parts of the world. A number of research studies have been conducted *en threatened* and endangered species, recommending the different countries to undertake dynamic *in situ* and *ex situ* conservation programs; to make genetic resource conservation an integral part of management plans; to carry out population biosystematics and dynamics studies, and, most important, to make a great effort for creating social awareness of the present and potential importance of these resources".

It is worth reiterating that the Chilean Forest Service is deeply committed to achieving the objectives of the World Conservation Strategy devised by the world's major conservationist agencies and, most especially, to the third of those objectives, which seeks to "assuring the sustained utilization of species and ecosystems". This sustained utilization can be achieved through conservation, and we understand under conservation that which is defined by Law No. 18,362, which created the National Protected Wild lands System (SNASPE). It states: "Conservation is such actions undertaken by man in the use of the biosphere so as to produce the greatest sustained benefit for the present generations, but securing its potential to meet the needs and aspirations of future generations. Conservation includes actions aimed at preserving, maintaining, utilizing on a sustained basis, restoring and improving the natural environment".

Within the context of increasing worldwide concern regarding natural resources, and considering that despite technological progress and prowess man depends on natural resources just as he did at the dawn of humankind, the need becomes evident of

doing our best to gain the necessary scientific and technical knowledge to undertake concrete actions to benefit our native flora.

It is in CONAF's highest interest, as well as that of the specialists attending this symposium, of the native flora and, last but not least, of the national community we are a part of, that the recommendations and conclusions arrived at in this symposium be based on sound technical foundations, in order for the actions and plans derived there from to be as realistic as possible and that they guide best the State's –and particularly CONAF's- actions associated with our flora species presenting the most pressing conservation problems.

I bid you then, ladies and gentlemen, to devote your energy to the success of these efforts.

I take this opportunity to express our wish that this meeting mark the starting point of a fruitful and long-lasting relationship, a relationship which should become deeper in the future as new joint actions are undertaken.

Ladies and gentlemen, I pronounce this symposium open.

Thank you

IVAN CASTRO POBLETE
EXECUTIVE DIRECTOR
Chilean Forest Service

CONCLUSIONS

The participants at the Symposium on "Threatened Chilean Native Tree and Shrub Flora" have arrived at the following conclusions:

1. The following 11 Chilean native tree and shrub flora species are in a critical conservation status and qualify to be classified under the category of ENDANGERED. They are as follows (arranged alphabetically):

Priority	Scientific Name	Common Name	Origin	Geographic distribution
3	<i>Avellanita bustillosii</i> Phil.	Avellanita	E	Regions V, M
2	<i>Beilschmiedia berteriana</i> (Gay) Kos.	Belloto del Sur	E	Reg. VII, VIII
11	<i>Berberidopsis corallina</i> Hook. f.	Michay rojo	E	Region VII - X
1	<i>Berberis litoralis</i> Phil.	Michay de Paposo	E	Region II
9	<i>Dalea azurea</i> (Phil.) Reiche	Dalea	E	Region II
4	<i>Gomortega keule</i> (Mol.) Baillon	Queule	E	Reg. VII, VIII
6	<i>Metharme lanata</i> Phil.	Metarma lanosa	E	Region I
10	<i>Nothofagus alessandrii</i> Esp.	Ruil	E	Region VII
8	<i>Pitavia punctata</i> (R. et P.) Mol.	Pitao	E	Reg. VII - IX
5	<i>Reichea coquimbensis</i> (Barn) Kaus.	Reichea	E	Region IV
7	<i>Valdivia gayana</i> Remy	Valdivia	E	Region X

"Region M." stands for Metropolitan Region.

2. The 26 Chilean native tree and shrub species listed below are in such a conservation status as to qualify as VULNERABLE:

Priority	Scientific Name	Common Name	Origin	Geographic distribution
*	<i>Araucaria araucana</i> (Mol.) K. Koch	Araucaria	S	Reg. VIII - X
5	<i>Austrocedrus chilensis</i> (D. Don) Pic. - Ser. et Bizz.	Ciprés de la Cordillera	S	Reg. V - X & M.
6	<i>Azorella compacta</i> Phil.	Llaretta	O	Reg. I - III
3	<i>Beilschmiedia miersii</i> (Gay) Kos.	Belloto del Norte	E	Reg. V & M.
2	<i>Carica chilensis</i> (Planch ex DC.) Solms. - Laub.	Palo Gordo	E	Reg. IV & V
1	<i>Croton chilensis</i> Muell. - Arg.	Higuerilla de Paposo	E	Reg. II
3	<i>Cordia decandra</i> H. et A.	Carbonillo	E	Reg. III & IV
2	<i>Dasyphyllum excelsum</i> (D. Don) Cabr.	Tayú	E	Reg. V - VI
4	<i>Deuterocohnia chrysantha</i> (Phil.) Mez.	Chaguar del jote	E	Reg. II & III
*	<i>Fitzroya cupressoides</i> (Mol.) Johnst.	Alerce	S	Reg. X
4	<i>Jubaea chilensis</i> (Mol.) Baillon	Palma chilena	E	Reg. IV-VII & M.
3	<i>Krameria cistoidea</i> H. et A.	Pacul	E	Reg. II-V & M.
5	<i>Laretia acaulis</i> (Cav.) Gill. et Hook	Llaretilla	S	Reg. III - IX
3	<i>Legrandia concinna</i> (Phil.) Kausel	Luma del Norte	E	Reg. VII & VIII
2	<i>Monttea chilensis</i> Gay	Uvillo	E	Reg. II - IV
5	<i>Myrica pavonis</i> C. DC.	Pacama	O	Reg. I
4	<i>Nothofagus glauca</i> (Phil.) Krasser	Hualo	E	Reg. VI-VIII & M.
4	<i>Nothofagus leonii</i> Esp.	Huala	E	Reg. VII & VIII
3	<i>Persea meyeniana</i> Nees.	Lingue del Norte	E	Reg. V-VII & M.
6	<i>Polylepis bessereri</i> Hieron	Queñoa	O	Reg. I
6	<i>Polylepis tarapacana</i> Phil.	Queñoa de altura	O	Reg. I & II
3	<i>Porlieria chilensis</i> Johnst.	Guayacán	E	Reg. IV-VI & M.
2	<i>Pouteria splendens</i> (A.DC.) O.K.	Lúcumo	E	Reg. IV & V
6	<i>Prosopis</i> (género)	Prosopis	O	Reg. I - V & M.
1	<i>Puya coquimbensis</i> Mez.	Chagual de Coquimbo	E	Reg. IV
2	<i>Puya venusta</i> Phil.	Chagualillo	E	Reg. IV-V

* The species *Araucaria araucana* and *Fitzroya cupressoides* were given the status of Nature Monument in 1976 through a Supreme Decree. No priority is listed for them, as CONAF is already taking censuses and carrying out studies and actions aimed specifically at their conservation on a priority basis.

3. That the 32 Chilean native tree and shrub flora species listed below have such a natural distribution or present such a status as to qualify in the category RARE:

Priority	Scientific Name	Common Name	Origin	Geographic distribution
1	<i>Adesmia balsamica</i> Bert.	Paramela de Puangue	E	Reg. V
2	<i>Adesmia campestris</i> (Rendl.) Rowl.	Mata espinosa	S	Reg. XII
1	<i>Adesmia resinosa</i> Phil.	Paramela de Til-Til	E	Reg. V & M.
1	<i>Asteriscium vidalii</i> Phil.	Anisillo	E	Reg. II & III
2	<i>Benthamiella</i> (género)	Benthamiella	S	Reg. XII
1	<i>Citronella mucronata</i> (R. et P.) D. Don	Huillipatagua	E	Reg. IV-X & M.
1	<i>Corynabutilon ochsenii</i> (Phil.) Kear	Huella chica	E	Reg. IX & X
1	<i>Eucryphia glutinosa</i> (P. et E.) Baillon	Guindo santo	E	Reg. VII - IX
1	<i>Grabowskia glauca</i> (Phil) Johnst.	Coralito del Norte	E	Reg. II
2	<i>Haplorhus peruviana</i> Eng.	Carza	O	Reg. I
2	<i>Hebe salicifolia</i> (Forst.) Pennell.	Hebe	O	Reg. X - XII
1	<i>Lobelia bridgesii</i> H. et A.	Tupa rosada	E	Reg. X
1	<i>Malesherbia angustisecta</i> Harms.	Malesherbia	E	Reg. I
1	<i>Malesherbia auristipulata</i> Ric.	Ají de zorra	E	Reg. I
1	<i>Malesherbia tocopillana</i> Ric.	Farolito	E	Reg. II
2	<i>Maytenus chubutensis</i> (Speg.) Lourt., O'Donell et Sleumer	Maitén del Chubut	S	Reg. M. - IX
2	<i>Menodora linooides</i> Phil.	Linacillo	S	Reg. V
2	<i>Mulinum valentinii</i> Speg.	Mulino	S	Reg. XII
1	<i>Myrceugenia colchaguensis</i> (Phil.) Navas	Arrayán de Colchagua	E	Reg. V - VII & IX
1	<i>Myrceugenia correaefolia</i> (H. et A.) Berg.	Petrillo	E	Reg. IV - VII
1	<i>Myrceugenia leptospermoides</i> (D.C.) Kausel	Macolla	E	Reg. VIII & IX
1	<i>Myrceugenia pinifolia</i> (F. Phil.) Kausel	Chequén de hoja fina	E	Reg. VII-IX
1	<i>Myrceugenia rufa</i> (Colla) Skottsbo.	Arrayán de hoja roja	E	Reg. IV & V
1	<i>Nolana balsamiflua</i> (Gaud.) Mesa	Suspiro	E	Reg. II
1	<i>Orites myrtoidea</i> (P. et E.) B. et H.	Radal enano	E	Reg. VII - IX
1	<i>Pintoa chilensis</i> Gay	Pintoa	E	Reg. III
1	<i>Prumnopytis andina</i> (P. et E.) de Laub.	Lleuque	E	Reg. VII - X
1	<i>Ribes integrifolium</i> Phil.	Parrilla falsa	E	Reg. VIII & IX
2	<i>Salvia tubiflora</i> Smith*	Salvia roja	O	Reg. II
1	<i>Satureja multiflora</i> (R. et P.) Briq.	Menta de árbol	E	Reg. VII - X
2	<i>Schinus marchandii</i> Barkley	Laura	S	Reg. XI
1	<i>Scutellaria valdiviana</i> (Clos.) Epling.	Teresa	E	Reg. VII - X

NOTE: The priority assigned at the Symposium corresponds to the urgency recommended for the initiation or strengthening of the protection and restoration efforts.

E = Endemic

S = Subantarctic (occurring naturally in Chile —from La Serena southwards— and in Argentina).

O = Occurring naturally in Chile and in other countries.

* The species *Salvia tubiflora* was classified at the Symposium under the category of ENDANGERED, but subsequent data furnished by researcher Ms. Adriana Hoffmann warrant its inclusion in the category of RARE, as its range includes other countries as well (mainly Peru), and it is a rather infrequent species in Chile.



Michay rojo (*Borberidopsis corallina* Hook. F.)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción. (Fig. 15, p. 127)
Editorial Universitaria.
Santiago, Chile, 248 p.

4. That, in addition to the nationwide threat level stated for the various species under Conclusions 1, 2, and 3, there are other species which also present conservation problems at given areas of the country. Annex 3 lists the threatened plant species, both at national and regional level, existing at each Administrative Region, listing as well sites of interest at the plant community level. It was also concluded that a species classified as vulnerable or rare at national level, may fall within a different category at regional level; a species not included in the national listing may be included in one or more regional level listings.

5. That the Chilean Native Flora Protection and Restoration Program submitted by the Protected Wildlands Department is a suitable method for tackling the problems faced by Chilean native flora, particularly flora threatened by extinction. Support for this Program has therefore been agreed upon and the participants at this Symposium and the scientific community at large are encouraged to provide their best support to its efforts.

AGREEMENTS

The participants at the Symposium on Threatened Chilean Native Tree and Shrub Flora have agreed as follows:

1. To accept the international concepts and criteria put forth by IUCN (1982) for defining the Species Conservation Status Categories as well as the Criteria for determining said status, included in Annex 1 hereto (indicating as well the amendments proposed at the Symposium), and to consider them suitable for use in floristic studies. Their utilization by the rest of the Chilean scientific community is also recommended.

Photograph: Alexis Villa S.



Southern Belloto (***Beilschmieia berteriana*** (Gay) Kosterm.) is an endemic tree species that may reach 25m. Its former distribution covered the central valley and front range of the Andes in the Regions of Maule and O'Higgins. Agricultural activities have dramatically reduced its population.

Photograph: Alexis Villa S.



Queule, (***Gomortega keule*** (Mol.) Baillon) the only species of the family Gomortegaceae, endemic to Chile, may reach a height of 25m. The few remnant populations grow in the Maule and Biobío Regions.

Photograph: Leonardo Araya V.



Coralillo (Little Coral) or Red Michay, (*Berberidopsis corallina* Hook. F.) grows as a shrub or vine in the laurifolious forests of the Coastal Range western slopes (exposed to the sea), between Maule and Los Lagos Regions. The species populations, always scant, have been reduced even more in the last decades.

Ruil (*Nothofagus alessandrii* Esp.)
 Source: Rodríguez R. et. al 1983. Flora Arbórea de Chile.
 Editorial Universidad de Concepción.
 (Fig. 50 p. 228)
 Concepción, Chile. 408 p.



2. To increase communication, information exchange and cooperation among specialists in matters associated with the conservation of threatened native plant species.
3. To promote, through the participants at this Symposium, research on taxonomy and other fields to expand knowledge on threatened native flora, particularly research and review of genera having a large number of species difficult to identify, within the research lines of the Universities and other institutions they represent; and to request assistance from their corresponding authorities for research lines on botany and phytogeography.
4. To produce technical monographs and a booklet for public information on each of the 11 Chilean native flora species under the ENDANGERED category. These monographs will be based on the corresponding literature and, wherever feasible and necessary, data from field or laboratory work carried out expressly for such purpose will be included. The various researchers commit them selves to conducting research and determining the most suitable channels for adequately circulating such monographs. (Annex 2 lists the species and researchers who offered to make the monographs.)
5. To make the conclusions and recommendations of the Symposium known at the institutions they represent. it is also agreed that those participants associated with the National Commission on Ecology recommend this Commission to disseminate information on those species classified at the Symposium under the ENDANGERED, VULNERABLE or RARE categories.
6. To conduct, on a priority basis, taxonomic and bibliographic studies on the genus *Prosopis* and propose a conservation status for each of the species included in this genus.



Queule (*Gomortega keule* (Mol.) Johnst.)
 Source: Rodríguez R. e. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción.
 (Fig. 31, p. 164.)
 Concepción. Chile, 408 p.

Palo Gordo (*Carica chilensis* (Planch. ex DC.) Solms. Laub.)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción.
Editorial Universitaria
(Fig. 16, p. 129).
Santiago, Chile. 24 p.



RECOMMENDATIONS

The participants at the Symposium on Threatened Chilean Native Tree and Shrub Flora recommend the following:

1. Considering that the current legislation is not sufficient to protect adequately a large portion of the threatened tree and shrub species, whatever their location and status, the Ministry of Agriculture is hereby urged to establish by Supreme Decree an official list of threatened native flora species or populations, dictating special provisions for each threat category defined at the Symposium, so as to insure their conservation. It is also recommended to keep this list under permanent updating incorporating into it any data provided by scientific investigation and technical knowledge.
2. To decree the conservation measures necessary for banning or regulating the harvesting, utilization or trading of species or parts of species for a given period of time, at those sites having



Tayú (*Dasyphyllum excelsum* (D. Don) Cabr.)
Source: Muñoz C. 1966. Sinopsis de la Flora Chilena.
Editorial Universitaria de Chile.
(Fig. LXIII).
Santiago, Chile. 500 p.

Palma Chilena (*Jubaea chilensis* (Mol.) Baillori)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción.
Editorial Universitaria.
(Fig. 36, p. 169)
Santiago, Chile. 248 p.



flora species or populations included in the official list of threatened species or populations.

3. Considering that the exploitation of threatened native tree and shrub flora is encouraged by the vagueness of some of the regulations governing forest operations (Decree Law No. 701 and the amendments thereto), CONAF is recommended to request the Universities to define the terms 'forest', 'second-growth forest', 'and tree stand' (including adequate concepts and definitions for arid and semi-arid zone plant communities), as well as the regulations concerning said plant formations; to accurately define what is meant by 'suitable for economic exploitation', included in the term 'afforestation' and which is used for determining whether subsidization is in order for sites whose original vegetation has been removed or altered either by anthropic or natural causes; and that special legislation be discussed for those associations of species not included in Decree Law 701 (arid and semi-arid zones located northward of the Sclerophyl Type).

4. To speedily update legislation regarding native flora in general, with the purpose of determining clearly and precisely the legal and regulating provisions in force, their scope and limitations, with the purpose of establishing aspects to be considered on a priority basis by future legislation to



Pacama (*Myrica pavonis* C. DC.)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción.
Editorial Universitaria.
(Fig. 21, p. 139).
Santiago, Chile. 248 p.

Hualo (*Nothofagus glauca* (Phil.) Krasser)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción.
Editorial Universitaria.
(Fig. 22, p. 141)
Santiago, Chile. 248 p.



enhance conservation of our native flora, particularly threatened native flora.

5. That the corresponding state agencies devise legal alternatives for protecting the most relevant plant species classified as threatened and growing in private lands.

6. Considering that CONAF is the institution encharged with watching over the conservation of Chile's natural heritage, particularly native flora, and considering the importance and short-term, medium-term and long-term needs of the Chilean Native Flora Protection and Restoration Program, said institution is recommended to provide the greatest support to this program, through the creation of a unit encharged with native flora, particularly of threatened native flora.

7. To create a Data Bank on native flora (species, populations and communities, their location, geographic distribution and other biologic and ecological data) with the purpose of assisting in their



Huala (*Nothofagus leonii* Esp.)
Fuente: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción.
(Fig. 56, p. 246).
Concepción. Chile. 408 p.

Photograph: Claudio Cunazza P.



Valdivia or Lyon's plant (**Valdivia gayana** Remy) is a small plant with a lignified stem, endemic to a little coastal area south of the city of Valdivia. It is related phytogeographically to the temperate rainforest. The species is at risk, with numbers ranging in the low hundreds and very restricted distribution.

Photograph: Leonardo Araya V.



Pitao, (**Pitavia punctata** Mol.) Human disturbance has reduced the species range and population.

Photograph: Iván Benoit C



Ruil (*Nothofagus alessandrii* Espinosa) is a tree reaching a height of 30m. Presently its range is reduced to a few patches in the coastal area of Maule Region. Human disturbance and the lack of physical continuity between remnant populations are threats seriously threatening this species, potentially important for commercial forestry.

Queñoa (*Polylepis besseri* Hieron)
Source: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción. (Fig. 67, p. 282)
Concepción, Chile. 408 p.



adequate management and protection.

8. Considering the existence of plant species, populations and communities of high interest due to endemism, fragility or singularity, at present not granted special legal or administrative protection, and considering that CONAF has carried out studies and taken steps to bring areas of interest into the National Protected Wildlands System, the corresponding state agencies are requested to support CONAF's efforts to establish new protected wildland units at sites containing plant communities not represented or insufficiently represented in the National Protected Wildlands System, particularly in the Northern and Central parts of the country. A few examples of such sites are listed below:



Guayacán (*Porlieria chilensis* Johnst.)
Fuente: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción. (Fig. 85, p. 351)
Concepción. Chile. 408 p.

Region	Name	Plant Community to be Protected
I	Pampa del Tamarugal National Reserve	Genus <i>Prosopis</i>
II	Paposo National Park	<i>Endemic cactacea</i> and <i>highly endemic "hillslope" vegetation</i>
II & III	Pan de Azúcar National Park	<i>Endemic cactacea</i> and endemic flora in general
VI	Río de los Cipreses National Reserve	<i>Sclerophyl</i> forest and Ciprés de la Cordillera
VIII	Isla Mocha National Reserve	Olivillo and Arrayán associations
X	Hornopirén National Park	High-altitude deciduous Andean rainforest - Alerce associations

9. That the administration of lands owned by state institutions, autonomous state agencies or by municipalities be transferred to CONAF, whenever the occurrence is detected in them of threatened plant species or of ecologically important plant populations or communities not included in the National Protected Wildlands System.

10. That the corresponding state agencies and the community at large promote actions aimed at preserving native flora in such a way that extinction of any one of its species, decrease in genetic diversity or the introduction and spread of pests and disease affecting it are prevented.

11. That the corresponding state agencies contact companies or private owners in whose lands threatened plant species occur, with the purpose of raising awareness regarding their conservation and enlisting their active collaboration in the protection of such species, committing themselves to watching over the protection of those threatened species whose habitat is present in their properties.

12. Considering the great variety of succulent plant species and the great pressure affecting them, particularly Cactaceae, derived either from scientific or commercial interest, the holding of a symposium on the conservation status of succulent plants is greatly encouraged. Particular stress is laid on carrying out, on a priority basis, Project "C" on succulent plants included in the Chilean Native Flora Protection and Restoration Program of CONAF's Protected Wildlands Department.

13. To hold a symposium on threatened native vegetation, discussed from the standpoint of formations and communities.

14. That CONAF and the academic centers having research lines in botany encourage and promote dissemination of practical ways of propagating and raising threatened species (according to the latest data provided by research), with the purpose of contributing to increasing their numbers and expanding knowledge on them.

15. That the Ministry of Agriculture enters into agreements with the Ministry of Education, aimed at making known the threatened species at school level.

16. That the researchers make available to CONAF's Protected Wildlands Department existing and future publications on threatened Chilean native flora.

17. To edit and release the Proceedings of this Symposium as soon as possible, and that its agreements, recommendations and conclusions be made available to the authorities and the general public, so that awareness is raised regarding both the problems affecting our native flora and the fact that the State, through CONAF, has great interest in increasing actions aimed at their conservation (protection, restoration, and sustained utilization).

COMPLEMENTARY RECOMMENDATIONS

Certain recommendations emerged from the Symposium's debates not intimately or directly related to the Objectives of the Symposium itself, but which the specialists, on account of the relevance and contents of said recommendations, urged to include in these Proceedings. The recommendations are as follows:

1. To regulate adequately and control strictly the use of vegetation for fuel, particularly in northern Chile, as well as to promote the use of alternatives, such as fuelwood from eucalyptus and pinetrees (*Eucalyptus* and *Pinus*), among others.
2. To provide special protection for Guayacán (*Porlieria chilensis*), performing an assessment of the resource it represents and setting up extraction quotas, in light of the pressure exerted upon this species for uses as fuelwood; in handicrafts or for making charcoal, on account of the unique characteristics of this wood.
3. That Forest Management Plans include an environmental assessment, including vegetation charts and establishment of extraction quotas.
4. To promote, through research and experimentation, the adequate management and utilization of forests or populations of exotic species.
5. That CONAF should prepare and periodically review regulations governing the utilization of native flora, so as to assure native flora regeneration with stocking rates and composition as recommended by scientific studies on the matter.
6. That in reviewing legal rules regarding protection of Chilean native flora, the fact be taken into consideration that tree felling on mountain slopes increases the danger of avalanches, landslides or mudslides, particularly in a country like Chile, where steep slopes abound.
7. That legislation regarding native flora ought not to be limited solely to banning or regulating activities or to establishing fines for non-complying parties, but should also include encouragement for species management and protection. For example, native forest management should be subsidized. Additionally, the enactment of regulations providing incentives for research and acquisition of scientific knowledge on our native species is recommended, as well as the education and dissemination of natural resource conservation and protection guidelines.
8. To urgently study and regulate hunting, trade, systematic control and census-taking of exotic fauna acclimatized in the country —such as red deer, wild hogs, muskrats, hurons, castors, etc.— and which could be classified as pests once their destructive effects on vegetation is eventually demonstrated.
9. To legislate on destructive grazing of sclerophyllous shrubs and on steppes.
10. To intensify both use of and afforestation with native species having forest and/or ornamental value.
11. To bring into the National Protected Wildlands System places of relevance for the conservation of important species, populations and communities presently not included in the System, or insufficiently represented in it, and in pressing need of protection and restoration.
12. To start the study and planning of the Chilean landscape as a set of spatially distributed resources, in order to watch over and control an acceptable transformation or exploitation of the landscape, turning it into a cultural landscape of greater national value.
13. To ban the introduction into the country of genetic material or individuals of exotic flora species which in their countries of origin, or in other countries to which they have been introduced, constitute a pest.

**CONAF'S CHILEAN NATIVE FLORA PROTECTION AND RESTORATION
PROGRAM**

Protected Wildlands Department

CONAF'S CHILEAN NATIVE FLORA PROTECTION AND RESTORATION PROGRAM

TABLE OF CONTENTS

	Page
I INTRODUCTION	25
II OBJECTIVES	25
III JUSTIFICATION	26
IV WORK PLAN	29
V BIBLIOGRAPHY	32

ANNEXES

1. Species taxonomic classification and distribution at the various administrative regions in Chile	33
2. Morphologic categories	38
3. Definition of concepts	38
4. Families and genera of Chilean flora. Number of taxa by geographic origin	39

I. INTRODUCTION

From his remote past, man has depended on nature as a source of goods and services, obtaining from vegetation a number of resources such as food, fuel, medicine and raw materials for industries. Furthermore, vegetation, as a fundamental component of wild lands, provides important services such as protection of soils and streams, air recycling, habitat for wild fauna and opportunities for recreation and scenic beauty for man.

Natural vegetation, used rationally, can provide on a sustained basis the goods and services mentioned above, as well as other products required by advancing technology. However, man has often subjected it to indiscriminate exploitation and to the negative effects of inadequate practices, such as burning, giving rise to a rapid depletion of the world's natural green cover. This phenomenon has been enhanced of late as a result of the demographic explosion and the introduction of increasingly sophisticated harvesting technologies, particularly in logging operations.

At present, as a result of the uncontrolled use in the past, serious problems have arisen both throughout the nation and in foreign lands, posed by the grave depletion of the natural vegetation cover. Such problems include extinction of species, uncontrolled erosion, desertification, silting of streams, floods and a rise in contamination.

The expanses of native vegetation in Chile are being increasingly encroached upon, up to the point that many species are at present under threatened or endangered status, and some even extinct. Among the latter are included Juan Fernández sandalwood and Easter Island toromiro. Other concrete cases of threatened species are known in addition to the above, but the conservation status of every native species is generally unknown. No thorough study has been conducted to ascertain the effective conservation status of most native plant species, which amount to nearly 5,000 different species of upper plants (Gajardo, 1983).

However, a number of botanists has pointed out in various publications, papers and media interviews, that it is sufficiently known and documented that many tree and tree-like native species are under some degree of threat of various origins. Considering that a score of species is under such status, it is imperative to undertake immediately a number of actions aimed at adequately protecting and restoring them, lending priority, in a first stage, to those tree and tree-like species classified under the "Endangered", "Vulnerable", and "Rare" conservation categories as defined by the IUCN, a classification which is to be carried out by a national meeting of specialists.

It is worth mentioning that this Program has been divided into 5 Projects. In a first stage and with a character of emergency, it has been deemed convenient to start with the Project on tree and tree-like species, aimed at those species classified under any one of the three conservation categories described above and under the following situations: endemic species, native species with sub-Antarctic range, and native species occurring also in other countries.

Lastly, it is worthy of mention that the project on protection and conservation of species endemic to the Juan Fernández Archipelago is already under way, conducted by CONAF, carrying out successfully the activities envisioned and being conducted in areas belonging to the National Park existing in this archipelago.*

II. OBJECTIVES

1. Short-Term Objectives

a) Determining the species having conservation problems and establishing the present situation of their populations.

(*) Since March 1988, the project has been considerably expanded with funding provided through WWF Project 3313 "Recovery and Conservation Programme for Juan Fernández Threatened Plants".

b) Determining the causes directly or indirectly giving rise to conservation problems affecting said species.

c) Detecting the sites where the species affected by problems occur and determining their present conservation status on the basis of the 6 categories set forth by the World Conservation Union (IUCN).

d) Detecting sites containing plant species, populations and communities of interest to be incorporated into the National Protected Wildlands System.

2. Medium-Term Objectives

a) To reintroduce species with problem into their, typical sites or into other areas within their natural range.

b) To reproduce in protected wildlands species affected by problems, particularly in National Reserves and in other sites such as the National Botanical Garden, located in Viña del Mar; Hualpén (Region VIII); the Universidad Austral's Botanical Garden and Arboretum; or the Universidad de Chile's Forestry School research site al Frutillar.

c) To devise a plan for rational management (or sustained utilization) of each species, once its population has recovered sufficiently.

III. JUSTIFICATION

Conservation and management of living resources, i. e. securing the perpetuation of the different species, together with their rational utilization, has great importance on different accounts.

Every living species is a unique national and world asset which, if extinct, becomes absolutely irrecuperable, entailing an economic, ecologic, scientific and educational loss.

The World Conservation Strategy (WCS) devised by the World Conservation Union (IUCN), the United Nations Environment Program (UNEP) and the World Wide Fund for Nature (WWF), summarizes the foregoing in the following three objectives aimed at the Conservation of Nature (IUCN, UNEP, WWF, 1980):

a) To maintain essential ecological processes and life support systems (e.g. soil regeneration and protection, nutrient recycling and water purification), on which human survival and development depend;

b) To preserve genetic diversity (the entire range of genetic material found in the living organisms of the whole world) on which the functioning of many of the processes and systems mentioned above depends. as well as the breeding programs necessary for the protection and improvement of crop plants, domestic animals and micro-organisms; a sizable portion of scientific and medical processes technical innovation; and survival of industries based on living resources;

c) To ensure the sustained utilization of species and ecosystems, particularly fishes and wild fauna, forests and grasses, constituting the vital basis for innumerable rural communities and major industries.

Potentially, every plant species endemic to Chile is directly or indirectly a usable resource for the future. Every native species is an important part of our natural heritage and it is our country's duty to prevent their demise, as total loss of their genetic material is irreversible.

All flora species in the country, as well as their genetic diversity, must be protected, so that any species or characteristic thereof which might be needed in the future will be available when needed. In other words, the option to utilize them must remain open.

Photograph: Iván Benoit C.



Croton or Higuera of Paposo (*Croton chilensis* Muell-Arg) is a shrub endemic to Paposo, a coastal desert spot in northern Chile, where fog is able to sustain a specialized vegetation community. Fuelwood collection and dependence on a critical environmental factor such as fog, have prompted scientists to include it in the **Vulnerable** list.

Photograph: Manuel Ibarra M.



Lúcumo or "Red Bark" (*Pouteria splendens* (D.C.) O.K.) is a shrub endemic to southern Coquimbo Region and a few spots in the Region of Valparaíso. Recreational development of coastal resorts is the main threat to this species.

Photograph: Rodolfo Gajardo M.



Although the condition of northern Belloto (*Bellschmledia miersii* (Gay) Kosterm.), is less critical as compared to southern Belloto, this handsome tree, endemic to the areas with the highest human population density in Chile, is suffering from the expansion of urban areas and the increased tapping of minor water sources for agricultural irrigation.

IV. WORK PLAN

1. Specific Projects

The Program was divided into five specific projects, which may be correlative or concurrent depending on their characteristics and the availability of funds, basic data and personnel. They are as follows:

1.1. Project A

Protection and recovery of tree and shrub species.

- a) Species endemic to Chile
- b) Native species with Subantarctic range
- c) Native species occurring also in other countries

1.2. Project B

Protection and recovery of species endemic to Oceanic Islands (Juan Fernández Archipelago, San Félix and San Ambrosio, Easter Island, Sala y Gómez).

1.3. Project C

Protection and recovery of threatened succulent species (cactacea, bromeliaceae, and others).

1.4. Project D

- a) Protection and recovery of arid-zone non-succulent species
- b) Protection and recovery of other threatened species (creeping plants, forbs, etc.)

1.5. Project E

Protection and recovery of:

- a) Species not affected by problems at a national level, but affected by problems at a regional level
- b) Species affected by problems at the outer portions of their natural range

2. Stages Envisaged

Actions aimed at preventing, as a first step, the extinction of tree and shrub species autoctonous to Chile envisage 6 stages:

2.1. Priority Species Definition Stage

Considering the categories defined by IUCN, priority will be given to those tree and shrub species classified under the categories of "Endangered", "Vulnerable", and "Rare".

As regards the species classified under the above categories, greater importance will be granted to endemic species; next, those with sub-Antarctic range and, thirdly, to those whose natural range includes other South American countries (Annex 1).

2.2. Bibliographical Information Compilation Stage

Once the priority species have been defined, an existing literature on the subject shall be compiled and information shall be requested from specialists. As a result of this work, a preliminary monograph shall be written on each of the priority species, covering in detail, as a minimum, the following points:

- a) Introduction
- b) Taxonomy
 - Taxonomic classification
 - Synonymy

- Vernacular names
- c) Biology and biogeography
- d) Morphology
 - General aspects
 - Leaves
 - Flowers
 - Fruits
 - Seeds
 - Bark
 - Roots
- e) Phenology and Reproduction
 - Flowering season
 - Seed-producing season
 - Germination (seedling survival, seed viability)
 - Dormancy
 - Vegetative reproduction (including *in vitro* reproduction)
- f) Ecological description of the species
 - Past range
 - Present range
 - Associated species and flora occurring in the surrounding area.
- g) Causes for population decrease
 - Anthropogenic causes (indiscriminate use, habitat destruction, burning, livestock raising, mining operations, etc.)
 - Natural causes (natural extinction, phytosanitary problems, excessive competition, etc.)
 - Protection and management recommendations
 - Other data of interest
 - Bibliography

2.3. Field Data Gathering Stage

This stage shall include a field visit by a specialist aimed at characterizing sites where previous botanic studies have indicated the species exists, considering a minimum of one place per Administrative Region where the species exists.

The specialist shall fill out a special form including as a minimum the following data:

2.3.1. General Background

- a) Location
 - Administrative (Region, Province, District)
 - Geographic (coordinates and location pinpointed in legal-sized map taken from 1:50,000 IGM chart of the specific site)
 - Altitude above sea level.
- b) Access
 - Roads, trails or paths
 - Distance from and location with respect to nearest settlements
- c) Ownership
 - Owner's and/or administrator's name and, where possible, Internal Revenue Service registration number
- d) Climate
 - Climate type as par Köppen's general classification
 - Precipitation and temperatures (maximum mean, minimum mean, extreme values) taken at the 2 or 3 nearest weather stations, indicating their location in the above map or in another map.
- e) Soil
 - Parent material
 - Land capability class
 - Soil description and type

- f) Aspect
- g) Distance to nearest streams or springs, or to water bodies having influence on the plants of the species under study
- h) Present land use of the property and use of plant species
- i) Other relevant data

2.3.2. *Specific Data*

- a) Species
- b) Sampling date
- c) Map or sketch of site (size A4)
- d) Approximate number of individuals of the species per hectare
- e) Area of occurrence (indicated in site sketch)
- f) Height and diameter (range and averages)
- g) Regeneration by size class (presence, relative abundance, competition, development status, substrate type, and specific environment)
- h) Associated species and flora occurring in the surrounding area (trees, shrubs and grasses)
- i) Characterization of the site's vegetation (plant associations and formations, abundance dominance, stratification, physiognomy)
- j) Protection and management recommendations
- k) Other relevant data.

The field stage shall also include the collection of samples for herbaria. Reports shall be submitted to CONAF's national headquarters and the corresponding CONAF regional offices.

2.4. *Seed Collection Stage*

Once the sites have been identified where the best individuals of a species occur in each Region, seeds shall be collected from each site, storing them adequately and identifying their provenance. A seed package shall be sent to the Chillán Seed Center, another one to the corresponding CONAF Regional Office and a third one to the National Botanical Garden, located in Viña del Mar. Furthermore, genetic material must be collected for vegetative propagation trials.

2.5. *Nursery Stage*

Depending on the facilities available to each Regional Office, seedling production at nurseries shall be considered for those species endemic to that Region, the corresponding costs chargeable to the account of the Regional Office.

In any case, as a minimum, propagation of priority species must be considered at the National Botanical Garden and at the National Reserves having permanent nurseries (e.g. Lago Peñuelas, Río Clarillo).

2.6. *Plantation Stage in State Lands*

A minimum of 1,000 plants of each priority species shall be planted at the National Reserves located nearest the natural range of the corresponding species.

2.7. *Plantation Promotion Stage at Sites Outside the SNASPE*

Utilization of nursery propagated threatened native species for ornamental purposes shall be encouraged at public sites (squares and parks) and private lands (farms and gardens). Particular stress shall be laid on making the species' characteristics and recommended techniques known to those in charge of running the public gardens of the Municipalities.

V. REFERENCES

1. GAJARDO, R. 1983. Sistema Básico de Clasificación de la Vegetación Nativa Chilena. Universidad de Chile, Santiago, 315 p. incl. maps.
2. HOFFMANN, A. 1980. Flora Silvestre de Chile. Zona Central. Editorial Fundación Claudio Gay. Santiago, 254 p.
3. HOFFMANN, A. 1982. Flora Silvestre de Chile. Zona Austral. Árboles, Arbustos y Enredaderas Leñosas. Editorial Fundación Claudio Gay. Santiago, 258 p.
4. MUÑOZ, C. 1966. Sinopsis de la Flora Chilena, claves para la identificación de familias y géneros. Second edition Santiago, 500 p., 243 figs. included in the text, 4 plates.
5. MUÑOZ, C. 1973. Chile: Plantas en Extinción. Santiago, 248 p., 41 figs., 31 plates incl. in the text.
6. ORMAZABAL, O. 1984. Preservación de Recursos Fitogenéticos in situ a través de Parques Nacionales y otras Áreas Protegidas: Importancia, avances, limitaciones y proyección futura. CONAF. Santiago, Chile. 21 p.
7. RODRIGUEZ, R. et al. 1983. Flora Arbórea de Chile. Editorial Universidad de Concepción, Chile. 408 p.

ANNEX 1

SPECIES TAXONOMIC CLASSIFICATION AND DISTRIBUTION
AT THE VARIOUS ADMINISTRATIVE REGIONS IN CHILE

REGION	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.
DIVISION PTERIDOPHYTA Dicksoniaceae...														
<i>Dicksonia berteriana</i>													E	
DIVISION SPERMATOPHYTA SUBDIVISION CONFIERO- PHYTINA Araucariaceae														
<i>Araucaria araucana</i>								S	S	S				
Cupressaceae														
<i>Austrocedrus chilensis</i>					S	S	S	S	S	S				
<i>Fitzroya cupressoides</i>										S				
<i>Pilgerodendro uviferum</i>										S	S	S		
Podocarpaceae														
<i>Podocarpus nubigena</i>									S	S	S	S		
<i>Podocarpus saligna</i>							E	E	E	E				
<i>Prumnopitys andina</i>							E	E	E	E				
<i>Saxegothaea conspicua</i>							S	S	S	S	S			
SUBDIVISIÓN MAGNO- LIOPHYTINA CLASE I: MAGNOLIATAE Winteraceae														
<i>Drimys confertifolia</i>													E	
<i>Drimys winteri</i>				S	S	S	S	S	S	S	S	S		
Monimiaceae														
<i>Laurelia philippiana</i>								S	S	S	S			
<i>Laurelia sempervirens</i>						E	E	E	E	E				
<i>Peumus boldus</i>				E	E	E	E	E	E	E				
Lauraceae														
<i>Beilschmiedia berteriana</i>							E	E						
<i>Beilschmiedia miersii</i>					E	E								
<i>Cryptocarya alba</i>				E	E	E	E	E	E					
<i>Persea lingue</i>					S	S	S	S	S	S				
<i>Persea meyeniana</i>					E	E	E							
Gomortegaceae														
<i>Gomortega keule</i>							E	E						
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.

Legend:

E = Endemic

S = Has sub-Antarctic range

O = Occurs also in the other South American countries

J.F. = Juan Fernandez Archipelago

E.I. = Easter Island

(All species listed for both Region V and VI also occur in the Metropolitan Region).

Source: Modified from Rodríguez et al. 1983. Flora Arbórea de Chile. Editorial Universidad de Concepción. Chile. 408 p.

(Cont.)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	I
Fagaceae															
<i>Nothofagus alessandrii</i>							E								
<i>Nothofagus alpina</i>							S	S	S	S					
<i>Nothofagus antarctica</i>							S	S	S	S	S	S			
<i>Nothofagus betuloides</i>										S	S	S			
<i>Nothofagus dombeyi</i>						S	S	S	S	S	S				
<i>Nothofagus glauca</i>						E	E	E							
<i>Nothofagus leonii</i>							E								
<i>Nothofagus nitida</i>										E	E	E			
<i>Nothofagus obliqua</i> var. <i>obliqua</i>						S	S	S	S	S					
<i>Nothofagus obliqua</i> var. <i>macrocarpa</i>					E	E	E								
<i>Nothofagus pumilio</i>							S	S	S	S	S	S			
Urticaceae															
<i>Boehmeria excelsa</i>													E		
Myricaceae															
<i>Myrica pavonis</i>	O														(1)
Cunonaceae															
<i>Caldcluvia paniculata</i>								S	S	S	S				
<i>Weinmannia trichosperma</i>							S	S	S	S	S	S			
Eucryphiaceae															
<i>Eucryphia cordifolia</i>								S	S	S					
<i>Eucryphia glutinosa</i>							E	E	E						
Saxifragaceae															
<i>Escallonia callcottiae</i>													E		
<i>Escallonia myrtoidea</i>				O	O	O	O	O							(2)
<i>Escallonia pulverulenta</i>				E	E	E	E	E	E						
<i>Escallonia revoluta</i>				E	E	E	E	E	E	E					
Rosaceae															
<i>Kageneckia angustifolia</i>				E	E	E	E								
<i>Kageneckia oblonga</i>				E	E	E	E	E							
<i>Poly/epis tarapacana</i>	O	O													(3)
<i>Polyepis besseri</i>	O														(4)
<i>Quillaja saponaria</i>				E	E	E	E	E							
Mimosaceae															
<i>Acacia caven</i>			O	O	O	O	O	O							(5)
<i>Prosopis alba</i>	O	O													(6)
<i>Prosopis chilensis</i>			O	O	O	O									(7)
<i>Prosopis tamarugo</i>	E														
Caesalpinaceae															
<i>Caesalpinia spinosa</i>	O	O	O	O											(8)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	

(Cont.)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	
Fabaceae															
<i>Geoffroea decorticans</i>	O	O	O	O											(9)
<i>Psoralea glandulosa</i>				E	E	E	E	E	E	E					
<i>Sophora fernandeziana</i>													E		
<i>Sophora macrocarpa</i>				E	E	E	E	E	E						
<i>Sophora masafuerana</i>													E		
<i>Sophora microphylla</i>							O	O	O	O	O				(10)
<i>Sophora toromiro</i>														E	
Myrtaceae															
<i>Amomyrtus luma</i>							S	S	S	S	S				
<i>Amomyrtus meli</i>								E	E	E					
<i>Blepharocalyx cruckshanksii</i>					E	E	E	E	E	E					
<i>Legrandia concinna</i>							E	E							
<i>Luma apiculata</i>					S	S	S	S	S	S	S				
<i>Luma chequen</i>				E	E	E	E	E	E	E					
<i>Myrceugenia chrysoarpa</i>									S	S					
<i>Myrceugenia correaefolia</i>				E	E	E	E								
<i>Myrceugenia exsucca</i>				S	S	S	S	S	S	S					
<i>Myrceugenia fernandeziana</i>													E		
<i>Myrceugenia obtusa</i>				E	E	E	E	E	E						
<i>Myrceugenia ovata</i> var. <i>nannophylla</i>							S	S	S	S					
<i>Myrceugenia parvifolia</i>							E	E	E	E					
<i>Myrceugenia planipes</i>								S	S	S	S				
<i>Myrceugenia schulzei</i>													E		
Acardiaceae															
<i>Haplorhus peruviana</i>	O														(11)
<i>Lithrea caustica</i>				E	E	E	E	E	E	E					
<i>Schinus latifolius</i>				E	E	E	E								
<i>Schinus molle</i>	O	O	O	O	O										(12)
<i>Schinus pearcei</i>			O												(13)
<i>Schinus polygamus</i>			O	O	O	O	O	O	O	O					(14)
Rutaceae															
<i>Fagara mayu</i>													E		
<i>Pitavia punctata</i>							E	E	E						
Zygophyllaceae															
<i>Porlieria chilensis</i>				E	E	E									
Icacinaceae															
<i>Citronella mucronata</i>				E	E	E	E	E	E	E					
Celastraceae															
<i>Maytenus boaria</i>			O	O	O	O	O	O	O	O					(15)
<i>Maytenus magellanica</i>								S	S	S	S	S			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	

(Cont.)

	I	II	III	IV	y	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	
Aextoxicaceae															
<i>Aextoxicon punctatum</i>				S	S	S	S	S	S	S					
Rhamnaceae															
<i>Talguenea quinquenervia</i>				E	E	E	E								
Santalaceae															
<i>Santalum fernandezianum</i>													E		
Proteaceae															
<i>Embothrium coccineum</i>							S	S	S	S	S	S			
<i>Gevuina avellana</i>							S	S	S	S	S				
<i>Lomatia dentata</i>				E	E	E	E	E	E	E					
<i>Lomatia ferruginea</i>							S	S	S	S	S	S			
<i>Lomatia hirsuta</i>				O	O	O	O	O	O	O					(16)
Arallaceae															
<i>Pseudopanax laetevirens</i>							S	S	S	S	S	S			
Flacourtiaceae															
<i>Azara celastrina</i>				E	E	E	E	E							
<i>Azara integrifolia</i>					E	E	E	E	E	E					
<i>Azara microphylla</i>				S	S	S	S	S	S	S					
<i>Azara petiolaris</i>				E	E	E	E	E							
<i>Azara serrata</i> var. <i>fernandeziana</i>													E		
<i>Azara serrata</i> var. <i>serrata</i>				E	E	E	E	E	E	E					
Salicaceae															
<i>Salix humboldtiana</i>			O	O	O	O	O	O							(17)
Elaeocarpaceae															
<i>Aristolelia chilensis</i>				S	S	S	S	S	S	S	S		S		
<i>Crinodendron hookerianum</i>										E					
<i>Crinodendron patagua</i>					E	E	E	E							
Malvaceae															
<i>Corynabutilon vitifolium</i>								E	E	E					
Sapotaceae															
<i>Pouteria splendens</i>				E	E										
Cactaceae															
<i>Browningia candelaris</i>	O														(18)
<i>Helianthocereus atacamensis</i>	E	E													
Buddlejaceae															
<i>Buddleja globosa</i>				O	O	O	O	O	O	O					(19)
Boraginaceae															
<i>Cordia decandra</i>			E	E											
Solanaceae															
<i>Latua pubiflora</i>										E					
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	

(Cont.)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	
Lamiaceae															
<i>Cuminia fernandezia</i>													E		
Verbenaceae															
<i>Rhaphithamnus spinosus</i>				O	O	O	O	O	O	O	O				(20)
<i>Rhaphithamnus venustus</i>													E		
Rubiaceae															
<i>Coprosma oliveri</i>													E		
<i>Coprosma pyrifolia</i>													E		
Asteraceae															
<i>Dasyphyllum diacanthoides</i>							S	S	S	S					
<i>Dasyphyllum excelsum</i>					E	E	E								
<i>Dendroseris litoralis</i>													E		
<i>Dendroseris neriifolia</i>													E		
<i>Senecio cymosus</i>								E	E	E	E				
<i>Senecio yegua</i>				E	E	E	E	E	E	E					
CLASE II: LILIATAE															
Areceaceae															
<i>Jubaea chilensis</i>				E	E	E	E								
<i>Juania australis</i>													E		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	J.F.	E.I.	

(1) Also in Peru and Ecuador.

(2) Also in Argentina.

(3) Also in Peru and Bolivia.

(4) Also in Peru, Bolivia and Argentina's North.

(5) Also in Argentina, Uruguay, Brazil and Paraguay.

(6) Also in Peru, Bolivia, Argentina, Uruguay and Paraguay.

(7) Also in Peru, Bolivia and Argentina.

(8) Also in Peru, Ecuador, Bolivia and Venezuela.

(9) Also in Peru, Argentina, Bolivia, Paraguay and Uruguay.

(10) Also in New Zealand.

(11) Also in southern Peru.

(12) Also in Mexico, Colombia, Ecuador, Brazil, Paraguay, Uruguay and Argentina.

(13) Also in Peru and Bolivia.

(14) Also in Argentina, Bolivia and Uruguay.

(15) Also in Argentina and Brazil

(16) Also in Argentina, Peru and Ecuador.

(17) Also almost in the entire South and Central America.

(18) Also in Peru

(19) Also in Argentina and Peru.

(20) Also in Peru

ANNEX 2

MORPHOLOGIC CATEGORIES

The morphologic type of the various plant species has been divided into several categories by different authors. In these Proceedings, an adapted Hoffmann (1978) criterion is used, according to which the morphologic type is divided into 6 categories:

1. *Tree*: A plant over 2 meters in height with a solo woody stem or trunk which branches out into a *canopy*.

2. *Shrub*: A plant with no preponderant trunk, as the woody trunk forks from the base.

3. *Creeping Woody* plant climbing over other trees or shrubs by means of tendrils or simply by holding onto them.

4. *Shrubby with radial rosette*: A plant whose leaves stem from the base, very close together and then opening outwards.

5. *Shrubby succulent*: A plant with very thick, "pulpy" stem or stem-from leaves with abundant juice, such as in cacti.

6. *Forb*: A medium —to small— sized plant with no ligneous stems.

ANNEX 3

DEFINITION OF CONCEPTS

- a) Grown wild : Wild plant descended from a cultivated plant or from its descendants.
- b) Autochthonous : Native.
- c) Endemic : Native species exclusive to the country or of a portion thereof.
- d) Exotic : Species not native to the country.
- e) Introduced : Species not original from the place where it occurs (occurring outside its natural range).
- f) Native : Species original to the country.
- g) Wild : Species not cultivated and that is not derived from cultivated plants.

ANNEX 4

FAMILIES AND GENERA OF CHILEAN FLORA. NUMBER OF TAXA BY GEOGRAPHIC ORIGIN.

Main range of families	Nº. of families in Chile	Nº. of genera in Chile	Number of genera by origin										Nº. Sp. By origin			Total al Nº of species
			COS	TRO	TEM	DIS	GOND	SUD	SUA	CH	Comp.	Int.	End.			
Cosmopolitan or Widesprea	79	621	84	71	85	75	35	127	80	64	1,269	323	2,025	3,617		
Mainly tropical or subtropical	41	102	3	34	7	3	10	18	11	16	76	35	181	292		
Boreal or Mediterranean	5	7	--	--	6	1	--	--	--	--	1	9	3	13		
Disjunct range	12	121	10	1	25	26	5	12	25	17	124	59	228	411		
Southern hemisphere or Gondwanic	30	52	1	2	28	--	--	1	10	10	58	1	63	120		
Endemic to South America	10	41	--	1	--	--	--	24	6	10	65	1	149	215		
Endemic to Southern America	7	13	--	--	--	--	--	--	11	2	41	--	37	78		
Endemic to Chile	6	8	--	--	--	--	--	--	--	8	--	--	12	12		
TOTAL	190	965	98	109	123	105	78	182	143	127	1,632	428	2,698	4,758		

COS: Cosmopolitan ; TRO: Tropical; TEMP: Temperate; DIS: Disjunct; GOND: Gondwanic; SUD: South American
 SAU: Southern South American; CHI; Chilean; COMP: Native non endemic; INT: Introduced naturalized. ; END: Endemic.

Source: Gajardo, 1983

Photograph: Claudio Cunazza P.



Guayacán (*Porlieria chilensis* Johnst) is a small tree endemic to an area that extends from the Atacama to the Metropolitan Regions. It is much sought after for handicrafts.

Photograph: Iván Benoit C.



The Chilean Palm (*Jubaea chilensis* (Mol.) Baillon) was abundant from Coquimbo to O'Higgins Regions. Populations have been reduced through tree felling to obtain a syrup from the sap, a process involving the death of the slow-growing trees.

Photograph: Iván Benoit C.



Carbonillo (*Cordia decandra* Hook et Am.) may grow as a tall shrub, up to four meters high. It is used as fuelwood by local residents in arid zones. White flowers of this species are conspicuous.

**LEGISLATION ON PROTECTION OF
CHILEAN NATIVE TREE AND SHRUB FLORA**

Speech delivered by Mr.
ENRIQUE GALLARDO
CHIEF LEGAL ADVISOR
CHILEAN FOREST SERVICE

LEGISLATION ON CHILEAN TREE AND SHRUB FLORA PROTECTION

I. INTRODUCTION

The organizers of this Symposium —aimed primarily at the protection of our country's tree and shrub species, particularly endangered species— have deemed it convenient that I make this presentation on the legislation presently in force regarding plant protection.

Discussing this subject will make it possible to become aware of whether the legal instruments available are sufficient to achieve the protection goals contained in the "Chilean Native Flora Protection and Restoration Program", a document to which you have contributed and which describes or contains implicitly the policies implemented by the Chilean Forest Service on this matter.

Having defined the endangered species protection policy, and on the basis of the technical and scientific data —a basis greatly expanded through your contributions—, and within the legal framework available, CONAF's task will be to make this policy known to all interested parties as well as to the general public, and to control its enforcement.

This task's unavoidably interdisciplinary nature, common to environmental protection as a whole, must be stressed, as it calls for the generous contribution from scientists, specialists and technicians from a number of disciplines.

Consequently, lawmakers and lawyers cannot but contribute to this task, particularly when considering that threatened species have attained such a status through man's irresponsible actions, driven blindly both by the lure of taking shortcuts to meeting his needs and by greed, depleting renewable natural resources in the process.

Legal and juridical factors constitute an essential tool and means to attain the conservation goals aimed at in the aforementioned program.

This presentation covers only those aspects of protection legislation regarding tree and shrub species, the associations, communities or populations of which form a forest, which is precisely the protected juridical asset included in Forest Law, a special branch of the Law, specifically, of the Natural Resources Law or Environment Law.

This proviso will surely disappoint some of you, as this presentation will not cover various plant species not classified as trees or shrubs but which, not any less than those, require urgent legal rules to protect them.

This limitation stems not only from the framework within which this Symposium is set, but largely from the limited amount of legal provisions existing on the matter.

II. FOREST LAW

The subject of our discussion is part of what we refer to as Forest Law, for which reason a few facts about this special branch of the law are in order.

We understand as Forest Law the set of Juridical Norms which aim at the conservation, increase, management and utilization of Forest Resources.

Forest Law has distinct and special characteristics which warrant its autonomy:

1. Its provisions fall within the realm of Public Law, as they regulate general and collective interests which go beyond private interest. There is an evident public interest behind its objectives.

2. It covers an unavoidably interdisciplinary activity, as it is based on specialized scientific and technical knowledge; and

3. It is based on and supported by a fundamental principle: conservation, understanding as such each and every action aimed at the preservation, protection, maintenance, utilization and improvement of Forest Resources.

Forest Law, considering that in the terms described above only dates from recent times, has norms dating back practically to the dawn of man.

III. HISTORY

The first precepts on forest related matters date back in Chile from Colonial times, when the Spanish legislation was in force; this legislation remained in force for several decades after Independence. The *Novísima Recopilación* ("Newest Compilation"), in its Book VI, ruled that "forests shall be conserved, authorizing felling solely of large trees and leaving the plant in such a state that it can regenerate". Later on, the *Ordenanzas de Nueva España y Leyes de Indias* ("Regulations of New Spain and Laws of the Indies") handed tuition of forests to the "cabildos", or town councils, which were to consider them as communal property aimed at meeting collective needs; these Regulations also expressly forbade felling of regenerating trees, dictated that treeless areas should be afforested, and that those sites where trees had previously grown were to be replanted or regeneration of its trees assisted.

From those days, the history of our Forest Law has included numerous legal and regulating—and even constitutional— norms aimed at increasing, preserving, managing and utilizing, directly or indirectly, our forest resources and in which protection and preservation have been specifically present.

Two extended periods of time can be made out in the evolution of Forest Law, separated from each other by the enactment of the 1931 Forest Law, which, with certain amendments, is still in force, as we shall see later on.

Until 1931, in addition to the aforementioned Spanish regulations and an incipient national legislation, there were also some regulations set forth by the Civil Code, enacted in 1855 and still in force, particularly those covering the right to use (Article 783), which requires the user of a piece of land to "conserve the forest in its essence..." "replacing the trees he fells". The laws of 1871 and 1872, which granted the President of the Republic authority to regulate the exploitation of forests in general; the *Reglamento General de Corta* ("General Felling Rules") of 1883, considered as the first Forest Law, established the first regulations on protection forests, which would be carried onto Decree Law 656, dating from 1925, and Decree with Force of Law 265, 1931, predating directly the current Forest Law.

The second period of forest law evolution starts in 1931, with the Forest Law, the text of which was established by Supreme Decree 4363, enacted that same year, from the Ministry of Lands and Colonization. As mentioned previously, the stipulations thereof are still in force with a number of amendments, particularly in aspects related to lands preferentially suitable for forestry, National Parks and Forest Reserves, use of fire and the penalties to be imposed in case of transgression.

In the first period of this second stage, two international conventions stand out for their importance for the protection of Chilean native tree and shrub flora, both are in effect as Law of the Republic. In 1967, the Convention for the Protection of Flora, Fauna and Scenic Beauty of the Americas (known as the Washington Convention) of 1940, and in 1975 the Convention on International Trade on Endangered Wild Fauna and Flora Species, known as CITES, dating from 1973.

During this period, a large number of Decrees establishing the regulations for the above laws were written, passed and enacted.

Worthy of special mention is Decree Law 701 of 1974, on Forest Development, a law which, in my opinion, marks the beginning of the second stage of this second period. It gave a renewed

Lúcumo (*Pautena splendens* (A. DC.) O.K.)
Source: Rodríguez R. et. al. 1983. Flora
Arbórea de Chile. (Fig. 86, p. 352).
Editorial de la Universidad de Concepción.
Concepción. Chile. 408 p.



boost to forestry and, after its amendment in 1979, constitutes the Forestry Development Statute, which provides both for incentives and the protection of forest resources,

A third and last stage of this second period starts in 1984, with the enactment of Law 18,348, an organic law for the Chilean Forest and Renewable Natural Resource Protection Service, legal successor to the present-day CONAF, and Law 18,362, which created the National Protected Wild lands System, laws which, although not yet in force, bestow upon the Forest Law and the regulations thereof a renewed environmental character, both in the institutional aspects as well as in comprehensive resource management.

IV. LEGISLATION IN FORCE

We shall now discuss the legislation presently in force regarding forest matters, emphasizing those regulations or norms relevant to the matter in hand, namely, effective protection and preservation of our endangered tree and shrub species.

It will help to better visualize the present legislation if we consider that its legal rules are classified, in hierarchical terms, as constitutional norms, corresponding to those norms contained in the Chilean Constitution; legal norms, corresponding to those contained in the Laws, which in turn can include laws adhering to international Conventions, Codes, Decrees with Force of Law and Decree Laws; lastly, Regulating Norms, contained fundamentally in Supreme Decrees. A way to picture this classification would be as a pyramid, at the top of which sits the Constitution; right underneath are the laws, and last, at the bottom, the regulations.

The Constitution originates from the Constitution Drafting Power; laws, from the Legislative Power; and Regulations, from the President of the Republic, who issues them through the corresponding ministries.

The Constitution is the Law of Laws, for which reason all laws must conform strictly to it. Regulations, in turn, must conform both to the corresponding laws and to the Constitution. Now we can go on to discuss each norm either broadly or specifically connected with protecting and preserving Chilean native tree and shrub species.

A) CONSTITUTIONAL NORMS

The 1980 Political Constitution of Chile sets forth three basic ideas bearing upon protection and preservation:

—The first is contained in Article 19, No. 8, which establishes the right of every person to live in an uncontaminated environment, on the one hand, and on the other, the State's duty to preserve nature. This constitutional guarantee and duty sets the basis for establishing by law certain specific restrictions to the exercise of given rights and freedoms in order to protect the environment.

—The second, Article 19 No. 2, which complements the above norm, guarantees the right to private property and determines that only a law can establish the limitations and obligations derived from the social functions of the right to property, Among the social functions of property it includes the conservation of the environmental heritage.

— The third, Article 20 section 2, establishes the protection recourse expressly for the case when the right to live in an uncontaminated environment may be affected by an arbitrary and illegal act imputable to an authority or a given person.

The above constitutional principles are enormously important since, as mentioned previously, all legislation enacted or to be enacted must conform to them.

In this regard, I should like to make a brief reference to a judgment issued by the Supreme Court in 1984 in a damage suit filed against the State by a Region IX landowner, originated from the absolute prohibition to fell or exploit araucarias existing in this property. The Supreme Court granted him the right to receive a compensation, in my opinion openly breaching the above constitutional norms and the applicable lawsuit procedures. I do hope that the two minority votes in the Supreme Court's resolution will change in the future the criterion employed, so that the correct doctrine and the constitutional rights described above are clearly established.

B) *LEGAL NORMS*

Let us now review the laws and, particularly, their provisions currently in force which constitute the tools helping us to attain our protection goals.

Chronologically, the following laws can be mentioned:

1. *Forest Law, Supreme Decree 4363 of the Ministry of Lands and Colonization.* Its Article 5 forbids felling or destruction of 3 classes of soil and water protection forests, made up of:

a) Native trees and shrubs located less than 400-m above water springs emerging in mountains as well as those native trees and forests located less than 200 m from the stream's banks, from the place of birth of the spring up to the flatlands.

b) Woodlands (arbolado) located within a 200-m radius from spring emerging in non-irrigated flatlands.

c) Trees growing on hills lopes from mid slope up to the summit. This prohibition is not absolute, as a reduction can be requested in the extension of the area where it is to be applied.

This Forest Law, in its Article 10, considered for the first time the establishment, in public lands, of National Parks and Forest Reserves with the purpose of regulating timber trade, "guaranteeing the life of certain tree species" and preserving scenic beauty.

This was complemented later by the enactment as Chilean law, in 1967, of the Convention for the Protection of Flora, Fauna and Scenic Beauty of the Americas, which defined different categories of protected areas. It also established other categories through Articles 12 and 21 of Decree Law 1939 and by Law 18,362, passed but not yet in force.

Lastly, Article 19 of the Forest Law empowered the President of the Republic to regulate the exploitation of barks containing tannins, saponin, as well as the collection of fruits from "native trees and shrubs."

2. *Decree with Force of Law 294 of 1960, organic law of the Ministry of Agriculture.* It defines

Algarrobo (*Prosopis chilensis* (Mol.) Stuntz emend. Burk).
Source: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción. (Fig. 68, p. 288)
Concepción. Chile. 408p.



the functions of this Ministry, aimed primarily at securing the conservation, “protection”, and increase of the renewable natural resources.

3. Law 15,020 of 1962 on Agrarian Reform. Its Article 55 established the faculty of the President of the Republic to create “Soil, Forest and Water Conservation Districts” in areas affected by erosion, whoever their owner may be. At those sites, the conservation techniques and programs indicated by the Ministry of Agriculture must be applied.

The same faculty is granted by Article 56 to forbid, with a prior report from the Tourism Office, felling of trees located up to 100 m from public highways and river or lake shores which are national properties for public use, as well as in ravines or “other areas not suitable for agricultural or livestock farming purposes”, whenever conservation of tourist attractions so requires.

However, exploitation activities are permitted in such fashion and under such conditions as approved by the Ministry of Agriculture. I mention this law because it has made it possible to establish, in private lands, a large number of the so-called “Protection Areas”.

This law is mentioned despite the fact that it was derogated in 1984, as Law 18,378 of that same year kept almost to the letter the same faculties, maintaining the protection for such natural areas.

4. Law No. 16,640 of 1967 on Agrarian Reform. Its Articles 228 and following created the Agriculture and Livestock Service (SAG), granting it, among other faculties, authority to “survey the renewable natural resources and watch over their conservation, protection and increase”, reproducing, now for this Service, the generic faculties granted the Ministry of Agriculture by D.F.L. 294 of 1960.

5. Convention on the Protection of Flora, Fauna and Scenic Beauty of the Americas. Adopted as a law through Supreme Decree 531 of 1967, issued through the Ministry of Foreign Affairs. This Convention is greatly important for our purposes, as it aims exactly, according to its text, “to protecting and preserving the natural environment, the individuals of all species and genera, both of indigenous flora and fauna, in numbers sufficient and in areas sufficiently vast to prevent their extinction by any means available to man”.

It defines National Parks and National Reserves with greater precision than the Forest Law and establishes as management and protection categories the Strict Nature Reserve and the Nature Monument.

This latter protection category defined “regions, objects or live animal or plant species with aesthetic interest or historical or scientific value to which absolute protection is granted”, making it possible to declare as such the species araucaria and alerce, permitting as well, using the same provision, to declare this category for other species, even those species that are not trees or shrubs.

This Convention, subscribed in Washington in 1940, even before becoming Chilean law promoted the regulations of the Forest Law, which in the following decades regulated the exploitation of various Chilean native tree and shrub species such as ulmo, tineo, llareta, quillay, algarrobo, tamarugo, chañar, guayacán, litre, maitén and palm, among others.

6. *Decree Law 701, of 1974, on Forest Development.* Among its provisions, it includes undoubtedly valuable protectionist stipulations, overlooked or not acknowledged by some people. Indeed, the development it aims at falls within two aspects: one of incentives, such as subsidizations and tax exemptions, and another one of protection.

Articles 21 and 22 of the text currently in force, such as the definition of a Management Plan in Article 2, have a significant protectionist component. Pursuant to this provision, no party is permitted to carry out logging or exploitation of a forest without a previously approved Management Plan. A Management Plan has been defined by this law as a “plan regulating the rational use and utilization of the renewable natural resources of a given plot of land, with the purpose of extracting the maximum benefit from said resources and securing, at the same time, their conservation, improvement and increase”.

If we add to this the obligation, for the agent logging or exploiting the forest, of reforesting or reclaiming an area at least equally large in size to that which has been logged or exploited, under the conditions included in the approved management plan, and the fact that non-compliance with these provisions, or logging or exploiting without a management plan, are levied very high fines, we cannot but conclude that this legal provision is markedly protectionist. The frequently repeated criticism that this law only benefits pine plantations, on the other hand, is totally contrary to fact, as all its provisions are equally applicable for subsidizing plantations with Chilean species.

Furthermore, the Technical Regulations pertaining to this Decree Law include markedly protectionist special provisions regarding management plans for native forests, aiming at securing their regeneration.

7. *The Convention on International Trade on Threatened Wild Fauna and Flora Species, enacted as a law by Supreme Decree 141 of 1975,* issued through the Foreign Affairs Ministry.

This Convention, where by the recommendations contained in the 1940 Washington Convention were materialized, has become an important legal tool for granting particular protection to endangered wild fauna and flora species, through the regulation of international trade on these species. To this end, the technical and administrative measures to prevent exploitation caused by international trade affecting the survival of said species. The parties to this Convention, among other actions, appoint one or more scientific and administrative authorities to watch over the enforcement of the protection norms set forth, nominate their endangered species into one of three appendices, depending on their conservation status, each of which establishes more or less strict requirements to authorize their exportation or importation, as well as seeing to the compliance with all its provisions.

I could personally observe, during the last Conference of the Parties to the Convention, held in 1984 in Buenos Aires, the importance attached to this Convention by the signatory countries, particularly the industrialized nations.

This reality demands that countries like ours pay particular attention to insuring compliance with the Convention's provisions to the benefit of effective protection of our endangered wild species as well as to safe ward national interests.

8. Lastly, this general overview of legal provisions could not be complete without mentioning *Law 18,348, organic of the Chilean Forest and Renewable Natural Resource Protection Service (CONAF), and Law 18,362, which created the National Protected Wild lands System,* both dating from 1984. Once in force, the former will entail a considerable step forward in the area of institutional jurisdictions, encharging CONAF with the management of all matters associated with renewable natural resources; the latter will bring up to date, in a harmonic and comprehensive fashion, all provisions in force dealing with National Protected Wild lands.

Photograph: Iván Benoit C.



Hualo (*Nothofagus glauca* (Phil.) Krasser) is frequently associated to other threatened species such as Ruil, Southern Belloto and Huala. The species may grow over 30m. high and is potentially important for commercial forestry in Central Chile.

Photograph: Claudio Campos O.



The genus *Prosopis* is represented in Chile by approximately 6 species, aB vulnerable due to strong human pressure upon their populations. Algarroba or Black Algarrobo (*Prosopis flexuosa* DC.) grows between the Atacama and Metropolitan Regions.

Photograph: César Ormazábal P.



Huala (*Nothofagus leonii* Espinosa) is a natural hybrid between *N.obliqua* and *N.glauca*.

C. REGULATING NORMS

The third and last hierarchical position is occupied by rules and regulations, issued through Supreme Decrees signed by the President of the Republic through his various ministries.

In matters related with the protection of native tree and shrub species, we can mention quite a number of regulating decrees for the laws mentioned above.

1) The following regulating decrees issued by the Ministry of Lands and Colonization bear mentioning with regard to the Forest Law:

- Watershed forests, S.D. 2,374, from 1937.
- Quillay bark, S.D. 1,247, from 1938.
- Ulmo and Tineo, S.D. 1,099, from 1940.
- Establishment of Llaretas Lands, S.D. 1,528, from 1940.
- Llaretas, S.D. 1,427, from 1941.
- Chilean Palm Tree, S. D. 908, from 1941.
- Quillay, Tamarugo, Chañar, Guayacán, Olivillo, Carbón or Carboncillo, Espino, Maitén, Litre and Bollén, S. D. 366, from 1944.
- Copihue, S.D. 129, 1971.

The first National Parks and Forest Reserves also originated from the same Forest Law, at first through the Ministry of Lands and Colonization and then through the Ministry of Agriculture and the Ministry of National Assets. Three National Parks were created through laws.

2) Thirty decrees associated with Law 15,020, of 1967, and issued through the Ministry of Agriculture, created a like number of "Protection Areas", pursuant to its Article 56.

3) Decrees have been issued by the Ministry of Agriculture with regard to the Convention for the Protection of America's Flora, Fauna and Natural Scenic Beauty, whereby two flora species have been declared Nature Monuments, namely:

- Araucaria, S.D. 29, from 1976.
- Alerce, S.D. 490, from 1976.

Six regions have also been declared Nature Monuments:

- Cinco Hermanas, S.D. 160, from 1982.
- Dos Lagunas, S.D. 160, from 1982.
- Los Pingüinos, S.D. 160, from 1982.
- Contulmo, S.D. 160, from 1982.
- Los Cisnes Lake, S.D. 160, from 1982.
- Surire Salt Flat, S.D. 29, 1983.

Four National Reserves have also been declared pursuant to this Convention:

- Río Clarillo, S.D.19, Metrop. Region from 1982
- Los Ruiles, S.D.94, Region VII from 1982
- Las Vicuñas, S.D.29, Region I from 1983
- Las Chinchillas, S.D.153, Region IV from 1983

4) D.S. 259, from 1980, is also worthy of mention. It was issued through the Ministry of Agriculture and is associated with Decree Law 701 on Forest Development. It is known as the Technical Regulations, which define 12 forest types and regulate the management plan for logging or exploitation of native forests. It recognizes, in terms of securing regeneration of these forests, four logging or exploitation methods and establishes severe restrictions or limitations to this activity.

Guindo Santo (*Eucryphia glutinosa* (P. et. E.) Baillon)
Source: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción. Concepción. Chile. 408 p.
(Fig. 26, p. 148)



V. CONCLUSIONS AND SUGGESTIONS

A characterization is now in order of the norms related to Chilean native tree and shrub species protection and preservation, aimed at putting forth later on some suggestions to improve them.

1) From the foregoing description of the existing legislation, the following may be concluded:

- There exists abundant legislation on the subject.
- However, the existence of legislation does not guarantee that it will be efficient, applicable or obeyed.
- There seems to be considerable dispersion and inconsistency among the existing laws.
- There is also a certain degree of anachronism.
- Some aspects call for further development, such as those regarding threatened species in terms of international trade norms.

The latter deficiencies are starting to be overcome by legislation passed in 1984 and soon to come in force, aimed at granting institutional coherence and updating and regulating National Protected Wild lands.

2) Another aspect worthy of discussion, in order to decide whether its development should be intensified, is the method chosen for protecting a species, for the legislation described herein protects species directly or indirectly through the protection of given areas.

An example of the first of such methods are the specific regulations on araucaria; the second method, for instance, is the establishment of a national park. On the one hand, legislation prohibits absolutely felling of trees, as in the case of araucaria or within national parks; on the other hand, it regulates exploitation, establishing greater or lesser restrictions, as in the case of quillay and within forest reserves.

3) The efficacy of protection in private lands, such as in Protection Areas, calls for further discussion.

Carza (*Haplorhus peruviana* Eng.)
Source: Rodríguez R. et. al. 1983. Flora Arbórea de Chile. Editorial de la Universidad de Concepción.
(Fig. 32, p. 167)
Concepción. Chile. 408p.



These and other conclusions and questions support suggesting a thorough review of existing legislation by capable professionals, with the purpose of proposing the derogation of obsolete norms, updating those up to now insufficient and providing them with the necessary flexibility demanded by the dynamic nature of the species to be protected.



Linacillo (*Menodora linooides* Phil)
Source: Muñoz C. 1973. CHILE: Plantas en Extinción. Editorial Universitaria.
(Fig. 27, p. 151)
Santiago. Chile. 248 p.

Pintoa (Pintoa chilensis Gay)
Source: Muñoz C. 1966. Sinopsis de la Flora Chilena
Editorial Universitaria de Chile.
(Fig. CCV).
Chile. 500 p.



In this same tack, it seems plausible that legislation should not be limited to prohibiting, regulating and fining noncompliances, but also should include incentives for the protection and management of species. Thus, in a similar fashion as a forestation and plantation management are subsidized, native forest management should also be granted similar incentives.

Provisions to provide incentives for research and increase of scientific knowledge on our native species are also notoriously absent, as are education on and dissemination of renewable natural resource conservation and protection norms.

Lastly, it seems appropriate to suggest, prior to carrying out the above review, that the policies on this matter should be clearly outlined, particularly considering that legislation is neither the solution nor the goal of protection. Problems are not solved “by” laws, but “through” them.

The logical steps to be taken would be the following:

- 1) Carrying out scientific research to quantify “how much” and ascertain “what” we have in flora resources.
- 2) Definition of a protection policy to determine the strategy to fulfill general and particular goals, in terms of responding “what” and “how” we protect. Of paramount importance is, obviously, the will to adhere to this policy.
- 3) Once the two above steps are completed, the foundation is laid for creating an updated, flexible, consistent and harmonic legislation.
- 4) Carrying out an intensive educational campaign at all levels, so as to disseminate scientific information, policies and legislation.

The task of protecting our nature will never cease to be necessary, and in this context the words of the Pope come to mind, that we should strive for transforming the present “culture of death” into a “culture of life”.

ANNEXES

ANNEX 1

DEFINITION OF CONSERVATION STATUS CATEGORIES AND CRITERIA FOR DETERMINING SUCH STATUS

International experience indicates that it is not possible to set a populational number limiting each category nor a minimum habitat area to state whether a taxon is endangered. The criterion and consensus of the specialists on fauna must be used to determine the conservation status for each taxon. The purpose is not to conduct a rigorously scientific study, but to make a list helping to set priorities for future fauna management.

A. - CONSERVATION STATUS CATEGORIES

EXTINCT (Ex).

Species not definitely located in the wild during the past 50 years (criterion as used by CITES).

ENDANGERED (E).

Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating.

Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction. Also included are taxa that are possibly already extinct but have definitely been seen in the wild in the past 50 years.



Radal Enano (*Orites myrtoidea* (P. et. E.) B. et. H. ex Sleumer).

Source: Muñoz C. 1973. CHILE: Plantas en Extinción. Editorial Universitaria.

(Fig. 14, p. 125).

Santiago. Chile. 248 p.

Lleuque (*Prumnopytis andina* (P. et. E.) de Laub.
Source: Muñoz C. 1973. CHILE: Plantas en Extinción.
Editorial Universitaria.
(Fig. 3, p. 103).
Santiago. Chile. 248 p.



VULNERABLE (V).

Taxa believed likely to move into the “Endangered” category in the near future if the causal factors continue operating.

Included are taxa of which most or all the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security has not yet been assured; and taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range.

RARE (R).

Taxa with small world populations that are not at present “Endangered” or “Vulnerable”, but are at risk.

These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

OUT OF DANGER (O).

Taxa formerly included in one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival has been removed.

INSUFFICIENTLY KNOWN (K).

Taxa that are suspected but not definitely known to belong to any of the above categories, because of lack of information.

N.B.: In practice, “Endangered” and “Vulnerable” categories may include, temporarily, taxa whose populations are beginning to recover as a result of remedial action, but whose recovery is insufficient to justify their transfer to another category.

B. - CRITERIA FOR DETERMINING THE CONSERVATION STATUS OF A SPECIES

- Historical criterion: a species which, basing on sound data, was formerly very abundant and had a vast range, but which at present, although not considered to be scant, has seen its range and abundance dramatically reduced, is a species in trouble.

- Distribution criterion: a species is more vulnerable if it shows high density in a reduced range, than a species with a sparser density but a wider range.

- Scarcity criterion: a species naturally scarce may be considered to be in trouble by this mere fact, more so if the species' populations are decreasing for any reason.

- Habitat criterion: a species whose habitat is being modified by human intervention preventing normal development of its populations, is considered to be a species in trouble.

- Non-anthropogenic criterion: a species whose populations are decreasing for reasons not imputable to man's actions, such as disease, climatic changes, etc., is also considered as a species in trouble.

Photograph: Leonardo Araya V.



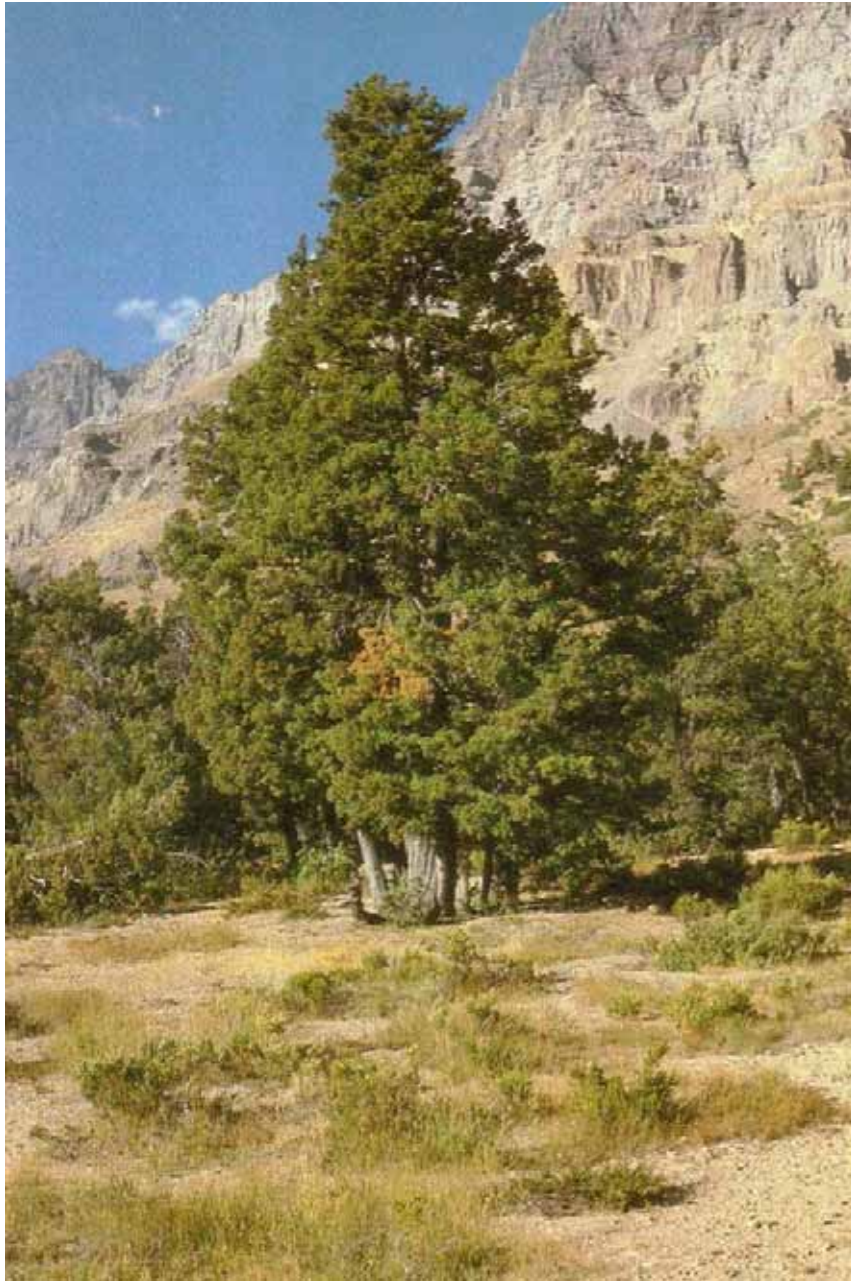
Guindo Santo (*Eucryphia glutinosa* (Poepp. et Endl.) Baillon) is a small tree, never reaching over 5 m. Occurs in areas of difficult access between the Regions of Maule and Araucanl. Little is known about the real size of this species populations.

Photograph Juan Salazar.



Pink Tupa (*Lobelia brldgesii* H. et Am) is knowri only from a small area ir, Valdivia province, specially Mancera island. Its ranty relates to specialized habitat requirements and small area of distnbution.

Photograph: Claudio Cunazza P.



Cordillera Cypress (***Austrocedrus chilensis*** (D. Don.) Florin et Boutelje) grows in the Andes from the Region of Valparaíso to Los Lagos. The wood is very durable, local residents use it for fenceposts and structures.

ANNEX 2

**NATIONAL LISTING OF TREE AND SHRUB SPECIES CLASSIFIED
UNDER THE CATEGORY OF "ENDANGERED" AND RESEARCHERS
ENCHARGED WITH WRITING MONOGRAPHS ON SUCH SPECIES**

Species	Range (Region)	Researcher
1. Avellanita bustillosii	V	R. Gajardo
2. Beilschmiedia berteriana		VII & VIII C. Donoso R. Muñoz A. Villa
3. Berberidopsis corallina	VII – X	F. Schlegel
4. Berberis litoralis	II	F. Schlegel
5. Dalea azurea	II	R. Rodríguez
6. Gomortega keule	VII & VIII	C. Donoso R. Muñoz A. Villa
7. Metharme lanata	I	R. Rodríguez
8. Nothofagus alessandrii	VII	A. Troncoso J. San Martín
9. Pitavia punctata	VII – IX	C. Donoso R. Muñoz A. Villa
10. Reichea coquimbensis	IV	G. Montenegro M. T. Serra S. Teillier
11. Valdivia gayana	X	C. Ramírez

ANNEX 3

**SPECIES AFFECTED BY CONSERVATION PROBLEMS AT REGIONAL LEVEL
AND SITES WITH PLANT COMMUNITIES OF INTEREST**

REGION I

A. Species affected by conservation problems in Region I and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Metharme lanata</i>	<i>Azorella compacta</i> <i>Myrica pavonis</i> <i>Polylepis besseri</i> <i>Polylepis tarapacana</i> <i>Prosopis spp.</i>	<i>Haplorhus peruviana</i> <i>Malesherbia angustisecta</i> <i>Malesherbia auristipulata</i>

B. Species affected by conservation problems in Region I and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	NONE

C. Sites of interest

- Chapiquiña range (pre-Andean shrubby vegetation) (18° 20'S – 69° 30' W).

REGION II

A. Species affected by conservation problems in Region II and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Berberis litoralis</i> <i>Dalea azurea</i>	<i>Azorella compacta</i> <i>Croton chilensis</i> <i>Deuterocohnia chrysantha</i> <i>Krameria cistoidea</i> <i>Monttea chilensis</i> <i>Polylepis tarapacana</i> <i>Prosopis spp.</i>	<i>Asteriscium vidalii</i> <i>Grabowskia glauca</i> <i>Malesherbia tocopillana</i> <i>Nolana balsamiflua</i> <i>Salvia tubiflora</i>

B. Species affected by conservation problems in Region II and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	NONE

C. Sites of interest

- Paposo (25° 03'S - 70° 27'W)
- Aguada Miguel Díaz (24° 32'S - 70° 34'W)
- Quebrada La Chimba (23° 34'S - 70° 21'W)
- Volcán Paniri (22° 03'S - 68° 13'W)
- Quebrada Esmeralda (25° 50'S - 70° 35'W)
- Guatín (22° 40'S - 68° 00'W)

REGION III

A. Species affected by conservation problems in Region III and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
	<i>Azorella compacta</i> <i>Cordia decandra</i> <i>Deuterocohnia chrysantha</i> <i>Krameria cistoidea</i> <i>Laretia acaulis</i> <i>Monttea chilensis</i> <i>Prosopis spp.</i>	<i>Asteriscium vidalli</i> <i>Pintoa chilensis</i>

B. Species affected by conservation problems in Region III and not included in the national listing of species affected by conservation problems

Vulnerable	Rare	Insufficiently Know
<i>Balsamocarpon brevifolium</i>	<i>Bulnesia chilensis</i>	<i>Heliotropium glutinosum</i> <i>Schinus pearcei</i>

C. Sites of interest

- Valle Feliz
- Barriales (between Copiapó and Vallenar) 28° 18'S - 70° 29'W)
- Quebrada Yeguas or Aguas Blancas (25° 40'S - 68° 34'W)
- Carrizal Bajo (28° 05'S – 71° 11'W)
- Quebrada Romero (10 km. south of Vallenar) (28° 41'S - 70° 43'W)
- Pan de Azúcar (26° 07' - 70° 40'W)

REGION IV

A. Species affected by conservation problems in Region IV and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Reichea coquimbensis</i>	<i>Carica chilensis</i> <i>Cordia decandra</i> <i>Jubaea chilensis</i> <i>Krameria cistoidea</i> <i>Laretia acaulis</i> <i>Monttea chilensis</i> <i>Porlieria chilensis</i> <i>Pouteria splendens</i> <i>Puya coquimbensis</i> <i>Puya venusta</i> <i>Prosopis spp.</i>	<i>Citronella mucronata</i> <i>Myrceugenia correaefolia</i> <i>Myrceugenia rufa</i>

B. Species affected by conservation problems in Region IV and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Insufficiently Know
<i>Lomatia hirsuta</i>	<i>Lomatia dentata</i> <i>Quillaja saponaria</i> <i>Aextoxicon punctatum</i> <i>Kageneckia angustifolia</i>	<i>Azara borealis</i> <i>Passiflora pinnatistipula</i>

C. Sites of interest

- Punta Teatinos (29° 48'S - 71° 21'W)
- Bosque de Los Chanchos (30° 10'S - 71° 1 8'W)
- Las Palmas de Tilama (32° 05'S - 71° 11'W)
- Choapa river valley (31° 40'S - 71° 19'W)
- Cuncumén valley (31° 46'S - 70° 32'W)
- Silla del Gobernador (Santa Inés) (32° 10'S - 71°31'W)
- Los Corrales (32° 10'S - 71° 31'W)
- Quebrada Marquesa (29° 50'S - 70° 57'W)
- Valle Hermoso (northeast of Combarbalá) (31° 15'S - 71° 00'W)

REGION V

A. Species affected by conservation problems in Region V and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Avellanita bustillosii</i>	<i>Austrocedrus chilensis</i> <i>Beilshmiedia miersii</i> <i>Carica chilensis</i> <i>Dasyphyllum excelsum</i> <i>Jubaea chilensis</i> <i>Krameria cistoidea</i> <i>Laretia acaulis</i> <i>Persea meyeniana</i> <i>Porlieria chilensis</i> <i>Poutaria splendens</i> <i>Puya venusta</i> <i>Prosopis spp.</i>	<i>Adesmia balsámica</i> <i>Adesmia resinosa</i> <i>Citronella mucronata</i> <i>Menodora linoides</i> <i>Myrceugenia colchaguensis</i> <i>Myrceugenia correaefolia</i> <i>Myrceugenia rufa</i>

B. Species affected by conservation problems in Region V and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Insufficiently Known
<i>Ribes nubigenus</i> <i>Nothofagus obliqua</i> <i>var. macrocarpa</i>	<i>Kageneckia angustifolia</i> <i>Blepharocalix cruckshanksii</i> <i>Lomatia hirsuta</i>	<i>Passiflora pinnatistipula</i>

C. Sites of interest

- Quebrada El Asiento (32° 39'S – 70° 49'W)
- Mina Santa María (32° 43'S - 70° 30'W)
- Cuesta La Dormida (33° 03'S - 71° 00'W)
- Quebrada do Córdoba (El Tabo) (33° 27'S - 71° 37'W)
- Quebrada El Tigre (Zapallar) 32° 34'S - 71° 26'W)
- Aguas Claras (32° 36'S - 71° 25'W)
- Cerro Imán
- Cerro Tabaco (32° 39'S – 70° 49'W)
- Talanquén de Quebradilla (32° 35'S - 71° 14'W)
- Pedegua (Petorca) 32° 20'S - 71° 04'W)
- Cuesta El Melón (32° 40'S - 71° 1 5'W)
- Bosque de Quintero (32° 46'S - 71° 31'W)

METROPOLITAN REGION

A. Species affected by conservation problems in the Metropolitan Region and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Avellanita bustillosii</i>	<i>Austrocedrus chilensis</i> <i>Beilshmedia miersii</i> <i>Dasyphyllum excelsum</i> <i>Jubaea chilensis</i> <i>Krameria cistoidea</i> <i>Laretia acaulis</i> <i>Nothofagus glauca</i> <i>Persea meyeniana</i> <i>Porlieria chilensis</i> <i>Prosopis spp.</i>	<i>Adesmia resinosa</i> <i>Citronella mucronata</i> <i>Maytenus chubutensis</i> <i>Myrceugenia colchaguensis</i> <i>Myrceugenia correaefolia</i>

B. Species affected by conservation problems in the Metropolitan Region not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	<i>Kageneckia angustifolia</i> <i>Cryptocarya alba</i> <i>Nothofagus obliqua</i> <i>var. Macrocarpa</i>	NONE

C. Sites of interest

- Altos de Chicauma (33° 15'S – 70° 58'W)
- Quebrada de Ramón (33° 26'S – 70° 28'W)
- Quebrada Agua del Palo (33° 21'S - 70° 21'W)
- Cerros de Cantillana (33° 57'S – 70° 58'W)
- Hacienda Loncha
- San Gabriel (33° 47'S – 70° 14'W)
- Cerrosde Hueque
- Norte de Athué (32° 02'S - 71° 07'W)
- Fundo Cerrillos (northwest of Lo Prado tunnel) (33° 03'S - 71° 24'W)

REGION VI

A. Species affected by conservation problems in Region VI and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	<i>Austrocedrus chilensis</i> <i>Dasyphyllum excelsum</i> <i>Jubaea chilensis</i> <i>Laretia acaulis</i> <i>Nothofagus glauca</i> <i>Persea meyeniana</i> <i>Porlieria chilensis</i>	<i>Citronella mucronata</i> <i>Maytenus chubutensis</i> <i>Myrceugenia colchaguensis</i> <i>Myrceugenia correaefolia</i>

B. Species affected by conservation problems in Region VI and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	<i>Blepharocalix cruckshanksii</i> <i>Nothofagus dombeyi</i> <i>Laurelia sempervirens</i> <i>Nothofagus obliqua</i>	<i>Myrceugenia exsucca</i>

C. Sites of interest

- Fundo Los Alpes (northeast of San Fernando) (34° 36'S - 70° 43'W)
- Las Palmas (Chépica) (34° 43'S - 71° 17'W)
- Sierra Bellavista (34° 48'S - 70° 45'W)
- Topocalma (34° 06'S - 71° 56'W)
- Quebrada Honda
- Quebrada El Roble
- Sector La Rosa (34° 18'S - 71° 15'W)

Petrillo (*Myrceugenia correaefolia* (H. et. A.) Berg.)
 Source: Rodríguez R. et. al. 1983. Flora Arbórea de Chile.
 Editorial de la Universidad de Concepción.
 (Fig. 84, p. 349)
 Concepción. Chile. 408 p.



REGION VII

A. Species affected by conservation problems in Region VII and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Beilschmiedia berteroaana</i>	<i>Austrocedrus chilensis</i>	<i>Citronella mucronata</i>
<i>Berberidopsis corallina</i>	<i>Dasyphyllum excelsum</i>	<i>Eucryphia glutinosa</i>
<i>Gomoterga keule</i>	<i>Jubaea chilensis</i>	<i>Maytenus chubutensis</i>
<i>Nothofagus alessandrii</i>	<i>Laretia acaulis</i>	<i>Myrceugenia colchaguensis</i>
<i>Pitavia punctata</i>	<i>Legrandia concinna</i>	<i>Myrceugenia correaefolia</i>
	<i>Nothofagus glauca</i>	<i>Myrceugenia pinifolia</i>
	<i>Nothofagus leonii</i>	<i>Orites myrtoidea</i>
	<i>Persea meyeniana</i>	<i>Prumnopytis andina</i>
	<i>Satureja multiflora</i>	
	<i>Scutellaria valdiviana</i>	

B. Species affected by conservation problems in Region VII and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Weinmannia trichosperma</i>	<i>Laurelia sempervirens</i>	<i>Tepualia stipularis</i>
<i>Saxegothaea conspicua</i>	<i>Lomatia ferruginea</i>	<i>Embothrium coccineum</i>
	<i>Crinodendron patagua</i>	<i>Pseudopanax laetevirens</i>
	<i>Nothofagus alpina</i>	<i>Sophora microphylla</i>
		<i>Maytenus magellanica</i>
		<i>Perilonia valdiviana</i>
		<i>Cassia arnotiana</i>
		<i>Nothofagus antarctica</i>
		<i>Nothofagus pumilio</i>

C. Sites of interest

- Bullileo (36° 17'S - 71° 25'W)
- Radal Siete Tazas (35° 24'S - 71° 02'W)
- Vilches (35° 34'S - 71° 14'W)
- Robles del Maule (35° 49'S - 72° 27'W)
- Quebrada El Ballical
- Vegas de Salas
- Laguna Suárez (36° 21'S - 71° 25'W)
- Los Queñes (34° 59'S - 70° 49'W)
- Laguna del Maule (36° 02'S - 70° 30'W)
- Laguna del Teno (35° 10'S - 70° 33'W)
- Northern banks of the Itata River (36° 21'S - 72° 45'W)
- Túnel Hornillos

VIII REGION

A. Species affected by conservation problems in Region VIII and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Beilschmiedia berteriana</i>	<i>Araucaria araucana</i>	<i>Citronella mucronata</i>
<i>Berberidopsis corallina</i>	<i>Austrocedrus chilensis</i>	<i>Eucryphia glutinosa</i>
<i>Gomortega keule</i>	<i>Laretia acaulis</i>	<i>Maytenus chubutensis</i>
<i>Pitavia punctata</i>	<i>Legrandia concinna</i>	<i>Myrceugenia correaefolia</i>
	<i>Nothofagus glauca</i>	<i>Myrceugenia leptospermoides</i>
	<i>Nothofagus leonii</i>	<i>Myrceugenia pinifolia</i>
		<i>Orites myrtoidea</i>
		<i>Prumnopytis andina</i>
		<i>Ribes integrifolium</i>
		<i>Scutellaria valdiviana</i>

B. Species affected by conservation problems in Region VIII and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	<i>Eucryphia cordifolia</i>
		<i>Caldcluvia paniculata</i>
		<i>Kageneckia oblonga</i>
		<i>Maytenus magellanica</i>
		<i>Senecio cymosus</i>
		<i>Laurelia philippiana</i>
		<i>Escallonia myrtoidea</i>
		<i>Corynabutilon vitifolium</i>

C. Sites of interest

- Cerro Cayumanqui (36° 42'S - 72° 29'W)
- Fundo San José (36° 41'S - 72° 57'W)
- Birthspring of the Chillán River (36° 48'S – 71° 26'W)
- Quebrada Pites
- Caramávida
- Trongol (37° 34'S - 73° 18'W)
- Isla Mocha (38° 22'S - 73° 54'W)
- Shangri-La (near Las Trancas) (36° 53'S – 71° 30'W)
- Laguna El Valiente

REGION IX

A. Species affected by conservation problems in Region IX and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Pitavia punctata</i> <i>Berberidopsis corallina</i>	<i>Austrocedrus chilensis</i> <i>Araucaria araucana</i> <i>Laretia acaulis</i>	<i>Citronella mucronata</i> <i>Corynabutilon ochsenii</i> <i>Eucryphia glutinosa</i> <i>Maytenus chubutensis</i> <i>Myrceugenia colchaguensis</i> <i>Myrceugenia leptospermoides</i> <i>Myrceugenia pinifolia</i> <i>Orites myrtoidea</i> <i>Prumnopytis andina</i> <i>Ribes integrifolium</i> <i>Satureja multiflora</i> <i>Scutellaria valdiviana</i>

B. Species affected by conservation problems in Region IX and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	<i>Persea lingue</i> <i>Laurelia philippiana</i> <i>Nothofagus alpina</i>	<i>Podocarpus nubigena</i> <i>Cryptocarya alba</i>

C. Sites of interest

- Tirúa (38° 20'S - 73° 24'W)
- Chivilcan (20 km northwest of Temuco)
- Rucamanqui (38° 41 'S - 72° 43'W)
- Flor del Lago (Villarrica)

REGION X

A. Species affected by conservation problems in Region X and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Valdivia gayana</i> <i>Berberidopsis corallina</i>	<i>Araucaria araucana</i> <i>Austrocedrus chilensis</i> <i>Fitzroya cupressoides</i>	<i>Citronella mucronata</i> <i>Corynabutilon ochsenii</i> <i>Hebe salicifolia</i> <i>Lobelia bridgesii</i> <i>Prumnopytis andina</i> <i>Satureja multiflora</i> <i>Scutellaria valdiviana</i>

B. Species affected by conservation problems in Region X and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	<i>Peumus boldus</i>	NONE

C. Sites of interest

- Boundary with Argentina, between Pirehueico and Arquihue (40° 01'S - 71° 38'W)
- Valle Hermoso (Pilmaiquén)
- San Pablo de Tregua
- San Martín (Río Cruces banks)
- Calle-Calle banks (west of Los Lagos) (39° 48'S - 72° 58'W)
- Piruquina (15 km. northwest of Castro) (42° 21'S - 73° 46'W)

Photograph: Leonardo Araya V.



Lleuque or Mountain Grape, (*Prumnopitys andina* (Poepp. ex Endl.) De Laub.) is an endemic tree growing in the Andes slopes between Maule and Los Lagos Regions. It is not sought after for any particular reason, their low number is probably a natural trait of species.

Photograph: Rodolfo Gajardo M.



Petrillo, (*Myrceugenia correaefolia* (Hook. et Arn.) Berg) is a shrub found preferently in coastal areas of Central Chile, where moisture from ocean fogs is available. It is typical of relict communities.

Photograph: Alfonso Glade C.



Llaretas (*Azorella compacta* Phil.) is a hard, slow-growing, cushion-like shrub that occurs in the Andes of Tarapacá, Antofagasta and Atacama Regions. The species was depleted by being used as fuel for railways and mining operations.

REGION XI

A. Species affected by conservation problems in Region XI and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	<i>Hebe salicifolia</i> <i>Schinus molle</i>

B. Species affected by conservation problems in Region XI and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	NONE

C. Sites of interest

- Chile Chico (surrounding area) (46° 32'S - 71° 45'W)
- General Carrera lake (46° 35'S - 72° 15'W)

REGION XII

A. Species affected by conservation problems in Region XII and included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
NONE	NONE	<i>Adesmia campestris</i> <i>Hebe salicifolia</i> <i>Mulinum valentinii</i> <i>Benthamiella spp.</i>

B Species affected by conservation problems in Region XII and not included in the national listing of species affected by conservation problems.

Endangered	Vulnerable	Rare
<i>Fuchsia magellanica</i> var. <i>eburnea</i>	<i>Adesmia boronioides</i> <i>Drimys winteri</i> <i>Escallonia rubra</i> <i>Lepidophyllum cupressiforme</i> <i>Maytenus disticha</i> <i>Maytenus magellanica</i> <i>Myoschilos oblongus</i> <i>Verbena tridens</i>	<i>Escallonia virgata</i> <i>Lomatia ferruginea</i>

C. Sites of interest

- Laguna Amarga (50° 57'S - 72° 34'W)
- Sierra Baguales (50° 40'S - 72° 30'W)
- Mountains in the vicinity of Dickson Glacier (50° 45'S - 73° 17'W)

NOTE: The geographic coordinates furnished for sites of interest are for reference purposes. They were obtained from the Atlas de la República de Chile, edited by the Instituto Geográfico Militar, from maps at a scale of 1:1,000,000.

ANNEX 4

**LISTING OF NATIVE TREE AND SHRUB SPECIES
CLASSIFIED UNDER THE CATEGORIES ENDANGERED,
VULNERABLE AND RARE BY FAMILIES**

A. ENDANGERED

Common Name	Scientific Name	Origin	Family
Avellanita	Avellanita bustillosii Phil.	E	Euphorbiaceae
Belloto del Sur	Beilschmiedia berteriana (Gay) Kostern	E	Lauraceae
Michay rojo	Berberidopsis corallina Hook. f.	E	Flacourtiaceae
Michay de Paposo	Berberis litoralis Phil.	E	Berberidaceae
Dalea	Dalea azurea (Phil.) Reiche	E	Papilionaceae
Queule	Gomortega keule (Mol.) Baillon	E	Gomortegaceae
Metarma lanosa	Metharme lanata Phil.	E	Zygophyllaceae
Ruil	Nothofagus alessandrii Esp.	E	Fagaceae
Pitao	Pitavia punctata (R. et P.) Mol.	E	Rutaceae
Reichea	Reichea coquimbensis (Barn.) Kausel	E	Myrtaceae
Valdivia	Valdivia gayana Remy	E	Escalloniaceae

B. VULNERABLE

Common Name	Scientific Name	Origin	Family
Araucaria	Araucaria araucana (Mol.) K. Koch	S	Araucariaceae
Ciprés de la Cordillera	Austrocedrus chilensis (D. Don) Pic.- Ser. et Bizz.	S	Cupressaceae
Llaretta	Azorella compacta Phil.	O	Umbelliferae
Belloto del Norte	Beilschmiedia miersii (Gay) Kostern	E	Lauraceae
Palo gordo	Carica chilensis (Planch. ex DC.) Solms.-Laub.	E	Caricaceae
Higuerilla de Paposo	Croton chilensis Muell. - Arg.	E	Euphorbiaceae
Carbonillo	Cordia decandra H. et A.	E	Boraginaceae
Tayú	Dasyphyllum excelsum (D. Don) Cabr.	E	Asteraceae
Chaguar del jote	Deuterocohnia chrysantha (Phil) Mez.	E	Bromeliaceae
Alerce	Fitzroya cupressoides (Mol.) Johnst.	S	Cupressaceae
Palma chilena	Jubaea chilensis (Mol.) Baillon	E	Arecaceae
Pacul	Krameria cistoidea H. et A.	E	Krameriaceae
Llaretilla	Laretia acaulis (Cav.) Gill. et Hook	S	Umbelliferae
Luma del Norte	Legrandia concinna (Phil.) Kausel	E	Myrtaceae
Uvillo	Monttea chilensis Gay	E	Scrophulariaceae
Pacama	Myrica pavonis C. DC.	O	Myricaceae
Hualo	Nothofagus glauca (Phil.) Krasser	E	Fagaceae
Huala	Nothofagus leonii Esp.	E	Fagaceae
Lingue del Norte	Persea meyeniana Ness	E	Lauraceae
Queñoa	Polylepis besseri Hienon	O	Rosaceae
Queñoa de altura	Polylepis tarapacana Phil.	E	Rosaceae
Guayacán	Porlieria chilensis Johnst.	E	Zygophyllaceae
Lúcumo	Pouteria splendens (A. DC.) O.K.	E	Sapotaceae
Prosopis	Prosopis (género)	O	Mimosaceae
Chagual de Coquimbo	Puya coquimbensis Mez.	E	Bromeliaceae
Chagualillo	Puya venusta Phil.	E	Bromeliaceae

C. RARE

Common Name	Scientific Name	Origin	Family
Paramela de Puangue	<i>Adesmia balsamica</i> Bert. et Colla	E	Papilionaceae
Mata espinosa	<i>Adesmia campestris</i> (Rendl.) Rowl.	S	Papilionaceae
Paramela de Til-Til	<i>Adesmia resinosa</i> Phil.	E	Papilionaceae
Anisillo	<i>Asteriscium vidalii</i> Phil.	E	Umbelliferae
Benthamiella	<i>Benthamiella</i> (género)	S	Solanaceae
Huillipatagua	<i>Citronella mucronata</i> (R. et P.) D. Don.	E	Icacinaceae
Huella chica	<i>Corynabutilon ochsenii</i> (Phil.) Kear.	E	Malvaceae
Guindo Santo	<i>Eucryphia glutinosa</i> (P. et E.) Baillon	E	Eucryphiaceae
Coralito del Norte	<i>Grabowskia glauca</i> (Phil.) Johnst.	E	Solanaceae
Carza	<i>Haplorhus peruviana</i> Eng.	O	Anacardiaceae
Hebe	<i>Hebe salicifolia</i> (Forst.) Pennell	O	Scrophulariaceae
Tupa rosada	<i>Lobelia bridgesii</i> H. et A.	E	Lobeliaceae
Malesherbia	<i>Malesherbia angustisecta</i> Harms.	E	Malesherbiaceae
Aji de zorra	<i>Malesherbia auristipulata</i> Ric.	E	Malesherbiaceae
Farolito	<i>Malesherbia tocopillana</i> Ric.	E	Malesherbiaceae
Maitén del Chubut	<i>Maytenus chubutensis</i> (Speg.) Lowrt., O'Donell et Sleumer	S	Celastraceae
Linacillo	<i>Menodora linoides</i> Phil.	S	Oleaceae
Mulino	<i>Mulinum valentinii</i> Speg.	S	Umbelliferae
Arrayán de Colchagua	<i>Myrceugenia colchaguensis</i> (Phil.) Navas	E	Myrtaceae
Pettrillo	<i>Myrceugenia correaefolia</i> (H. et A.) Berg.	E	Myrtaceae
Macolla	<i>Myrceugenia leptospermoides</i> (DC.) Kausel	E	Myrtaceae
Chequén de hoja fina	<i>Myrceugenia pinifolia</i> (F. Phil.) Kausel	E	Myrtaceae
Arrayán de hoja roja	<i>Myrceugenia rufa</i> (Colla) Skottsbo.	E	Myrtaceae
Suspiro	<i>Nolana balsamiflua</i> (Gaud.) Mesa	E	Nolanaceae
Radal enano	<i>Orites myrtoidea</i> (P. et E.) B. et H. ex Sleumer	E	Proteaceae
Pintoa	<i>Pintoa chilensis</i> Gay	E	Zygophyllaceae
Lleuque	<i>Prumnopytis andina</i> (P. et E.) de Laub.	E	Podocarpaceae
Parrilla falsa	<i>Ribes integrifolium</i> Phil.	E	Saxifragaceae
Salvia roja	<i>Salvia tubiflora</i> Smith	O	Labiatae
Menta de árbol	<i>Satureja multiflora</i> (R. et P.) Briq	E	Labiatae
Laura	<i>Schinus marchandii</i> Barkley	S	Anacardiaceae
Teresa	<i>Scutellaria valdiviana</i> (Clos.) Epling.	E	Labiatae

E = Endemic.

S = Sub-Antarctic (occurring naturally in Chile and Argentina, from La Serena southwards).

O = Occurring naturally in Chile and in other countries.

A N N E X 5

**NATIONAL LISTING OF NATIVE TREE AND SHRUB SPECIES CLASSIFIED
UNDER THE CATEGORIES OF ENDANGERED, VULNERABLE, AND RARE
BY SNASPE * UNIT(S) WHERE THEIR PRESENCE HAS BEEN DETECTED**

A. ENDANGERED

Scientific Name	Common Name	SNASPE Unit
<i>Avellanita bustillosii</i>	Avellanita	—
<i>Beilschmiedia berteroana</i>	Belloto del Sur	—
<i>Berberidopsis corallina</i>	Michay rojo	—
<i>Berberis litoralis</i>	Michay de Paposó	—
<i>Dalea azurea</i>	Dalea	—
<i>Gomortega keule</i>	Queule	—
<i>Metharme lanata</i>	Metarma lanosa	—
<i>Nothofagus alessandrii</i>	Ruil	Los Ruiles National Reserve
<i>Pitavia punctata</i>	Pitao	Los Ruiles National Reserve
<i>Reichea coquimbensis</i>	Reichea	—
<i>Valdivia gayana</i>	Valdivia	—

Total: 11 species

B. VULNERABLE

Scientific Name	Common Name	SNASPE Unit
<i>Araucaria araucana</i>	Araucaria	National Parks: Laguna del Laja, Ralco, Conguillío, Nahuelbuta, Villarrica, Huerehue and Tolhuaca. National Reserves: Malleco, Malalcahuello, Nalcas, China Muerta, Alto Biobío, and Hualafquén
<i>Austrocedrus chilensis</i>	Ciprés de la Cordillera	National Parks: Laguna del Laja and Conguillío. National Reserves: Río Clarillo, Río de los Cipreses and Ñuble.
<i>Azorella compacta</i>	Llaretá	National Parks: Lauca and Volcán Isluga. Las Vicuñas National Reserve.

* SNASPE: National System of Protected Wildlands (National Parks, Nature Monuments and National Reserves).

<i>Beilschmiedia miersii</i>	Belloto del Norte	La Campana National Park. Peñuelas National Reserve.
<i>Carica chilensis</i>	Palo gordo	Fray Jorge National Park.
<i>Cordia decandra</i>	Carbonillo	Fray Jorge National Park. Las Chinchillas National Reserve.
<i>Croton chilensis</i>	Higuerilla de Paposo	—
<i>Dasyphyllum excelsum</i>	Tayú	La Campana National Park.
<i>Deuterocohnia chysantha</i>	Chaguar del jote	Pan de Azúcar National Park.
<i>Fitzroya cupressoides</i>	Alerce	National Parks: Alerce Andino, Vicente Pérez Rosales, Los Alerzales and Chiloé. National Reserves: Valdivia and Llanquihue.
<i>Jubaea chilensis</i>	Palma chilena	La Campana National Park.
<i>Krameria cistoidea</i>	Pacul	Las Chinchillas National Reserve.
<i>Laretia acaulis</i>	Llaretilla	El Morado National Park. National Reserves: Río Blanco, Río Clarillo and Río de los Cipreses.
<i>Legrandia concinna</i>	Luma del Norte	—
<i>Monttea chilensis</i>	Uvillo	Fray Jorge National Park.
<i>Myrica pavonis</i>	Pacama	—
<i>Nothofagus glauca</i>	Hualo	Los Ruiles National Reserve.
<i>Nothofagus leonii</i>	Huala	—
<i>Persea meyeniana</i>	Lingue del Norte	La Campana National Park. Río Clarillo National Reserve.
<i>Polylepis besseri</i>	Queñoa	National Parks: Lauca and Volcán Isluga. Las Vicuñas National Reserve.
<i>Polylepis tarapacana</i>	Queñoa de altura	National Parks: Lauca and Volcán Isluga. Las Vicuñas National Reserve.
<i>Porlieria chilensis</i>	Guayacán	National Parks: Fray Jorge and La Campana. Las Chinchillas National Reserve.
<i>Pouteria splendens</i>	Lúcumo	—
<i>Prosopis</i> spp.	Prosopis	Pampa del Tamarugal National Reserve.
<i>Puya coquimbensis</i>	Chagual de Coquimbo	—
<i>Puya venusta</i>	Chagualillo	—
Total: 26 species.		

C. RARE

Scientific Name	Common Name	SNASPE Unit
<i>Adesmia balsamica</i>	Paramola de Puangue	La Campana National Park.
<i>Adesmia campestris</i>	Mata espinosa	—
<i>Adesmia resinosa</i>	Paramela de Til-Til	La Campana National Park.
<i>Asteriscium vidalii</i>	Anisillo	—
<i>Benthamiella</i> spp.	Benthamiella	Torres del Paine National Park.

<i>Citronella mucronata</i>	Huillipatagua	National Parks: Fray Jorge and La Campana. Los Rujies National Reserve. Cerro Nielol Nature Monument.
<i>Corynabutilon ochsenii</i>	Huella chica	—
<i>Eucryphia glutinosa</i>	Guindo Santo	Tolhuaca National Park. Malleco National Reserve.
<i>Grabowskia glauca</i>	Coralito del Norte	—
<i>Haplorhus peruviana</i>	Carza	—
<i>Hebe salicifolia</i>	Hebe	Chiloé National Park (?).
<i>Lobelia bridgesii</i>	Tupa rosada	—
<i>Malesherbia angustisecta</i>	Malesherbia	—
<i>Malesherbia auristipulata</i>	Ají de zorra	—
<i>Malesherbia tocopillana</i>	Farolito	—
<i>Maytenus chubutensis</i>	Maitén de Chubut	—
<i>Menodora linoidea</i>	Linacillo	—
<i>Molinum valentinii</i>	Mulino	—
<i>Myrceugenia colchaguensis</i>	Arrayán de Colchagua	—
<i>Myrceugenia correaefolia</i>	Petrillo	Fray Jorge National Park.
<i>Myrceugenia leptospermoides</i>	Macolla	—
<i>Myrceugenia pinifolia</i>	Chequén de hoja fina	—
<i>Myrceugenia rufa</i>	Arrayán de hoja roja	La Campana National Park. Peñuelas National Reserve.
<i>Nolana balsamiflua</i>	Suspiro	—
<i>Orites myrtoidea</i>	Radal enano	Laguna del Laja National Park.
<i>Pintoa chilensis</i>	Pintoa	—
<i>Prumnopytis andina</i>	Lleuque	National Parks: Conguillío, Tolhuaca (?) and Villarrica. Malleco National Reserve.
<i>Ribes integrifolium</i>	Parrilla falsa	—
<i>Satureja multiflora</i>	Menta de árbol	—
<i>Schinus marchandii</i>	Laura	Jeinimeni National Reserve (?).
<i>Scutellaria valdiviana</i>	Teresa	—
<i>Salvia tubiflora</i>	Salvia roja	—

Total: 32 species

Note: SNASPE units accompanied by a (?) mark indicate probable species presence at the site, but without field corroboration by CONAFs Protected Wildlands Department.

A hyphen (—) means that so far this species has not been detected at any SNASPE unit.

Photograp: Leonardo Araya V.



Radalillo or Dwarf Radal, (*Orites myrtoide* (Poepp. et Endl) Benth. et Hook is associated to mesomorphic environments, especially rocky slopes between Maule and Araucanía Regions Specialized habitat requirements explain their limited numbers.

Photograp: Angel Cabeza M.



Araucaria or Pehuén, sometimes called monkey puzzle tree in English, (*Araucaria araucana* (Mol.) K. Koch.) is a tree that may reach a height of 50 m. Occurs in Chile an neighboring areas of Argentina. The seeds were used as food by the Andean indians.

Photograph: Alfonso Glade C.



The high quality of its wood has been the reason for the widespread cutting of Alerce or Chilean False Larch (*Fytzroya cupressoides* (Mol.) Johnst.), this has driven the tall, long-lived tree, to the vulnerable species category.

A N N E X 6

LIST OF RESEARCHERS AND SPECIALISTS PARTICIPATING AT THE SYMPOSIUM ON ENDANGERED NATIVE TREE AND SHRUB FLORA

Belmonte Schwarzbaum, Eliana
U. de Tarapacá. Arica
Professor
18 de Septiembre 2222. Arica
Casilla 287 Arica
Phone 42600 - 42624 - 42726 - 42640
Telex 221036

Donoso Zegers, Claudio
Universidad Austral. Valdivia
Professor
Independencia 641. Valdivia
Casilla 567 Valdivia
Phone 213911
Telex 271035

Gajardo Michell, Rodolfo
Fac. Cs. Agrarias y Forestales. U. de Chile
Professor General Ecology Lectureship
Santa Rosa 11315. Santiago
Casilla 1004
Phone 587042 -218

Hoffmann Jacoby, Adriana
Fundación Claudio Gay
Researcher
Alvaro Casanova 613, Peñalolén. Santiago
Casilla
Phone 2264972

Marticorena Pairoa, Clodomiro
Fac. de Cs. Biológicas y de Rec. Naturales U. de Concepción.
Professor, Botany Dept.
Campus Universitario. Concepción
Casilla 2407 Concepción
Phone 234985
Telex 260004

Matthei Jensen, Oscar
Fac. de Cs. Biológicas y de Rec. Naturales. U. de Concepción
Professor, Botany Dept.
Campus Universitario. Concepción
Casilla 2407 Concepción
Phone 234985
Telex 260004

Mesa Meza, Aldo
Academia Superior de Ciencias Pedagógicas. Santiago
Professor, Systematic Botany Lectureship
José Pedro Alessandri 774. Santiago
Casilla 147 - Correo Central Santiago
Phone 2257731 Anexo 286

Montenegro Rizzardini, Gloria
Fac. de Ciencias Biológicas P. U. Católica de Chile
Head, Botany Laboratory
Avda. Portugal 35. Santiago
Casilla 114-D Santiago
Phone 2223533

Muñoz Schick, Mélica
Natural History Museum
Head, Botany Section
Interior Quinta Normal, Santiago
Casilla 787 Santiago
Phone 90011 -24

Navas Bustamante, Luisa
Fac. de Ciencias Básicas y Farmacéuticas. U. de Chile
Professor
Las Palmeras 3425. Santiago
Casilla
Phone 225.4375

Pisano Valdés, Edmundo
Instituto de la Patagonia. U. de Magallanes
Professor
Avda. Bulnes km. 4 Norte. Pta. Arenas
Casilla 113-D
Phone 23039

Quintanilla Pérez, Víctor
U. de Santiago de Chile
Professor, Geographic Engineering Dept.
Avda. Sur 3469 Santiago
Casilla 4637 Correo 2
Phone 761875

Ramírez García, Carlos
U. Austral de Chile
Professor
Independencia 641 Valdivia
Casilla 567 Valdivia
Phone 213911
Telex 271035

Rodríguez Rodríguez, Guillermo
Fac. de Cs. Agropecuarias y Forestales. U. de Concepción (Chillán)
Professor
Av. Vicente Méndez 595. Chillán
Casilla 537 Chillán
Phone 226333 - Telex 262004

Rodríguez Ríos Roberto
Fac. de Cs. Biológicas y de Rec. Naturales. U. de Concepción
Assistant Professor, Botany Dept.
Campus Universitario, Concepción
Casilla 2407 Concepción
Phone 23485 - Telex 260004

San Martín Acevedo, José
P. U. Católica de Talca
Professor
Camino San Clemente s/n
Casilla 617 Talca

Schlegel Sachs, Federico
U. Austral de Chile
Professor
Independencia 641 Valdivia
Casilla 567 Valdivia
Phone 213911 -Telex 271035

Serra Vilalta, María Teresa
Facultad de Cs. Agrarias y Forestales. U. de Chile
Professor, Dendrology
Santa Rosa 11315
Casilla 1004
Phone 587042 -218

Teillier Arredondo, Sebastián
Fac. de Cs. Biológicas P. U. Católica de Chile
Herbarium Manager, Botany Laboratory
Av. Portugal 35. Santiago
Casilla 114-D Santiago
Phone 2223533

Troncoso Aguilar, Alejandro
U. de Talca. Dpto. Biología y Química
Professor
Camino Lircay s/n Talca
Casilla 747 Talca
Phone 31682 anexo 240

Villaseñor Castro, Rodrigo
U. de Playa Ancha de Ciencias de la Educación
Professor
Gran Bretaña 40
Casilla 34-V Valparaíso
Phone 211525

ANNEX 7

ROSTER OF PARTICIPANTS FROM CONAF AND OTHER NON-UNIVERSITY INSTITUTIONS

National Scientific and Technological Research Commission (CONICYT)

Gabriel Seisdedos
Acting Planning Director

General Comptrollership of the Republic

Peter Balasz
Controller, Santiago
Nino Cifuentes
Head, Agriculture and National Assets Subdivision, Santiago
Jorge Reyes
Head, Administrative Auditing, Santiago

National Fauna and Flora Defense Committee (CODEFF)

Leonardo Araya
Member, Forest Resources Research Commission, Santiago
Rafael Asenjo
Member, Legal Commission, Santiago

Natural Resources Protection Division (DIPROREN)

Eduardo Cruz
Head, Flora and Fauna
Mario Lagos
Director

Chilean Forest Service (CONAF)

Pedro Araya
Head, National Parks Section, Santiago
Antonio Benedetto
Head, Control Dept, Santiago
Iván Benoit
Head, Wild Fauna Section, Santiago
Fernando Carbone
Head, Normalization Section, Forest Control Dept., Santiago
Juan Cerda
Head, Technical Dept., Region IV
H. Fredy Correa
Head, Protected Wildlands Program, Region III
Gustavo Cruz
Head, Protected Wildlands Program, Region VI
Enrique Gallardo
Chief Lawyer, Chilean Forest Service, Santiago
Jorge Gándara
Head, National Reserves Section, Santiago
Santiago Gómez
Head, Planning, Protected Wildlands Dept.

Jorge López
Director, Chillán Seed Center

Jorge Marín
Head, Control Program, Metropolitan Region

Sergio Mendoza
Head, Control Program, Region VI

Ricardo Meza
Regional Director, Region V

Roberto Muñoz
Head, Protected Wildlands Program, Region VIII

César Ormazábal
Head, Protected Wildlands Program, Santiago

Juan Pablo Reyes
Manager, National Botanical Garden, Region V

Ricardo Rodríguez
Head, Protected Wildlands Program, Region II

Carlos Sierra
Head, Communications Bureau, Santiago

Francisco Ulloa
Officer, Forest Management Dept., Santiago

Alexis Villa
Head, Protected Wildlands Program, Region VII

Carlos Weber
Head, International Projects, Protected Wildlands Dept., Santiago

PROPOSALS

THREATENED PLANT SITES AND VEGETATION TYPES IN CHILE. A PROPOSAL

César S. Ormazábal
Head, Protected Wildlands Dept.
Chilean Forest Service

1. - INTRODUCTION

Some international organizations concerned with the conservation of nature have estimated that, should the current trend continue, around 60,000 upper plant (vascular) species will be extinct by mid next century (IUCN/WWF, 1987). This means that almost one out of every four plants presently existing will have disappeared forever, entailing an irrecoverable loss of the enormous potential for man's welfare embodied in these plants' germplasm.

Therefore, mankind and each of the nations making it up have a great deal of responsibility in the identification, adoption and fulfillment of the steps and actions necessary to prevent this veritable disaster. In the past, the trend was to protect individual species, but the notion now favored is to focus conservation efforts into places harboring a great diversity of plant species (particularly endemic plants) within a relatively small area, thus giving rise to the "Plant Site" concept. Preferably, plant sites ought to be at the same time representative of plant formations or types threatened by degradation or extinction, larger and rich in species, be it from the standpoint of diversity, endemism, or presence of phylogenetically interesting species (Ormazábal, 1987).

The responsibility of Chile regarding protection of her flora heritage is immense. While the number of vascular plant species proper of this country amounts to 5,215 (including a small number of naturalized species) —grouped in 192 families and 1,032 genera (Marticorena & Quezada, 1985) — may seem small in comparison with the number of species in large-sized countries with tropical rainforests, the degree of endemism, i.e. plants occurring naturally only within the Chilean territory, is extremely high; according to Gajardo (1983) and IUCN (1986), it exceeds 50 percent. This endemism results from the long north-south distance over which the country stretches in southern South America, with 4,200 km in straight line across almost 40 degrees of latitude, and from the ecological isolation imposed by an exceptionally dry desert in the north (the Atacama), a great mountain range to the east (the Andes Mountains), glaciers, mountains, fiords and channels in the south, and a very large body of water to the west (the Pacific Ocean). Added to this, the country's complex physiography, with two north-south mountain ranges running almost the entire length of its territory, the presence of crosswise ranges and valleys, and altitude differences ranging from sea level to almost 7,000 meters, have originated a vast gamut of ecological conditions to which organisms have had to adapt themselves in their evolution, giving rise to unique ecosystems and species.

Worthy of mention are "the arid and semi-arid lands, harboring a scant number of species if compared with tropical forests, but species which, as a result of their adaption to the harsh environmental conditions, produce many valuable biochemical substances" (World Environment and Development Commission, 1987).

In Chile, arid and semi-arid areas are being affected by mining and livestock farming activities, woody material collection for fuel, and water tapping, while Mediterranean areas with sclerophyllous and laurileaved forests are being affected by agriculture, livestock farming, forest plantations and fuelwood collection. In these same areas, *Nothofagus* forests have been largely replaced by *Pinus radiata* and *Eucalyptus* spp. plantations. This increasingly gives the little altered species-rich sites within the plant types mentioned a relict quality, together with granting them greater ecological importance. It is therefore of uppermost priority to determine, even on a preliminary basis, which are the most threatened vegetation types in Chile, and the plant sites containing the largest share of Chile's floristic wealth.

This paper aims, on the basis of the vegetation type and plant site concepts, at listing a number of floristically valuable sites, representative of Chile's endangered plant sites.

2. - SELECTION CRITERIA

The selection criteria applied for vegetation types and plant sites were those recommended by the Threatened Plants Unit of the World Conservation Union (IUCN/WWF, 1987). The method considers selecting first the Threatened vegetation types, and then selecting for each of them at least one plant site.

Criteria for Selecting Vegetation Types

The Chilean plant classification system proposed by Gajardo (1983) was used as the framework within which to analyze vegetation types or units. This classification identifies 8 ecological regions, 17 sub-regions and 83 vegetation formations in Chile. For the effect of this discussion, the vegetation type concept was considered equivalent to the plant formation concept.

When applying the threatened vegetation type selection criteria, special consideration was given to those criteria related to species diversity and degree of endemism, in addition to the global threat degree which can be *a priori* assumed to affect them.

The absence of or insufficient representation within the National Protected Wildlands System (SNASPE) was also considered a relevant factor when determining the actual or potential threat status for a given vegetation type. Although within areas included in the SNASPE there are two major plant sites affected by serious actual damage and risk of degradation (Juan Fernández Archipelago National Park and La Campana National Park), when selecting threatened vegetation types, those widely represented within the SNASPE were disregarded (e.g. Valdivian Forest or temperate rainforest, profusely represented at the Puyehue, Vicente Pérez Rosales, Alerce Andino and Chiloé National Parks).

Criteria for Selecting Plant Sites

The sites to be selected at local level, within each threatened vegetation site, must meet the following requirements:

- a) That the site or area be evidently rich in species, even if the total number of species is not yet adequately known.
- b) That the site or area be known to contain a large number of species exclusive (endemic) to that site.

In addition to the two above characteristics —the most important ones—, at least one of the following features was also deemed desirable for the sites:

- c) That the site be under actual or impending potential threat of large-scale devastation.
- d) That the site includes a varied and vast range of habitat types.
- e) That the site contains a significant proportion of species adapted to special ecologic conditions (e.g. saline soils, fog, etc.).
- f) That the site contains an important gene bank of plants valuable for man or of potentially useful plants.
- g) That the site be relatively small, or that it be divided into several areas physically separated from each other.

3. - FINDINGS

Threatened Vegetation Types

Based on the application of the criteria indicated above, it was found that the vegetation types having a greater risk of extinction in Chile correspond to 9 vegetation types (Plant Formations according to Gajardo, 1983), belonging to 4 Ecologic Sub-Regions located between Antofagasta (23° 40' south lat.) and Chillán (36° 40' south lat.), and are as follows:

- A. Coastal Desert Ecologic Sub-Region
 - 1. Tal-Tal Coastal Desert
 - 2. Huasco Coastal Desert
- B. Shrub Steppe Ecologic Sub-Region
 - 3. Tree-like Steppe Shrubs
- C. Sclerophyl Forest Ecologic Sub-Region
 - 4. Coastal Scherophyl Forest
 - 5. Mountain Sclerophyl Forest
- D. Montane Deciduous Forest Ecologic Sub-Region
 - 6. Santiago Deciduous Forest
 - 7. Mountain Deciduous Forest
 - 8. Maule Deciduous Forest
 - 9. Linares Pre-Andean Deciduous Forest

Plant Sites Within Each Threatened Vegetation Type

Pursuant to the criteria outlined above, and based on the author's field observations, as well as on data from literature for the area where the threatened vegetation types occur, the following 12 sites are proposed as "Plant Sites, arranged from North to South:

Site Name and Geographic Coordinates

1) Paposo	24°50'S - 70°24'W	7) Fundo Los Alpes	34°35'S - 70°45'W
2) Carrizal Bajo	28°05'S - 71°15'W	8) Radal/Siete Tazas	35°27'S - 70°57'W
3) Santa Inés/Los Molles	32°10'S - 71°31'W	9) Altos de Vilches	35°36'S - 71°02'W
4) Quebrada El Tigre	32°33'S - 71°26'W	10) Robles del Maule	35°50'S - 72°28'W
5) Macizo de Cantillana	33°55'S - 70°58'W	11) Río Ancoa	35°52'S - 71°07'W
6) Palmas de Cocalán	34°12'S - 71°09'W	12) Bullileo	36°19'S - 71°24'W

Next, Table 1 shows the geographic coordinates for each site along with the vegetation type it corresponds to, and the threatened (endangered, vulnerable and rare) tree and shrub species so far detected within the site. Admittedly, there might be other plant sites within the area covered by the threatened vegetation types. Here, preference is granted to the best known and best studied

sites, either as a result of surveys carried out by famous botanists (e.g. Paposo), Degree Theses (e.g. Bullileo, Radal - 7 Tazas) and reports of research agreements entered into by CONAF and Universities where the floristic value of certain areas has been stressed (e.g. Carrizal Bajo, Santa Inés/Los Molles, Quebrada El Tigre, Fundo Los Alpes, Río Ancoa, etc.)

A limitation affecting Table 1 is that threatened forb and succulent plant species which might occur in the site are not indicated. This is due to the lack of official, published information on endangered forb and succulent species, in contrast with the case of tree and shrub species. For the Paposo and Carrizal Bajo sites, species indicated in the Oltremari et al. (1987) report are included, corresponding to the succulent and shrub species which in the opinion of said authors should be officially considered as endangered.

Another important limitation is that exhaustive information is still unavailable regarding the total number of vascular plant species in each plant site and each threatened vegetation type. The only exception is the Santa Inés/Los Molles site, located in the vicinity of the Pichidangui beach resort. A thorough survey was carried out at this site (Ibarra et al., 1988), detecting 11 characteristic plant communities and a total of 129 species, including forbs, shrubs and trees, in an area covering approximately 4,000 hectares.

TABLE 1
THREATENED PLANT SITES AND WOODY SPECIES

SITE (nearest town) Geographic Coordinates Threatened Vegetation Type	THREATENED PLANT SPECIES Tree or Shrub (1)
<p>— PAPOSO Taltal, Region II</p> <p>— 24°50' south lat. - 70°24' w. long.</p> <p>— Taltal Coastal Desert</p>	<p><i>Berberis litoralis</i> (P) <i>Croton chilensis</i> (V) <i>Dalea azurea</i> (P) (N) <i>Deuterocohnia chrysantha</i> (V) <i>Krameria cistoidea</i> (V) <i>Prosopis chilensis</i> (V) <i>Salvia tubiflora</i> (R) <i>Copiapoa eremophila</i> * <i>Copiapoa humilis</i> * <i>Pyrrhocactus paucicostatus</i> * <i>Pyrrhocactus tenuls</i> * <i>Trichocereus fulvilanus</i> * <i>Tigridia philippiana</i> *</p>
<p>— CARRIZAL BAJO (Huasco, Region III)</p> <p>— 28°05'south lat. - 71°15'w. long</p> <p>— Huasco Coastal Desert</p>	<p><i>Krameria cistoidea</i> (V) <i>Copiapoa carrizalensis</i> * <i>Copiapoa dura</i> * <i>Copiapoa echinata</i> <i>Leontochir ovallei</i> * <i>Neoporteria laniceps</i> * <i>Neoporteria sociabills</i> * <i>Neoporteria villosa</i> * <i>Pyrrhocactus carizalensis</i> <i>Pyrrhocactus huacensis</i> * <i>Pyrrhocactus totoralensis</i> *</p>
<p>— SANTA INES/LOS MOLLES (Pichidangui, Regions IV and V)</p> <p>— 32°10' south lat. – 71°31'w. long.</p> <p>— Tree-like Steppe Shrubs</p>	<p><i>Citronella mucronata</i> (R) <i>Myrceugenia correaefolia</i> (R) <i>Myrceugenia rufa</i> (R) <i>Passiflora pinnatistipula</i> (R) <i>Pouteria splendens</i> (V) <i>Puya venusta</i> (V)</p>
<p>— QUEBRADA “EL TIGRE” (Zapallar, Region V)</p> <p>— 32°33' south lat. – 71°26' w. long.</p> <p>— Coastal Sclerophyl Forest</p>	<p><i>Beilschmiedia miersii</i> (V) <i>Citronella mucronata</i> (R) <i>Myrceugenia correaefolia</i> (R) <i>Passiflora pinnatistipula</i> (R)</p>
<p>— MACIZO DE CANTILLANA (Aculeo, Metropolitan and VI Region)</p> <p>— 33°55' south lat. – 70°58' w. long.</p> <p>— Santiago Deciduous Forest</p>	<p><i>Avellanita bustillosii</i> (P) (N) <i>Beilschmiedia miersii</i> (V) <i>Citronella mucronata</i> (R) <i>Nothofagus glauca</i> (V) <i>Persea meyeniana</i> (V)</p>

<ul style="list-style-type: none"> — PALMAS DE COCALAN (Las Cabras, Region VI) — 34°12' south lat. - 71°09' w. long. — Coastal Sclerophyl Forest — Santiago Deciduous Forest 	<p><i>Jubaea chilensis</i> (V) <i>Nothofagus glauca</i> (V) <i>Persea meyeniana</i> (V)</p>
<ul style="list-style-type: none"> — FUNDO LOS ALPES (San Fernando, Region VI) — 34°35' south lat. – 70°45' w. long. — Mountain Sclerophyl Forest — Mountain Deciduous Forest 	<p><i>Citronella mucronata</i> (R) <i>Persea meyeniana</i> (V)</p>
<ul style="list-style-type: none"> — RADAL-7 TAZAS (Molina, Region VII) — 35°27' south lat. – 70°57' w. long. — Mountain Sclerophylous Forest — Mountain Deciduous Forest 	<p><i>Austrocedrus chilensis</i> (V) <i>Citronella mucronata</i> (R) <i>Laretia acaulis</i> (V) <i>Legrandia concinna</i> (V) <i>Maytenus chubutensis</i> (R) <i>Nothofagus glauca</i> (V) <i>Nothofagus leonii</i> (V)</p>
<ul style="list-style-type: none"> — ALTOS DE VILCHES (San Clemente, Region VII) — 35°36' south lat. – 71°02' w. long. — Mountain Deciduous Forest 	<p><i>Austrocedrus chilensis</i> (V) <i>Maytenus chubutensis</i> (R) <i>Nothofagus glauca</i> (V)</p>
<ul style="list-style-type: none"> — ROBLES DEL MAULE (Cauquenes, Region VII) — 35°50' south lat. - 72°28' w. long. — Maule Deciduous Forest 	<p><i>Citronella mucronata</i> (R) <i>Dasyphyllum excelsum</i> (V) <i>Gomoterga keule</i> (P) <i>Myrceugenia pinifolia</i> (R) <i>Myrceugenia rufa</i> (R) <i>Nothofagus alessandrii</i> (P) <i>Nothofagus glauca</i> (V) <i>Pitavia punctata</i> (P)</p>
<ul style="list-style-type: none"> — RIO ANCOA (Linares, Region VII) — 35°52' south lat. – 71°07' w. long. — Linares Pre-Andean Deciduous Forest 	<p><i>Austrocedrus chilensis</i> (V) <i>Beilschmiedia berteriana</i> (P) <i>Citronella mucronata</i> (R) <i>Nothofagus glauca</i> (V) <i>Nothofagus leonii</i> (V)</p>

<p>— BULLILEO (Parral, Region VII)</p> <p>— 36°19' south lat. – 71°24' w. long.</p> <p>— Linares Pre-Andean Deciduous Forest</p>	<p><i>Austrocedrus chilensis</i> (V)</p> <p><i>Citronella mucronata</i> (R)</p> <p><i>Eucryphia glutinosa</i> (R)</p> <p><i>Legrandia concinna</i> (V)</p> <p><i>Nothofagus glauca</i> (V)</p> <p><i>Nothofagus leonii</i> (V)</p> <p><i>Orites myrtoidea</i> (R)</p>
--	---

(*) Succulent and forb species indicated for Paposo and Carrizal Bajo Were taken from Oltremari et al. (1987).

(1) Conservation Status: E = Endangered; R = Rare; V Vulnerable, corresponds to the status granted to each species at the Symposium on Chilean Threatened Native Tree and Shrub Flora (CONAF, 1985)

E = Endangered

R = Rare

V = Vulnerable

N = Not found at the site (only literature indicates it for that site)

4- RECOMMENDATIONS

Botanical data on each site shall be expanded in the future, with the purpose of ascertaining more accurately and objectively species' diversity, degree of endemism, presence of species with actual or potential genetic value, etc. To this end, thorough surveys of the species present would be convenient, recording their abundance, conservation status, regeneration, actual or potential factors bearing negatively upon their populations, etc.

Considering that the 9 plant sites identified are not included in the National Protected Wildlands System (SNASPE), the necessary legal and administrative steps to secure their protection must be taken, even if only through categories complementary to the SNASPE. The following actions must be urgently performed:

- a) Integrate now into the SNASPE the Carrizal Bajo area, taking to advantage the state ownership of the land.
- b) Given the private ownership of the remaining eight sites, the following is proposed:
 1. To declare the Paposo area a Nature Sanctuary, as no trees exist in that area to warrant bestowing upon it a Tourism Protection Area status.
 2. To declare the Santa Inés/Los Molles, Quebrada El Tigre, Macizo de Cantillana, Fundo Los Alpes, Río Ancoa, and Bullileo areas as Tourism Protection Areas.
 3. To strengthen surveillance and protection of the Tourism Protection Areas already established (Radal-7 Tazas, Altos de Vilches, Robles del Maule).
 4. To acquire for the State the lands within the Palmas de Cocalán National Park.

REFERENCES

1. COMISIÓN MUNDIAL DEL MEDIO AMBIENTE Y DEL DESARROLLO. 1987. Nuestro Futuro Común. Alianza Editorial, Madrid, España, 460 p.
2. CONAF. 1985. Actas del Simposio Flora Nativa Arbórea y Arbustiva de Chile, Amenazada de Extinción. Santiago, Chile. 80 p.
3. GAJARDO, R. 1983. Sistema Básico de Clasificación de la Vegetación Nativa Chilena. Universidad de Chile/Corporación Nacional Forestal. Santiago, Chile. 315 p. mapas.
4. HOFFMANN, A. 1987. Lista preliminar flora costera II Región. Santiago, 8 p. (no publicada).
5. IBARRA et al. 1988. Obtención de antecedentes básicos para la preparación de un plan de manejo de conservación de bosques relictos en el sector Pichidangui-Los Molles. Proyecto (CONAF/PNUD/FAO:DP/CHI/83/017 Universidad de Chile. Santiago. 270 p.
6. MARTICORENA, C. y M. QUEZADA. 1985. Catálogo de la flora vascular de Chile. Universidad de Concepción. Gayana Botánica. Volumen 42, Números 1-2. Concepción, Chile. 157 p.
7. OLTREMARI, J.; SCHLEGEL, F. y R. SCHLATTER. 1987. Antecedentes básicos sobre recursos naturales de 10 sectores costeros de la II y III Región. Proyecto CONAF/PNUD/FAO:DP/CHI/83/017/Universidad Austral de Chile. Documento de Trabajo Interno Nº 6. Santiago, Chile. 169 p.
8. ORMÁZABAL, C. 1987. Preservación de recursos fitogenéticos *in situ* a través de Parques Nacionales y otras Áreas Protegidas: Importancia, Avances, Limitaciones y Proyección Futura. Anales Simposio Recursos Fitogenéticos, Valdivia, 1984. International Board for Plant Genetic Resources/Universidad Austral de Chile. pp. 104-114.
9. IUCN, 1986. Plants in Danger. What do we know? IUCN Conservation Monitoring Centre. Threatened Plants Unit. Surrey, England. 461 p.
10. IUCN/WWF, 1987. Centres of Plant Diversity. A Guide and Strategy for their Conservation. IUCN/WWF Plants Conservation Programme and IUCN Threatened Plants Unit. Surrey, England. 40 p.

**PROPOSAL TO MODIFY THE CONSERVATION STATUS CLASSIFICATION
OF 15 TREE AND SHRUB SPECIES PURSUANT TO DATA PROVIDED
BY THE STUDY “TECHNICAL FILES ON SPECIFIC SITES
WHERE THREATENED WOODY SPECIES OCCUR”**

Iván L. Benoit
Head, Wild Flora Section
Chilean Forest Service

During 1987, Messrs. Rodolfo Gajardo, María Teresa Serra and Iván Grez, from the Silviculture Department of the Faculty of Agricultural and Forest Sciences, Universidad de Chile, carried out, under a request by the Chilean Forest Service (CONAF), a study called “Technical Files on Specific Sites Where Threatened Woody Species Occur”. The study consisted of an analysis of 141 sites located from Regions IV through X which, according to specialized literature or data furnished by the scientific community, contain populations of tree or shrub species affected by conservation problems. General data is provided about each site, including environmental and vegetational descriptions, basic data on the endangered species present or assumed to be present, a floristic composition table and a site map.

The data gathered by the study support a proposal —to be submitted to the scientific community in a next symposium— in order to amend the conservation status of the species listed below:

Avellanita bustillosi: This species was not found at the two sites where it had been collected previously: Aculeo Lake and Los Perales de Marga-Marga. Intensive prospecting to find this plant is recommended. It should be classified as PROBABLY EXTINCT.

Beilschmiedia miersii: The assessment of practically all the existing populations showed the presence of a severe threat, inasmuch as the remnant populations, located mostly at ravine bottoms, are being encroached upon by farming activities. Additionally, the species requires high amounts of water, wherefore water tapping upstream of small watersheds has triggered the deterioration or disappearance of some populations. Its transfer from VULNERABLE to ENDANGERED is recommended.

Carica chilensis: It was intensely prospected in several sites where it had previously been collected or mentioned, ascertaining now its absence at many such sites and its sparseness at some others. Its transfer from the category VULNERABLE to ENDANGERED is recommended.

Kranneria cistoidea: This shrub has a wide range, and its populations, although growing in arid zones and subjected to the corresponding pressures, boast a good conservation status. Furthermore, based on the findings of the study, it appears to be a species undergoing an expansion process. Even though no data are available regarding its situation at the northern reaches of its range, its reclassification from VULNERABLE to OUT OF DANGER is recommended.

Legrandia concinna: A small number of individuals was found at all the populations prospected, located mostly in environmentally altered sites. The small contingent of the populations, its restricted range and the strong anthropic pressure affecting it call for a modification of its status from VULNERABLE to ENDANGERED.

Monttea chilensis: This once abundant shrub has seen its scant populations dramatically depleted; it was found at only one site in Region IV. The strong pressure exerted on woody species suggests that more northerly populations present a similarly pressing status. Its reclassification from VULNERABLE to ENDANGERED is recommended.

Nothofagus leonii: This natural hybrid of roble and hualo presents an extremely localized range, occurring solely as very few individuals at each site, most commonly as a lone individual. This added to the strong anthropic pressure exerted upon its populations, prompt its removal from the category VULNERABLE and its inclusion into the category ENDANGERED.

Pouteria splendens: The populations of this species were found only at two coastal sites, both under the threat of impending encroachment by land development of adjacent summer resorts. Its reclassification from VULNERABLE to ENDANGERED is recommended.

Puya venusta: Most populations of this species have been wiped out or encroached upon by adjacent urban developments. At the few sites where populations occur, the species faces strong pressure both from collectors and tourists who cherish its flowers. Its transfer from VULNERABLE to ENDANGERED is recommended.

Adesmia resinosa: A species about which precious little is known, up to the point that even its identification is difficult. Its transfer from RARE to INSUFFICIENTLY KNOWN is recommended.
Citronella mucronata: A species whose populations, while having few individuals, occur frequently within its widespread range. Its transfer from RARE to OUT OF DANGER is recommended.

Eucryphia glutinosa: A species which, although of limited range, is abundant and relatively easy to find in its habitat, often forming extensive populations. This species should not be considered RARE and instead be classified as OUT OF DANGER.

Maytenus chubutensis: A species difficult to identify, whose habitat occurs in hardly accessible mountainous areas covered by forests about whose flora little is known. Therefore, its reclassification from RARE to INSUFFICIENTLY KNOWN is recommended.

Myrceugenia colchaguensis: A species with extremely localized range. The natural plant communities where it occurs have been profoundly modified by human intervention. Its reclassification from RARE to ENDANGERED is recommended.

Myrceugenia pinifolia: A species of restricted range although occurring frequently within its range. Its apparent scantiness appears to stem from the difficulties to identify it. Reclassification from RARE to INSUFFICIENTLY KNOWN is recommended.

THE CONSERVATION STATUS OF CHILEAN SUCCULENT PLANTS: A PRELIMINARY ASSESSMENT

Adriana E. Hoffmann J., Ana R. Flores
Foundation Claudio Gay

INTRODUCTION

Succulents are plants in which leaves, stems or roots are more fleshy than usual in superior plants, due to the development of water-storing tissue. This feature is accompanied by a number of other characteristics not exclusive to succulent plants but associated to water retention and originating in their xerophytic character: a reduction of the transpiring surfaces, thick epidermis, presence of scales or trichomas, fewer stomata, etc.

Succulents in Chile, particularly Cactaceae and Bromeliaceae, play a significant role in natural ecosystems, especially in arid and semi-arid regions (covering a high proportion of the national territory), constituting an important part of the plant cover and often characterizing the landscape's physiognomy.

From the standpoint of utilization, Chilean succulent plants do not constitute a resource as economically significant as in other American countries such as Mexico, where they represent a valuable resource: pineapples, fibers, nopals, cactus fruit, etc.

Cactaceae and Bromeliaceae are families with an almost exclusively American range, great adaptability to widely varying environment, different life forms, both terrestrial and epiphyte, many of them sharing the spiny character. However, they belong to two different Classes of the Phanerogams: Cactaceae are Dicotyledon and Bromeliaceae, Monocotyledon.

Cactaceae are typical succulent plants: thick green waterstoring stems, and leaves transformed into spines. Bromeliaceae, in turn, are succulent only to a certain extent. They do not have part of the typical succulent plant anatomy, particularly the fleshy tissues, but are mostly xerophytic, able to withstand aridity and dryness and are adapted to tap environmental moisture.

To carry out an objective assessment of the conservation status of any taxa, it is first necessary to gather detailed data on its range, population size and density; reproductive system of the species; and age structure, among other parameters. All these data should be combined with thorough knowledge on habitat conditions and the factors which may be causing instability or threatening the populations.

This knowledge is scant regarding Chilean Cactaceae and Bromeliaceae. Little is known on their biology, ecology, physiology or evolutive trend. No significant data is available either on the ecosystems where they occur, such as temperatures, moisture and solar radiation; soil types, aspect, etc., or about the various environmental stresses to which they are subjected by nature and which prompt them to adopt different strategies to cope with these stresses. Unfortunately, no complete and reliable macroclimatic data is available in Chile for all the areas where those species occur. Even less available are microclimatic records of the different biotopes.

For Cactaceae, neither herbarium material is available (not even the types) nor reference collections of a different class, such as live plants, illustrations, etc., to conveniently identify the species. Taxonomy of Cactaceae, not only Chilean Cactaceae, has always been an exceedingly difficult and literally "thorny" subject matter. In the case of Bromeliaceae, a somewhat larger amount of reference material is available, although scant for most genera.

While both families have a very vast range in Chile, covering practically the entire national territory, the distribution of most species is restricted to certain specific locations, which normally cover a relatively small and inaccessible area. Most of the varieties are xerophytic succulents, adapted to desert ecosystems.

At this early stage, the only possibility to perform an assessment is to put forth a "preliminary

conjecture”, based on personal or communicated knowledge and data existing in specialized literature. Thus, each of the species making up these families will be listed in the various conservation categories considering whether it has a wide distribution, with a relatively known specific density, or whether it thrives in a very localized area; whether it is collected for any commercial or popular-usage purposes; and whether the environment where it occurs faces or not short-term or medium-term destruction.

Cacti are the object of great interest on the part of collectors the world over; until recently, their collection in the wild, transportation and trade were intense. As a result, Cactaceae became protected internationally by CITES (Convention on International Trade on Endangered Species), of which Chile is also a signatory nation. Due to the difficulties in species identification, CITES opted for protecting all the species in the family.

Bromeliaceae have also attracted the attention of hobby collectors looking for exotic plants, giving rise in turn to a call for granting them protection. Both Cactaceae and Bromeliaceae boast a high degree of endemism in Chile (Bromeliaceae: 79.2%; Cactaceae: 93.13%). This paper has the purpose of providing a first approximation to the conservation status of these species.

CACTACEAE: Of the 13 genera, 85 species and nearly 100 varieties analyzed, 20 have no conservation problem, 16 are naturally rare in habitat, 36 are under some kind of anthropogenic threat, 83 are vulnerable, 4 insufficiently known and 1 (*Neoporteria horrida* var. *aspillagai*) was not found in the wild, as a result of overcollection and deep alteration of its habitat.

BROMELIACEAE: Of the 26 species studied (one of them not yet described), 17 are vulnerable, 3 rare, 8 insufficiently known and 2 out of danger.

CACTACEAE

It is a large family, including 65 genera and around 2.000 species, occurring from Canada to Patagonia in widely varying habitats and life forms. In Chile there are 13 genera, recently regrouped, about 80 species and approximately 160 varieties described. They occur from Arica to Chile Chico, and from sea level to the vegetation line in the mountains.

Due to the high number of species, they will be grouped generically in the various conservation categories, emphasizing those species affected by problems.

1. **Malhuenia.** It is one of the most primitive genera of Cactaceae, with 5 poorly defined species in Chile and Argentina. In Chile there is one, *M. poeppigii*, particularly abundant in volcanic soils. **Out of Danger.**

2. **Browningia.** There are about 7 Andean species. In Chile there is one, *B. candelaris*, occurring from Region I to central Peru. Not endemic, but very **Vulnerable** in our country. Its habitat is extremely arid, it has scant natural regeneration and its fruit is collected for food. The whole plant has also been intensively collected.

3. **Haageocereus.** A genus with around 30 Andean species. In Chile there are 2, and are **Vulnerable** (*H. fascicularis* and *H. australis*), one of which is not endemic (*H. australis*, also occurring in Peru).

4. **Oreocereus.** There are about 15 Andean species. Four occur in Chile, 3 of which not endemic (*O. leucotrichus*, *O. varicolor* and *O. hempelianus*). The native species *O. australis* (synonym of *Arequipa australis*), occurring on mountains of Region I, is **Vulnerable**, same as *O. hempelianus*.

5. **Echinops.** It is a very widespread South American genus, with some 50 poorly-defined species. In the new regrouping, *Trichocereus* has been included in the category of sub-genus (Friedrich, 1974; Hunt & Taylor, 1988). Eight species occur in Chile (7 endemic), of which 2 do not present conservation problems (*E. chilensis*, *E. coquimbana*); 6 are **Vulnerable**: *E. litoralis*, *E. skottsbergii*, *E. spinibarbis*, *E. deserticola*, *E. uebelmanniana* and *E. atacamensis*. The range of this last species extends to Argentina and is **Vulnerable** as a result of the intense utilization of its wood as construction material, for handicrafts, as fuel, etc. Its natural regeneration is extraordinarily scant and slow. One species is **Rare**: *E. glaucus*.

Photograph: Adriana Hoffmann J.



In extremely arid places, such as the Pacific coast of Northern Chile, even the humidity provided by fog, makes possible the existence of a complex community, with plants such as Chaguar del Jote (*Deuterocohnia chrysantha* (Phil.) Mez.) and some cacti like *Copiapoa cinerea* (Phil.) B. et R.

Photograph: Adriana Hoffmann J.



Cactito, "Little cactus", (*Copiapoa hypogaea* Ritter var. *lauii* (Diers) A. Hoffmann) is one of the smallest Chilean cacti, reaching a diameter of only one to three centimeters. Populations are few and small.



Paposo, although located in the arid coast of Antofagasta Region, is a place with a slightly better humidity conditions, allowing the growth of a large number of species, many of them with conservation problems. Shown here are two Bromeliaceae (*Puya boliviensis* Baker), with spiny leaves, and a recently discovered and yet unnamed species (*Tillandsia* sp.).

6. Copiapo. This is an endemic genus, with 18 recently regrouped species and about 40 varieties. Of these, only 2 are considered to be Out of Danger: *C. coquimbana* var. *coquimbana*, abundant and with a wide range, and *C. cinerascens* var. *cinerascens*, which, although with a restricted range, is abundant and protected within the Pan de Azúcar National Park. Seven are considered to be Rare, due to their scantiness (*C. desertorum* var. *hornilloensis*, *C. desertorum* var. *rubriflora*, *C. chanaralensis* and *C. cinerea* var. *variispinata*) or very difficult to observe in their habitat, as many of them are geophyte and observable only when flowering or bearing fruit (*C. humilis* var. *esmeraldana*, *C. hypogaea* var. *barquitensis*, and *C. hypogaea* var. *lauii*).

We consider 4 species to be **Endangered**: *C. tocopillana*, which occurs in an extremely arid zone, heavily affected by mining activities, near Tocopilla; *C. hypogaea* var. *hypogaea*, also very scant and occurring in a highly disturbed area near Chañaral; *C. dura* var. *cuprea* and *C. tenuissima*, as a result of deterioration of their habitat by mining activities. Twenty-eight varieties, i.o. over 50% of the total, are considered **Vulnerable** and 3, **Insufficiently known**: *C. humilis* var. *paposoensis*, *C. humilis* var. *taltalensis* and *C. coquimbana* var. *alticostata*.

7. Corrycactus. An Andean genus with 10 to 20 poorly-defined species. One non-endemic species is found in Chile, *C. brevistylus*, occurring from Camiña to Arequipa, Perú. **Vulnerable** in Chile.

8. Eulychnia. A genus endemic to Chile, with 5-10 poorly-studied species. Six of them were considered here, of which, in our opinion, 4 do not present conservation problems (*E. castanea*, *E. acida*, *E. breviflora* and *E. saint-pieana*); 1 is **Vulnerable** (*E. aricensis*) and 1 is **Endangered** (*E. iquiquensis*), as a result of natural death of the immense populations formerly existing on the coastal slopes between Iquique and Antofagasta. The reasons for this are not clear, and could include climatic changes, pests, lack of pollinators, etc. It would constitute an interesting subject matter for research.

9. Eriosyce. This is another genus endemic to Chile, containing 2-7 species. This study considered only two species to be valid (*E. sandillon* and *E. rodentiophila*), both **Vulnerable** as a result of being relatively scant, overcollected and/or growing in habitats intensely or potentially disturbed by human intervention.

10. Neoporteria. This is the largest genus of Chilean Cactaceae and regroups several genera of great affinity: *Neochilenia*, *Horridocactus*, *Pyrrhocactus*, *Thelocephala* and *Islaya*, which now constitute sub-genera. *Neoporteria* contains 25 species with about 80 varieties, of which we consider only 2 to be **Out of Danger**: *Neoporteria subgibbosa* var. *subgibbosa* and *N. curvispina* var. *andicola*. Seven are **Rare**. Thirty-one are **Endangered** for various reasons, such as encroachment by agricultural and mining activities, pollution in the form of garbage dumps in their habitat, urban and tourism-related land development, road construction and other engineering works, browsing by guanacos, wild donkeys and goats, collection, overcollection and vandalism.

For the same reasons, a further 39 varieties are considered **Vulnerable**. Two are **Insufficiently Known** (*N. horrida* var. *odoriflora* and *N. curvispina* var. *lissocarpa*), and 1 **Extinct** in its natural habitat (*Neoporteria horrida* var. *aspillagae*), which only grew at the Tanume farm, in the coastal area near Santa Cruz.

11. Neowerdermannia. A genus with few species (2-3) occurring in Bolivia, the North of Argentina and Chile. In our country there is one non-endemic species classified as **Vulnerable**: *Neowerdermannia chilensis*, which occurs in the higher mountains of the Parinacota Province.

12. Austrocactus. This group includes the Chilean species of *Erdisia*. It is a genus occurring in Chile and Argentina, with 4-5 representatives. In Chile there are 3, two of which are endemic (*A. hibernus* and *A. spiniflorus*) and one native to the Chilean-Argentinian Patagonia (*A. patagonicus*). The latter is a **Rare** species, and the other 2 are **Vulnerable**.

13. Opuntia. One of the largest genera, both in term of range (from southern Canada to southern Chile), number of species (around 200) and life forms. There are 12 species in Chile, 9 of which are **Out of Danger** and 2 are **Vulnerable** (*O. conoidea*, *O. Tunicata* var. *chilensis*).

CHILEAN CACTACEAE CONSERVATION STATUS

Species	Conservation Status
1. <i>MAIHUENIA</i>	
— <i>poepigii</i> “maihuén”, “luanmamell’	O
2. <i>BROWNINGIA</i>	
— <i>candelaris</i> “candelabro”	V
3. <i>HAAGEOCEREUS</i>	
— <i>fascicularis</i> “tumilla’, “macso”	V
— <i>australis</i>	V
4. <i>OREOCEREUS</i>	
— <i>leucotrichus</i> “chastudo peludo”	O
— <i>variicolor</i> “chastudo”	O
— <i>hempelianus</i> “achacaño”	V
— <i>australis</i>	V
5. <i>ECHINOPSIS</i>	
— <i>glaucus</i>	R
— <i>chilensis</i> “quisco”, “guillave”	O
— <i>litoralis</i> “quisco de la costa”	V
— <i>skottsbergii</i> “quisco de Fray Jorge”	V
— <i>coquimbana</i>	O
— <i>spinibarbis</i>	V
— <i>deserticola</i>	V
— <i>atacamensis</i> “cardón’	V
— <i>uebelmanniana</i>	V
6. <i>COPIAPOA</i>	
— <i>tocopillana</i>	E
— <i>atacamensis</i>	
var. <i>atacamensis</i> “boliviana”	V
var. <i>calderana</i> “copiapoa de Lembcke”	V
— <i>solaris</i>	V
— <i>tenuissima</i>	E
— <i>humilis</i>	
var. <i>humilis</i>	V
var. <i>paposoensis</i>	K
var. <i>taltalensis</i>	K
var. <i>esmeraldana</i>	R
— <i>cinerea</i>	
var. <i>cinerea</i>	V
var. <i>haseltoniana</i>	V
var. <i>variispinata</i>	R
var. <i>gigantea</i>	V
var. <i>columna-alba</i>	V
var. <i>albispina</i>	V
var. <i>tenebrosa</i>	V
var. <i>eremophila</i>	V
— <i>krainziana</i>	V
— <i>longistaminea</i>	V

Species

Conservation Status

— <i>desertorum</i>	
var. <i>Desertorum</i>	V
var. <i>rupestris</i>	V
var. <i>hornilloensis</i>	R
var. <i>rubriflora</i>	R
— <i>serpentisulcata</i>	V
— <i>cinerascens</i>	
var. <i>cinerascens</i>	O
var. <i>grandiflora</i>	V
— <i>chanaralensis</i>	R
— <i>hypogaea</i>	
var. <i>hypogaea</i>	E
var. <i>barquitensis</i>	R
var. <i>lauii</i>	R
— <i>marginata</i>	
var. <i>marginata</i>	V
var. <i>bridgesii</i>	V
— <i>megarrhiza</i>	
var. <i>megarrhiza</i>	V
var. <i>echinata</i>	V
— <i>dura</i>	
var. <i>dura</i>	V
var. <i>cuprea</i>	E
— <i>dealbata</i>	
var. <i>dealbata</i>	V
var. <i>carrizalensis</i>	V
— <i>coquimbana</i>	
var. <i>coquimbana</i>	O
var. <i>pseudocoquimbana</i>	V
var. <i>vallenarensis</i>	V
var. <i>fiedleriana</i>	V
var. <i>pendulina</i>	V
var. <i>Alticostata</i>	K
7. CORRYOACTUS	
— <i>brevistylus</i> “guacalla”, “quisco de flores amarillas”	V
8. EULYCHNIA	
— <i>castanea</i> “copao de Philippi”	O
— <i>acida</i>	O
— <i>breviflora</i> “copao”	O
— <i>saint-pieana</i>	O
— <i>iquiquensis</i>	E
— <i>aricensis</i>	V
9. ERÍOSYCE	
— <i>sandillón</i> “sandillón”, “asiento de suegra”	
var. <i>sandillón</i>	V
var. <i>algarrobensis</i>	V
var. <i>ihotzkyanae</i>	V
— <i>rodentiophila</i>	V

Species

Conservation Status

10. *NEOPORTERIA*

— <i>krainziana</i> “erizo de Krainz”	E
— <i>nidus</i> “viejito”, “nidito”	
var. <i>nidus</i>	E
var. <i>gerocephala</i>	V
var. <i>multicolor</i>	V
var. <i>coimasensis</i>	V
— <i>villosa</i> “quisco peludo”	
var. <i>villosa</i>	E
var. <i>laniceps</i>	E
— <i>subgibbosa</i> “quisquito”, “cacto rosado”	
var. <i>subgibbosa</i>	O
var. <i>litoralis</i>	V
var. <i>litoralis</i> fma. <i>intermedia</i>	V
var. <i>robusta</i>	V
— <i>castanea</i> “castañita”	V
— <i>clavata</i> “cacto maza”	
var. <i>clavata</i>	E
var. <i>nigrihorrida</i>	V
— <i>wagenknechtii</i> “quisquito don Rodolfo”	
var. <i>wagenknechtii</i>	V
var. <i>Wagenknechtii</i> fma. <i>napina</i>	V
var. <i>vallenarensis</i>	V
var. <i>microsperma</i>	V
— <i>eriosyzoides</i> “quisco de Huanta”	V
— <i>horrida</i> “hórrido”	
var. <i>horrida</i>	V
var. <i>choapensis</i>	E
var. <i>odoriflora</i>	K
var. <i>armata</i>	E
var. <i>colliguayensis</i>	V
var. <i>aspillagae</i>	EX
— <i>curvispina</i> “cacto rojo”	
var. <i>curvispina</i>	V
var. <i>marksiana</i>	V
var. <i>lissocarpa</i>	K
var. <i>engleri</i>	V
var. <i>andicola</i>	O
var. <i>grandiflora</i>	V
var. <i>garaventai</i>	V
— <i>simulans</i> “simulador”	E
— <i>intermedia</i> “quisquito de Chañaral”	
var. <i>intermedia</i>	R
var. <i>tenuis</i>	R
var. <i>pygmaea</i>	E
var. <i>pilisipina</i>	R
var. <i>calderana</i>	E
var. <i>gracilis</i>	R

Photograph Adriana Hoffmann J.



The “Lost One” (*Neoporteria odieri* (Lem.) Back. var. *krausii*), endemic of Atacama coast received such name because the plant is sunken in the ground, almost unnoticeable except when flowering. Plant growers originate a strong collection pressure.

Photograph: Adriana Hoffmann J.



All species of *Eriocyse* are endemic to Chilean territory. The species shown here, the Sandillón, (*Eriocyse sandillon* (Remy) Phil.) is vulnerable due to a combination of factors, namely habitat destruction, overcollection and natural scarcity.

Photograph Adriana Hoftmann J.



Tigridia philippiana (Johnston), endemic to Paposo, is classified as rare due to its limited range and low numbers.

Species	Conservation Status
— <i>carrizalensis</i> “quisquito de Carrizal”	
var. <i>carrizalensis</i>	E
var. <i>totalensis</i>	V
— <i>jussieui</i> “quisquito del Elqui”	
var. <i>jussieui</i>	V
var. <i>trapichernsis</i>	V
var. <i>chorosensis</i>	V
var. <i>wagenknechtii</i>	E
var. <i>dimorpha</i>	E
var. <i>chaniarensis</i>	V
var. <i>setosiflora</i>	E
var. <i>huascensis</i>	E
— <i>recondita</i> “escondido”	
var. <i>recondita</i>	E
var. <i>residua</i>	E
var. <i>vexata</i>	V
— <i>occulta</i> “cacto oculto”	E
— <i>vallenarensis</i> “quisquito de Vallenar”	
var. <i>vallenarensis</i>	V
var. <i>transitensis</i>	V
var. <i>atroviridis</i>	E
var. <i>crispus</i>	E
— <i>paucicostata</i> “pocas costillas”, “peludín”	
var. <i>paucicostata</i>	E
var. <i>paucicostata</i> fma. <i>viridis</i>	V
var. <i>echinus</i>	R
var. <i>floccosa</i>	E
var. <i>glaucescens</i>	E
var. <i>neohankeana</i>	E
— <i>aricensis</i> “ariqueño”	
var. <i>aricensis</i>	R
var. <i>saxifraga</i>	E
var. <i>floribunda</i>	R
— <i>taltalensis</i> “quisquito de Taltal”	
var. <i>taltalensis</i>	V
var. <i>transiens</i>	E
— <i>kunzei</i> “cunze”	
var. <i>kunzei</i>	E
var. <i>confinis</i>	V
— <i>chilensis</i> “chilenito”	
var. <i>chilensis</i>	V
var. <i>albidiflora</i>	E
— <i>napina</i> “napín”	
var. <i>napina</i>	V
var. <i>lembckeii</i>	V
var. <i>aerocarpa</i>	V
var. <i>duripulpa</i>	E
— <i>odieri</i> “perdido”	
var. <i>odieri</i>	V
var. <i>kraussii</i>	E
var. <i>longirapa</i>	E
— <i>esmeraldana</i> “esmeraldano”	
var. <i>esmeraldana</i>	V
var. <i>malleolata</i>	V

Species	Conservation Status
11. <i>NEOWERDERMANNIA</i> — <i>chilensis</i> “macso”, “cacto”	V
12. <i>AUSTROCACTUS</i> — <i>spiniflorus</i> — <i>hibernus</i> — <i>patagonicus</i>	V R V
13. <i>OPUNTIA</i> — <i>miquelii</i> “tuna de Miguel”, “tunilla” — <i>ovata</i> “gatito”, “perrito” — <i>atacamensis</i> “chuchampe” — <i>leoncito</i> “leoncito” — <i>echinacea</i> “puscaya”, “espina” — <i>ignescens</i> “jala-jala”, “puscayo” — <i>conoidea</i> “conoidea” — <i>berteri</i> “pegote”, “perrito” — <i>soehrensii</i> “ayrampu” — <i>tunicata</i> var. <i>chilensis</i>	O O O O O O V O O V

O : Out of Danger
V : Vulnerable
R : Rare

E : Endangered
Ex : Extinct in its Habitat
K : Insufficiently Known

CHILEAN CACTACEA CONSERVATION STATUS SUMMARY
(167 TAXA)

Genera	CONSERVATION STATUS						ORIGIN	
	O	R	E	V	K	Ex	NE	E
1. MAIHUENIA	1						1	
2. BROWNINGIA				1			1	
3. HAAGEOCEREUS				2			1	1
4. OREOCEREUS	2			2			3	1
5. ECHINOPSIS	2	1		6			2	7
6. COPIAPOA	2	7	4	28	3			44
7. CORRYCACTUS				1			1	
8. EULYCHNIA	4		1	1				6
9. ERIOSYCE				4				4
10. NEOPORTERIA	2	7	31	38	2	1		81
11. NEOWERDERMANNIA				1			1	
12. AUSTROCACTUS		1		2			1	2
13. OPUNTIA	8			2			5	5
TOTAL	21	16	36	88	5	1	16	151

Note: All varieties of the species studied are included in these figures.

O: Out of danger; R: Rare; E: Endangered; V: Vulnerable; K: Insufficiently Known;
Ex: Extinct in Habitat; NE: Not Endemic; E: Endemic.

BROMELIACEAE

Bromeliaceae are a large family, with well-defined characteristics (spinnate leaves in basal rosette and flowers clustered in inflorescence), to which chagual, pineapple and Tillandsia belong, among others. This family, native to the New World, occurs from southern United States to Chiloé in Chile. It includes around 50 genera with some 2,000 species.

In Chile there are six genera with 24 species and 5 sub-species. The list below was made on the basis of that contained in "Catálogo de la Flora Vasculare en Chile", by Marticorena and Quezada.

1. **Deuterocohnia**. It groups 7 species, distributed throughout Ecuador, Bolivia, Argentina, Paraguay and Chile. In Chile it is represented only by *D. chrysantha*, a non-endemic species. It is one of the most xerophytic Bromeliaceae and occurs in Antofagasta and Atacama, where it is relatively abundant. **Vulnerable**.

2. **Fascicularia**. This genus is endemic to Chile, with 5 species occurring in the southern part of the country. They are all terrestrial, although one of them can behave eventually as an epiphyte: *F. bicolor*, which occurs from Colchagua to Chiloé; it has the widest range. It is classified as **Vulnerable**, since its beautiful inflorescence have made it the object of intense collection for ornamental purposes.

No herbarium material is available for *Fascicularia kirchhoffiana*, only a photograph at the National Museum of Natural History in Santiago. It was described by Badilla in 1963 from a sample collected near Chanco. **Insufficiently Known**. In the case of *Fascicularia litoralis*, only the type is known collected at the Colchagua coastal area. It appears to be very similar to *F. kirchhoffiana*, but with a narrower leaf base. We believe the *Fascicularia* which occurs abundantly in the coastal area near Constitución corresponds to this species. **Insufficiently known**. In the case of *Fascicularia micrantha* only the type is known, original from Lota. **Insufficiently known**. Similar is the case of *Fascicularia pitcairniifolia*, of which only the type is known, from Puerto Lagunas, Aysén. Its range in the deep south is puzzling, and it could be inaccurate. It is very well known as a cultivated plant, but its origin is unknown. It could correspond to a hybrid. **Insufficiently Known**.

3. **Greigia**. With around 30 species, it occurs within an elongated range along the Pacific coast stretching from Mexico to Chile, and from sea level to almost 4,000 m altitude. There is a gap in this range, stretching from northern Peru to Central-southern Chile (Biobío), corresponding to one of the most arid stretches of the western South American coast.

In Chile the genus is represented by four species, three of them occurring from Concepción to Chiloé and one endemic to Masatierra island, Juan Fernandez archipelago. *Greigia berteroi*. Relatively abundant at Masatierra, **Vulnerable** as all plant species endemic to this small oceanic island. *Greigia landbeckii*, growing in Chiloé island forests, the leaves are much used for handicrafts (baskets, ropes, mats, etc.). **Vulnerable**. *Greigia pearcei* described for Concepcion and Valdivia, could be a form of *G. Landbeckii*. **Insufficiently known**. *Greigia sphacelata*, fruits are heavily collected, as they have a pleasant flavor, similar to pineapple. Abundant from Concepcion to Chiloé. **Vulnerable**.

4. **Ochagavia**. Genus endemic to Chile, with three species, although a fourth one, not yet described, could exist in the IX Region.

Ochagavia carnea seems to the author **Out of Danger** due to its widespread distribution from the southern area of the IV Region to the IX Region, being very abundant in places of difficult access such as rocky outcrops, steep ravines, etc. *Ochagavia chamissonis*, known only from Hualqui, Concepción. Description mentions yellow petals as opposed to pink in the other species of the genus. **Insufficiently known**. *Ochagavia elegans*, known only from Masatierra island, Juan Fernandez archipelago, where it is relatively abundant. **Vulnerable** for the same reasons as *Greigia berteroi*.

5. **Puya**. The genus, with nearly 200 species, is widely represented in the western part of the continent. In Chile, eight species with three sub-species have been described.

Puya alpestris is **Rare**, known only from the Andes of Colchagua and near Antuco. Similar to *Puya berteroniana*, but with blue flowers. *Puya berteroniana*, although abundant and with a wide range (from the IV to the VIII Regions), it has been heavily used. Buds are cut for food and fibers are made out of the leaves, **Vulnerable**. *Puya boliviensis* occurs in the humid belt at the coastal area of Regions II and III. The type was taken at Morro de Caldera, but very little herbarium material is available for study, **Rare**. *Puya chilensis* is abundant and has a vast range, extending between Regions IV and IX. It is used for fiber, but its apex is not consumed as often as in the case of *P. berteroniana*, due to its being harder to clip and not as soft and tasty. If the resource is managed as up to now, it would be out of danger, but the quality of its fiber might attract industrial attention. This should be avoided, for its natural regeneration is extremely slow, **Vulnerable**. *Puya coerulea* var. *coerulea* has a vast range (on hillslopes from Aconcagua to Bío-Bío), abundant and not usually exploited, **Out of Danger**. *P. coerulea* var. *intermedia* occurs from Antofagasta to Colchagua, on hillslopes. Less abundant, **Vulnerable**. Only the type is known in the case of *P. coerulea* var. *monteroana*; it was collected in Colchagua, at the Centinela hill, in 1925. **Insufficiently Known**. *P. coerulea* var. *violacea* occurs from Aconcagua to Maule. **Vulnerable**. There are some doubts regarding the validity of *Puya quillotana* as a species. The description was made by Bertero of a type collected at hills around Quillota. It could correspond to a form of *P. chilensis*. **Insufficiently Known**. *P. coquimbensis*, occurring in Region IV's coastal area. **Vulnerable**. *Puya venusta* is classified as **Vulnerable** because it is restricted to Regions IV and V and only in the coastal area, where land development for tourist facilities poses a continuing threat.

6. **Tillandsia**. This genus of Bromeliaceae is the largest both in number of species and range. It occurs in practically every American country and in all kinds of habitat, with around 500 species, most of which are epiphyte. Six species occur in Chile, one of which has not yet been described.

Tillandsia capilaris fma. *capilaris* and fma. *virescens* (epiphyte or terrestrial) are relatively abundant in localized sites which usually constitute fragile ecosystems (Atacama, Coquimbo, Aconcagua). *T. capilaris* is a greatly variable species and has a wide range, occurring also in Peru, Bolivia, Argentina and Uruguay. Both forms are **Vulnerable**. *Tillandsia geissei* occurs between Antofagasta and Coquimbo, saxicolous on rocks or epiphyte on shrubs and cacti, but very localized in the humid strip of the coastal hills. **Vulnerable**. *Tillandsia landbeckii* (epiphyte or terrestrial) occurs in Ecuador, Peru and northern Chile (up to Ovalle). **Vulnerable**. *Tillandsia usneoides* has a vast range in the Americas (from Florida, U.S.A., to Chile's Region X; there is a gap in the Tange, however, stretching from northern Chile to Illapel). In Chile it is not very abundant. **Vulnerable**. A new species was found in December 1988, *Tillandsia* sp. at Paposos, which has not yet been described. **Rare**.

LIST OF CHILEAN BROMELIACEAE AND THEIR CONSERVATION STATUS

Species	Conservation Status
1. DEUTEROCOHNIA	
—chrysantha (Phil.) Mez. "chaguar del jote"	V
2. FASCICULARIA "poe", chupalla"	
—bicolor (R. et P.) Mez. calilla"	V
—kirchhoffiana (Wittm.) Mez. "puñeñe"	K
—litoralis (Phil.) Mez. "chupón"	K
—micrantha (Phil.) Mez.	K
—pitcairniifolia (Verlot) Mez.	K
3. GREIGIA	
—berteroi Skottsberg	V
—landbeckii (Lechler ex Phil.) Phil. "ñochoa"	V
—pearcei Mez, D.C.	K
—sphacelata (R. et P.) Regel "chupón", "quiscal"	V

4. OCHAGAVÍA	
— <i>carnea</i> (Beer) Smith et Looser “cardoncillo”	O
— <i>chamissonis</i> (Mez) Smith et Looser	K
— <i>elegans</i> Phil.	V
5. PUYA	
— <i>alpestris</i> (Poepp.) Gay	R
— <i>berteroniana</i> Mez “chagual”	V
— <i>boliviensis</i> Baker	R
— <i>chilensis</i> Mol. “cardón”	V
— <i>coerulea</i> Lindl.	
var. <i>coerulea</i> “chagualillo”	O
var. <i>intermedia</i> Smith et Looser	V
var. <i>monteroana</i> Smith et Looser	K
var. <i>violacea</i> Smith et Looser “pilpolle”	V
— <i>coquimbensis</i> Mez. “Chagual de Coquimbo”	V
— <i>quillotana</i> Weber	K
— <i>venusta</i> Phil. “chagual chico” “chagualillo”	V
6. TILLANDSIA	
— <i>capillaris</i> R. et P. “clavel del aire”	
form <i>capillaris</i>	V
form <i>virescens</i> L.B.Sm.	V
— <i>geissei</i> Phil.	V
— <i>landbeckii</i> Phil. “calachunca”, “paja blanca”	V
— <i>usneoides</i> (L) L. “barba de Viejo”, “barbón”	V
— <i>sp. nueva de Paposo</i>	R

O : Out of danger
V : Vulnerable

R : Rare
K : Insufficiently known

CHILEAN BROMELIACEAE CONSERVATION STATUS SUMMARY (30 TAXA)

Genera	CONSERVATION STATUS				ORIGIN	
	V	K	R	O	E	NE
1. DEUTEROCOHNIA	1					1
2. FASCICULARIA	1	4			5	
3. GREIGIA	3	1			4	
4. OCHAGAVIA	1	1		1	3	
5. PUYA	6	2	2	1	11	
6. TILLANDSIA	5		1		2	4
Total	17	8	3	2	25	5

Note: These figures also include the varieties and forms of the species studied.

O:	Out of Danger	K:	Insufficiently Known
V:	Vulnerable	E:	Endemic
R:	Rare	NE:	Not Endemic

THREATENED CHILEAN CONTINENTAL PTERIDOPHYTA

Roberto Rodríguez R.

Botany Department

Faculty of Biological Sciences and Natural Resources

University of Concepción

Chilean continental Pteridophyta include approximately 125 taxa, especially abundant at the country's Sub-Antarctic forest region, where moisture and high rainfall foster their development. In that area, there is a significant number of endemic species, which on account of their biological interest and scarcity have attained a high scientific value within this primitive group of vascular plants.

Many species affected by conservation problems occur at sites not particularly favorable for ferns, as in the ravines in Chile's north and at the high-plateau areas. These plants usually occur more profusely in regions farther to the north; they come from North or Central America, and have spread southwards along the Andes mountains until reaching their southern boundary in Chile's northern provinces.

Adiantum excisum Kunze

Endemic to Chile, occurring from the Elqui to the Biobío provinces. **Insufficiently known.**

Adiantum gertrudis Espinosa

Endemic to Chile. Only known of at the La Campana mountain (Quillota province) and El Roble mountain (Metropolitan Region). **Endangered.**

Adiantum pearcei Phil.

Endemic to Chile. Known of only at the Los Andes province. **Vulnerable.**

Asplenium fragile Presl var. *lomense* Weatherby

Asplenium fragile Presl occurs in Venezuela, Colombia, Ecuador, Bolivia and Peru; the *lomense* variety is endemic to Chile and known of solely at Taltal (Antofagasta province). **Rare.**

Asplenium gilliesii Hook.

Known in Peru and northern Argentina, Bolivia and in the Chilean high-plateau. The only individual seen in Chile by G. Looser (1944) is the following found in Arica, Tarapacá Region: "Pocopocone, 30-XII-1897, Pöhlmann coll." **Rare.**

Asplenium monanthes L.

It occurs widely in Africa. In the American continent it occurs from Arizona, through Central America and South America's Andean region, to Chile. It also occurs in Jamaica and Hawaii. In Chile it occurs in few places from Cautín to Magallanes. **Rare.**

Asplenium triphyllum Presl

Its range extends from Colombia, through South America's Andean region, Bolivia and northwestern Argentina, to Chile and Patagonia. In Chile it only occurs at Regions I and XII, where it is very infrequent. **Rare.**

Blechnum corralense Espinosa

Endemic to Chile. It occurs at a few sites between the Valdivia and the Chiloé provinces. **Endangered.**

Bothrychium lunaria (L.) Sw. var. *dusenii* Christ

Bothrychium lunaria is probably the Ophioglossaceae species with the widest range, occurring in northern Europe, Asia, northern India, California, southern South America, Australia and New Zealand.

The *dusenii* variety occurs in southern Patagonia in Chile and Argentina. There are few populations, with *dusenii* growing mostly in colonies, although lone individuals also occur. It grows on semi-dry soils, meadows from 200 to 400 m above sea level, barren slopes, *Milinum* steppes, on sandy soils at sea shore, very close to water bodies, etc. In Chile it is **Rare**.

Cheilanthes arequipensis (Maxon) R. et A. Tryon

(Syn: *Notholaena arequipensis* Maxon). It occurs in southern Peru, northern Argentina and in Chile's northernmost areas, in Region I. **Rare**.

Cheilanthes bonariensis (Willd.) Proctor

(Syn: *Notholaena aurea* (Poir.) Desv). It has a wide range in the American continent, from southern United States through Mexico, Central America, along the Andes Mountain Range, up to northern Argentina and northern Chile. In Chile it occurs only in Region II (Taltal). **Rare**.

Cheilanthes myriophylla Desv.

It occurs from northern Mexico, along the Andes Mountain Range, to northern Argentina and Chile. In Chile it occurs only in Region I's high plateau areas. **Rare**.

Cheilanthes pilosa Goldm.

High-altitude species occurring in Peru, Argentina and Chile. In Chile it occurs in Region I's high plateau areas. **Rare**.

Cheilanthes pruinata Kaulf.

High-altitude species occurring in Peru, Bolivia, northern Argentina and northern Chile. In Chile it occurs in the Andes mountains at Region II and III. **Rare**.

Cryptogramma crispa (L.) R. Br. var. *chilensis* (Christ) Looser

(Syn: *Cryptogramma fumariifolia* (Phil. ex Baker) Christ). *Cryptogramma crispa* has a very wide and disjunct range. The typical variety is original to Europe and Asia. There are a further three poorly-defined varieties, occurring in the United States, Canadá, northeast and southeast Asia and Chile and southern Argentina. The *chilensis* variety occurs in Chile between the Limarí and Malleco provinces, at the Andean foothills. **Insufficiently Known**.

Dennstaedtia glauca (Cay.) C. Chr. ex Looser

It occurs in Peru, Bolivia, northeastern Argentina and Chile. In Chile it occurs from the Aconcagua valley to the Linares province, from 200 to 1800 meters above sea level. **Rare**.

Elaphoglossum gayanum (Fée) Moore

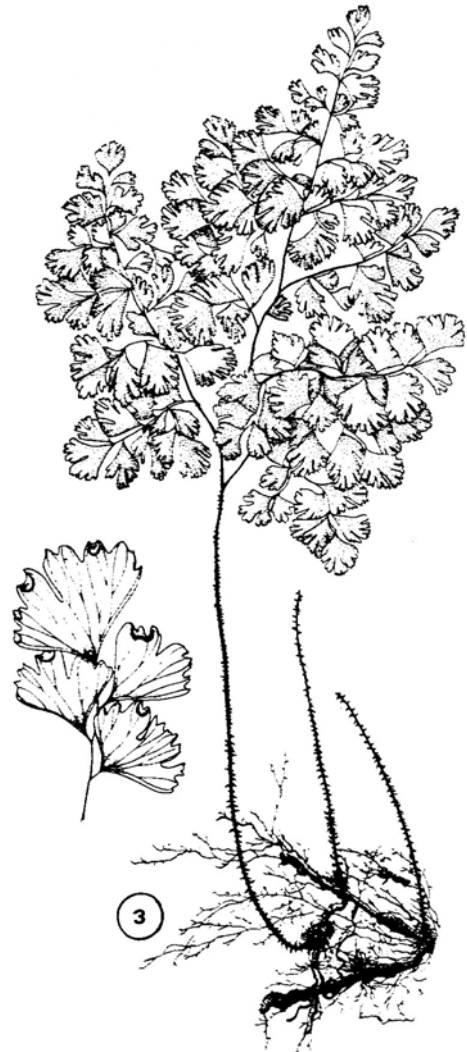
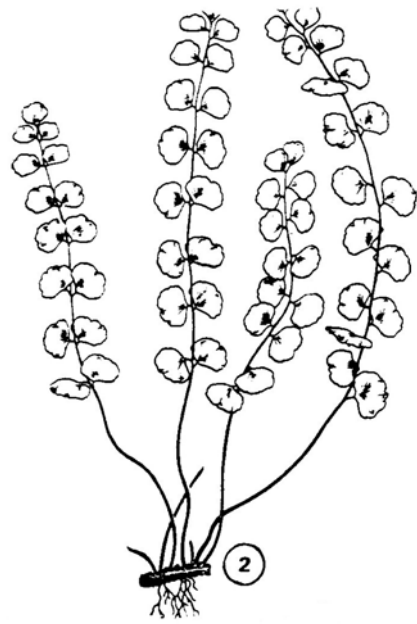
With a wide range in the American continent, from Mexico through Central America, along the Andes Mountains to northern Chile, Argentina and southern Brazil. In Chile it occurs from Valdivia to the Aysén Region, in few sites with small-sized populations growing in areas with volcanic lava. **Vulnerable**.

Elaphoglossum mathewsii (Fée) Moore

Its range stretches from Colombia through Ecuador and Peru, to southern Chile and Argentina. In Chile it occurs between the Valdivia and Llanquihue provinces. **Rare**.

Elaphoglossum porteri Hicken

Endemic to Chile. It occurs only in the areas around parallel 41° south latitude. **Vulnerable**.



1. ***Adantium exsimum*** Kunze, Insufficiently known
Lam.: Original, the author.
2. ***Adantium pearcei*** Phil. Vulnerable.
Lam.: Looser, G. 1955a.
3. ***Adantium gertrudis*** Espinosa. Endangered.
Lam.: Original, the author.



4.- *Blechnum corralense* Espinosa. Endangered.
Lam.: Looser, G. 1958.

5.- *Cryptogramma crispa* (L.) R. Br. var. *chilensis* (Christ.)
Looser. Rare variety.
Lam.: Looser, G. 1955a.

6.- *Dennstaedtia glauca* (Cav.) C. Chr. ex Looser,
Rare.

Equisetum giganteum L.

This species occurs in Cuba, Jamaica, Central America, the Andes Mountains in South America, and in Chile and Argentina. Some extremely large individuals (3-5 m tall and larger-than-usual stems) occur exclusively in some valleys of Chile's Arica province. In Central Chile individuals are smaller and slimmer. **Rare**, considering the populations at Chile's northern reaches.

Gleichenia litoralis (Phil.) C Chr.

Endemic to Chile, known of only at the coastal areas of Valdivia and Chiloé. **Rare**.

Gleichenia squamulosa (Desv.) Moore var. *gunckeliana* (Looser) Duek.

This variety is known only of at the Valdivia province. **Vulnerable**.

Grammitis patagonica (C. Chr.) Parris

It occurs in Chilean and Argentineans sub-Antarctic forests; it also occurs in New Zealand. **Rare**.

Histiopteris incisa (Thunb.) J. Sm.

A species with a wide range, occurring in India, Ceylon, South Africa, Australia, Tasmania, New Zealand, Antilles, Colombia, Venezuela, the Guianas, Brazil, Peru and Chile. It occurs profusely at the Juan Fernández archipelago, but in the continent it is found in scant places from Chiloé to Magallanes. **Insufficiently known** in continental Chile.

Hymenophyllum cuneatum Kunze

It grows profusely at the Juan Fernández archipelago, but in continental Chile it is rather scant; it occurs between the province of Valdivia and the Aysén Region. **Insufficiently known** in continental Chile.

Hymenophyllum nahuelhuapiense Diem et Licht.

Diem and Lichtenstein discovered this plant at the Nahuel-Huapi National Park (Argentina) in 1959, and only in the past few years it has been collected in Llanquihue and Chiloé. It occurs around parallel 41° south latitude, on both sides of the Andes range. **Rare**.

Isoetes savatieri Franchet

It occurs from the Lake District to Tierra del Fuego. It is also known of at two coastal sites located much farther to the north: the Nahuelbuta mountain range and Pichidangui (in the southern reaches of Region IV). It grows totally immersed in fresh-water ponds and lakes, up to 5 or 6 m depth; occasionally, some above-water individuals can be found among shore rocks, covered almost constantly by waves. It is **Rare** in Nahuelbuta and **Vulnerable** in Pichidangui. Not enough data is available on northern individuals.

Lycopodium chonoticum Phil.

The only sample known is the type specimen at the Herbarium of the National Museum of Natural History, in Santiago. It looks similar to *Lycopodium confertum*, but more delicate and forb-like, with medium-sized strobils. The notion has been advanced that this species corresponds only to a variety of *L. confertum* Willd. If it is a valid species, it is **Endangered**.

Lycopodium fuegianum Roiv.

A species only known to Tierra del Fuego. It was discovered by Skottsberg and described by Roivainen in 1936; according to the latter, it is a very infrequent species. **Rare**.

Notholaena sulphurea (Cav.) J. Sm.

It occurs from Mexico, through Central America and along the Andes mountains, to Chile's Atacama Region, in the northern part of the country. Despite its vast range, it occurs sparsely. **Vulnerable**.

Ophioglossum nudicaule L. fil. var. *robustum* Licht.

Endemic to Chile, found only at the Aysén Region. **Rare.**

Ophioglossum valdivianum Phil.

It occurs in the sub-Antarctic forest of Chile and Argentina. The scant material known comes solely from Region X. **Rare.**

Pellaea myrtilifolia Mett. ex Kuhn

Endemic to Chile. It occurs from the northern reaches of the Coquimbo Region to the Colchagua province, between 600 and 1,600 m altitude. **Insufficiently Known.**

Pellaea ternifolia (Cav.) Link

It occurs from southern United States, through Mexico, the Andean regions and southern Brazil, to Chile and Argentina; it has been mentioned at Hawaii. In Chile it occurs from the Arica to the Valdivia provinces. **Insufficiently Known.**

Pilularia americana A. Braun

A species occurring in the United States and Chile. In the latter, it grows at scant sites from Coquimbo to the Osorno province. **Insufficiently Known. Endangered** at Pichidanguí.

Polypodium espinosae Weatherby

Endemic to Chile. It only occurs at the Antofagasta Region. **Endangered.**

Polypodium masafuerae Phil.

It occurs at the Juan Fernández archipelago (Alejandro Selkirk island), southern Peru and northern Chile. It is generally very infrequent and in continental Chile it occurs solely at the Antofagasta Region. **Endangered.**

Trichomanes exsectum Kunze

It occurs profusely in Juan Fernández, but is very infrequent in continental Chile, where it can be found from the Valdivia to the Chiloé provinces. **Rare** in continental Chile.

Trismeria trifoliata (L) Fée ex Diels

It occurs in southern Florida (U.S.A.), Great Antilles, Mexico to Costa Rica, Venezuela, Colombia, Paraguay, Uruguay, Brazil, Chile and Argentina. In Chile it is known of solely at the Tarapacá province. **Rare.**

Woodsia montevidensis (Spreng.) Hieron.

It occurs from Colombia to Bolivia, in Chile, Argentina, Uruguay, Brazil, Santo Domingo and in some regions of Africa. In Chile it occurs solely at the Tarapacá Region. **Rare.**

Marsilea mollis Robinson et Fernald

This genus's presence in Chile was reported by Looser in 1961. It grows in temporary ponds at the coastal areas of the Limarí and Choapa provinces. **Endangered.**

Salvinia auriculata Aublet

Floating plants occurring in Cuba, Brazil, Ecuador, Paraguay, Uruguay and Argentina. In Chile it has been mentioned as a cultivated plant grown wild, thriving at brooks and streams of the Valparaíso province. Records are scant and the environment has been dramatically altered. **Endangered.**

THREATENED CHILEAN CONTINENTAL PTERIDOPHYTA

	Status	Range
ASPLENIACEAE		
<i>Asplenium fragile</i> var. <i>lomense</i>	R	End.
<i>Asplenium gilliesii</i>	R	S.A.
<i>Asplenium monanthes</i>	R	Afr., N.A., S.A.
<i>Asplenium triphyllum</i>	R	S.A.
BLECHNACEAE		
<i>Blechnum corralense</i>	E	End.
DENNSTAEDTIACEAE		
<i>Dennstaedtia glauca</i>	R	S.A.
<i>Histiopteris incisa</i>	K	Afr., Asia, Oce., S.A.
DRYOPTERIDACEAE		
<i>Elaphoglossum gayanum</i>	V	C.A., N.A., S.A.
<i>Elaphoglossum mathewsii</i>	R	S.A.
<i>Elaphoglossum porteri</i>	V	End.
<i>Woodsia montevidensis</i>	R	S.A.
EQUISETACEAE		
<i>Equisetum giganteum</i>	R	C.A., S.A.
GLEICHENIACEAE		
<i>Gleichenia litoralis</i>	R	End.
<i>Gleichenia squamulosa</i> var. <i>gunckeliana</i>	V	End.
HYMENOPHYLLACEAE		
<i>Hymenophyllum cuneatum</i>	K	End.
<i>Hymenophyllum nahuelhuapiense</i>	R	S.A.
<i>Trichomanes exsectum</i>	R	End.
ISOETACEAE		
<i>Isoetes savatieri</i>	V-R	S.A.
LYCOPODIACEAE		
<i>Lycopodium chonoticum</i>	E	End.
<i>Lycopodium fuegianum</i>	R	End.

MARSILEACEAE

<i>Marsilea mollis</i>	E	N. A., S.A.
<i>Pilularia americana</i>	E-K	N. A., S.A.

OPHIOGLOSSACEAE

<i>Bothrychium lunaria</i> var. <i>dusenii</i>	R	S.Ant.
<i>Ophioglossum nudicaule</i> var. <i>robustum</i>	R	End.
<i>Ophioglossum valdivianum</i>	R	S.Ant.

POLYPODIACEAE

<i>Grammitis patagonica</i>	R	S.Ant.
<i>Polypodium espinosae</i>	E	End.
<i>Polypodium masafuerae</i>	E	S.Ant.

PTERIDACEAE

<i>Adiantum excisum</i>	K	End.
<i>Adiantum gertrudis</i>	E	End.
<i>Adiantum pearcei</i>	V	End.
<i>Cheilanthes arequipensis</i>	R	Sudam.
<i>Cheilanthes bonariensis</i>	R	N.A., C.A., S.A.
<i>Cheilanthes myriophylla</i>	R	C.A., S.A.
<i>Cheilanthes pilosa</i>	R	S.A.
<i>Cheilanthes pruinata</i>	R	S.A.
<i>Cryptogramma crispa</i> var. <i>chilensis</i>	K	S.Ant.
<i>Notholaena sulphurea</i>	V	C.A., S.A.
<i>Pellaea myrtillifolia</i>	K	End.
<i>Pellaea ternifolia</i>	K	N.A., C.A., S.A.
<i>Trismeria trifoliata</i>	R	N.A., C.A., S.A.

SALVINIACEAE

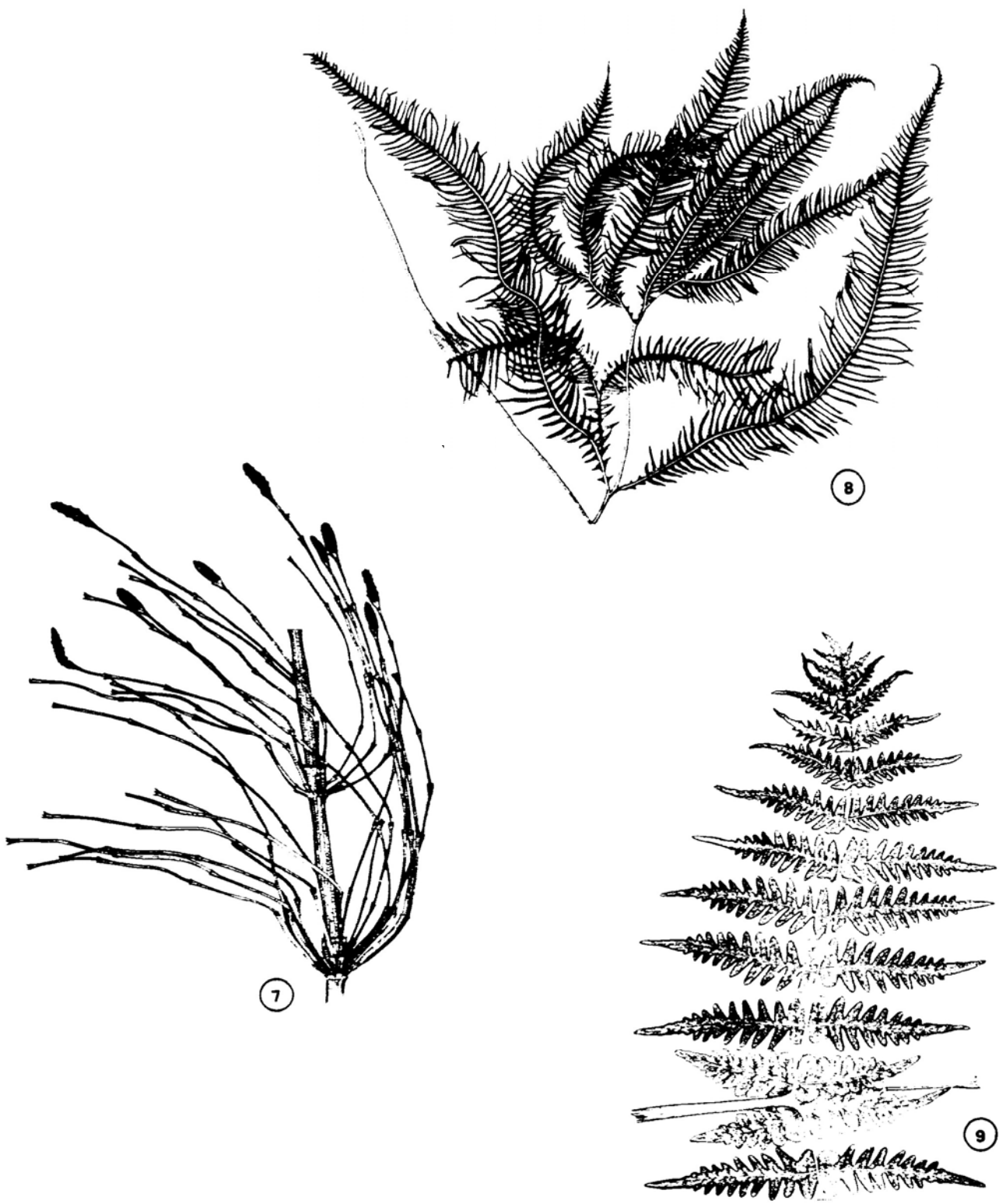
<i>Salvinia auriculata</i>	E	S.A.
----------------------------	---	------

IUCN Categories:

E = Endangered
V = Vulnerable
R = Rare
K = Insufficiently known

Range:

Afr. = Africa
Asia = Asia
C. A. = Central America
End. = Endemic
N.A. = North América
Oca. = Oceanía
S.Ant. = Sub-Antarctic
S.A. = South America



7.- *Equisetum giganteum* L. Rare.
Lam.: Original, the author

8.- *Gleichenia litoralis* (Phil.) C. Chr. Rare.
Lam.: Onginai, the author.

9.- *Histiopteris incisa* (Thumb.) J. Sm. Insufficiently known.
Lam.: Original, the author.



10. - *Isoetes savatieri* Franchet. Vulnerable.

11. - *Marsilea mollis* Endangered.
Lam.: Johnston, D.M. 1986.

12. - *Pellaea ternifolia* (Cav.) Link. Insufficiently known.
Lam.: Looser, G. 1955a.

TABLE 1

**ENDEMIC CONTINENTAL CHILEAN PTERIDOPHYTA
AFFECTED BY CONSERVATION PROBLEMS**

Species	Region												
	I	II	III	IV	V	RM	VI	VI	VIII	IX	X	XI	XII
<i>Adiantum excisum</i>				x	x	x	x	x	x				
<i>Adiantum gortudis</i>					x	x							
<i>Adiantum pearci</i>					x								
<i>Asplenium fragil</i> var. <i>lomenso</i>		x											
<i>Blechnum corralenso</i>											x		
<i>Elaphoglossum porten</i>											x		
<i>Gleichenia litoralis</i>											x		
<i>Gleichenia squamulosa</i> var. <i>gunc*eliana</i>											x		
° <i>Hymenophyllum cuneatum</i>											x	x	
<i>Lycopodium chonoticum</i>												x	
<i>Lycxpodium fuegianum</i>													x
<i>Ophioglossum nudicaule</i> var. <i>robustum</i>												x	
<i>Poilaea myrtiflifolia</i>				x	x	x	x						
<i>Polypodiume spinosae</i>			x										
° <i>Trichomanes exsectum</i>											x		

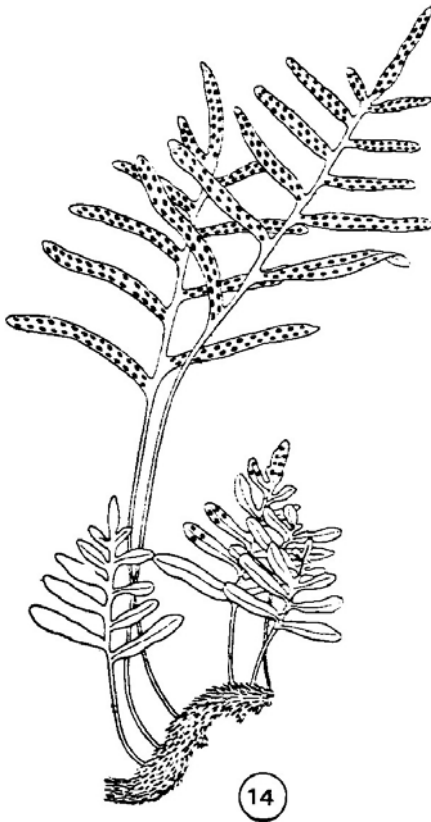
° Also occurring in Juan Fernández archipelago.

REFERENCES

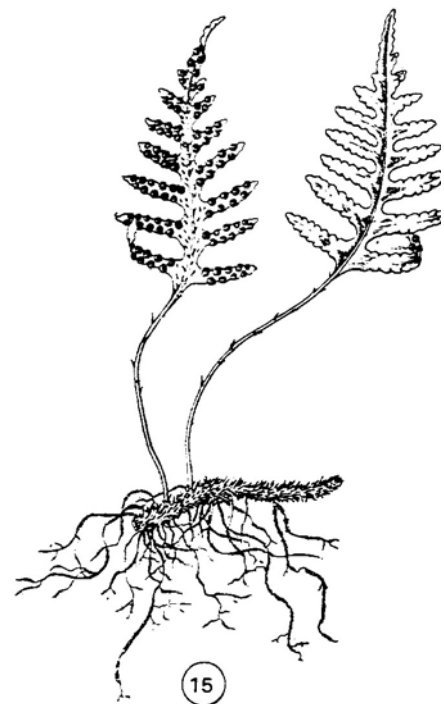
- DIEM, J. y LICHTENSTEIN, J.S. 1959. Las Himenofiláceas del área argentino-chilena del sud Darwiniana 11(4): 611-760.
- JOHNSON, D.M. 1986. Systematics of the New World Species of Marsilea (Marsileaceae). Syst. Bot. Monogr. 11: 1-87.
- JOHNSTON, I.M. 1929. Papers on the flora of northern Chile. 1. The Coastal flora of the departments of Chañaral and Taltal; 2. The flora of the Nitrate Coast; 3. Undescribed species from the cordilleras of Atacama. Contr. Gray Herb. 85: 1-172, 2 mapas.
- LICHTENSTEIN, J.S. 1944. Las Ofioglosáceas de la Argentina, Chile y Uruguay. Darwiniana 6 (3): 380-441.
- LOOSER, G. 1940. El género *Elaphoglossum* Schott (Filicales) en Chile. Anais 1º Reun. Sul-Amer. Bot. 3: 399-408, 4 lám.
- LOOSER, G. 1944. Sinopsis de los *Asplenium* (Fílices) de Chile. Lilloa 10: 233-265, 6 lám.
- LOOSER, G. 1952. El género *Polypodium* y sus representantes chilenos. Revista Univ. (Santiago) 36(1): 13-82, 16 lám.
- LOOSER, G. 1955 a. Los helechos (Pteridófitos) de Chile central. Moliniana 1: 5-95.
- LOOSER, G. 1955 b. Los *Cheilanthes* (Filicales) de Chile. Moliniana 1: 139-154, 4 lám.
- LOOSER, G. 1958. Clave de los *Blechnum* (Filicales) de Chile. Revista Univ. (Santiago) 43: 123-128, 17 lám.
- LOOSER, G. 1961. Los Pteridófitos o helechos de Chile (excepto Isla de Pascua). I. Revista Univ. (Santiago) 46: 213-262, 17 lám.
- LOOSER, G. 1968. Los Pteridófitos o helechos de Chile (excepto Isla de Pascua). Parte IV. Revista Univ. (Santiago) 53: 27-39, 1 lám.



13



14



15

- 13.- *Pellaea myrtillifolia* Mett. ex Kuhn. Insufficiently known.
Lam.: Looser, G. 1955a.
14. - *Polypodium espinosae* Weatherby. Endangered.
Lam.: Johnston, I.M. 1929.
15. - *Polypodium masa fueie* Phil. Endangered.
Lam.: Looser, G. 1952.

ANNEX 1

PTERIDOPHYTE SPECIES PREVIOUSLY REPORTED AS ENDANGERED BUT CURRENTLY NOT AFFECTED BY CONSERVATION PROBLEMS

Adiantum mochaenum Kunkel = *Adiantum chilense* Kaulf.

It has a wide range in continental Chile, Juan Fernández, Argentina and Malvinas (Falkland) islands.

Adiantum poiretii Wikstr. var. *sulphureum* (Kaulf.) Tryon = *Adiantum sulphureum* Kaulf.

Adiantum scabrum Kaulf.

Frequent in central and southern Chile, from Coquimbo to Malleco.

Asplenium dareoides, A.N. Desv.

Sub-Antarctic. Frequent from Curicó to Cape Horn; it also occurs at Fray Jorge and Juan Fernández.

Asplenium obliquum G. Forster *Asplenium obtusatum* G. Forster var. *sphenoides* (Kunze) C. Chr. et Skotts.

Frequent along Chile's coastal areas from the Coquimbo Region to Magallanes, mostly at the sea shore.

Cheilanthes valdiviana Phil.

This species has been excluded from Chile's flora. The only individual of this taxon existing in Chile is at the Herbarium of the Natural History Museum in Santiago. Its label reads: "Prov. Valdivia in andibus Huanegue. Gay in 1835." No other samples have been collected at the Valdivian region where the type had been found. It probable corresponds to a mistaken location.

Ctenitis spectabilis (Kaulf.) Kunkel = *Megalastrum spectabile* (Kaulf.) A.R Smith et R.C Moran

Endemic, with a wide range in Chile stretching from Limarí to Aysén. It is common in southern forests undergrowth.

Equisetum xylochaetum Mett. = *Equisetum giganteum* L.

Hymenophyllum darwinii Hook. f. ex v. den Bosch

Valdivian sub-Antarctic. Frequent in Chilean southern forests from Malleco to Tierra del Fuego.

Hymenophyllum dentatum Cav.

Frequent from Arauco to Tierra del Fuego. It also occurs in Argentina.

Hymenophyllum dicranotrichum (K. Presi) Hook. ex Sadeb.

Endemic, frequent in Chile's southern forests, from Concepción to Aysén.

Hymenophyllum peltatum (Poir.) A.N. Desv.

It has a wide range throughout the world. In Chile it occurs from Valdivia to Cape Horn, and also in Fray Jorge.

Lycopodium selago L.

This species does not belong to Chile's flora.

Notholaena tomentosa (A.N. Desv.) A.N. Desv. = *Cheilanthes hypoleuca* (Kunze) Mett.

Endemic, occurring from Antofagasta to Valdivia.

Ophioglossum crotalophoroides Walt.

It occurs throughout the American continent, from southern United States to Patagonia. In Chile it occurs from the southern portions of Coquimbo to Aysén, in small-sized populations. This plant appears in springtime and is not rare in natural pastures. Its small size often lets it go undetected, leading to poor collection.

Pteris chilensis A.N. Desv.

Endemic, frequent in continental Chile from Petorca to Palena. It also occurs in Juan Fernández.

ANNEX 2

CHILEAN PTERIDOPHYTES WITH CONSERVATION PROBLEMS GROUPED
BY REGION OF OCCURRENCE

	Endangered	Vulnerable	Rare
Region I			
<i>Asplenium gilliesii</i>			X
<i>Asplenium triphyllum</i>			X
<i>Cheilanthes arequipensis</i>			X
<i>Cheilanthes myriophylla</i>			X
<i>Cheilanthes pilosa</i>			X
<i>Cheilanthes pruinata</i>			X
<i>Equisetum giganteum</i>			X
<i>Trismeria trifoliata</i>			X
<i>Woodsia montevidensis</i>			X
Region II			
<i>Asplenium fragile</i> var. <i>lomense</i>			X
<i>Cheilanthes bonariensis</i>			X
<i>Cheilanthes pruinata</i>			X
<i>Poypodium espinosae</i>	X		
<i>Polypodium masafuerae</i>	X		
Region III			
<i>Notholaena sulphurea</i>		X	
Region IV			
<i>Isoetes savatieri</i> (also in Aysen Región)	X	X	
<i>Marsilea mollis</i>			
Region V			
<i>Adiantum gertrudis</i> (also in Met.Región)	X		
<i>Adiantum pearceli</i>		X	
<i>Denrstaedtia glauca</i> (up to Mafleco)			X
<i>Salvinia auriculata</i>	X		
Region IX			
<i>Asplenium moflan fhes</i> (up to Magalanes)			X
<i>Isoetes savatieri</i>			X
Region X			
<i>Blochnum corralense</i>	X	X	
<i>Elaphoglossum gayanum</i> (up to Aysen)			X
<i>Elaphoglossum mathewsii</i>		X	
<i>Elaphoglossum porteri</i>			X
<i>Gleichenia litoralis</i>		X	
<i>Gleichenia squamulosa</i> var. <i>gunckeliana</i>			X
<i>Grammitis patagonica</i> (up to Magallanes)			X
<i>Hymenophyllum nahuelhuapiense</i>			X
<i>Ophioglossum valdivianum</i>			X
<i>Trichomanes exsectum</i>			X

Region	Endangered	Vulnerable	Rare
Region XI Lycopodium chonoticum Ophioglossum nudicaule var. robustum	x		x
Region XII Bothrychium lunaria var. dusenii Lycopodium fuegianum			x x

Note: The following species are **Insufficiently Known** and therefore have not been included in any particular Region.

Adiantum excisum
Cryptogramma crispa var. *chilensis*
Histiopteris incisa
Hymenophyllum cuneatum
Pellaea myrtillifolia
Pellaea ternifolia
Pilularia americana

CHILEAN GEOPHYTE MONOCOTYLEDONS: TAXONOMIC SYNOPSIS AND CONSERVATION STATUS

Adriana E. Hoffmann J.
Foundation Claudio Gay

INTRODUCTION

Geophytes are plants that develop underground structures to store water and nutrients, such as bulbs, rhizomes, corms or tubers. Life is dormant inside the shoot's meristematic tissues, protected from the weather by a thick soil layer. When moisture, temperature and/or solar radiation conditions are right, the plants emerge from their dormancy and, drawing on their reserves, put their growing tissues into action and break above the soil's surface; once emerged, they can start to synthesize their own food for the subsequent development stages.

Among Chilean Monocotyledons there are 9 families with geophyte petaloid species, all belonging to the Super Order Liliiflorae (Dahlgren, 1985): Amaryllidaceae, Alliaceae, Anthericaceae, Hyacinthaceae, Tecophilaceae, Alstroemeriaceae, Iridaceae, Corsiaceae and Orchidaceae. Orchids will not be included in this paper, because they represent a very large group and still require a great deal of study.

The degree of adaptation of some of these plants to the different environmental conditions is sometimes remarkable. For instance, at the Atacama desert—one of the driest in the world, with 25 mm average annual rainfall and where periods of several consecutive rainless years are not uncommon—, numerous species of bulbous plants—such as *Rhodophiala*, *Zephyra*, *Camassia*, *Alstroemeria*, etc.— thrive in vast and relatively dense populations. Here soil surface temperatures can be extremely high, making it difficult to imagine how these species manage to survive.

PART I: THE ORGANIZATION

The study of Chilean Monocotyledons showed that nearly all petaloid species (with the exception of Bromeliaceae) are grouped in 3 Orders of the Super Order Liliiflorae, with 9 families, 40 genera and about 180 species.

Super Order LILIFLORAE

First Order: Asparagales

1. AMARYLLIDACEAE (St. Hilaire, 1805), groups the genera *Placea*, *Phycella* (includes *Farnatina*), *Rhodophiala* and *Traubia* in the tribe Hippeastreae; and *Stenomesson* in the tribe Stenomessae, with a large amount of species described, widely distributed throughout Chile and in several other South American countries,

2. ALLIACEAE (J. G. Agardh, 1858). Organizes in two Sub-Families (Allioideae and Gilliesioideae) all the genera traditionally included in the family Liliaceae.

In the Sub-Family Allioideae, the tribe Allieae groups *Ipheion*, *Nothoscordum*, *Tristagma*, *Zoellnerallium*, *Leucocoryne* y *Pabellonia*.

The Sub-Family Gilliesioideae includes a number of generally inconspicuous, weak plants, with very typical floral characters. Almost all the species of the genera *Ancrumia*, *Erinna*, *Garaventia*, *Gethyum*, *Gilliesia*, *Miersia*, *Solaria* and *Speea* are rarely collected.

3. ANTHERICACEAE (J. G. Agardh, 1858), groups the monotypic genera *Pasithea* and *Trichopetalum*.

4. HYACINTHACEAE (Batsh, 1802). It includes *Camassia* with a single species in Chile, with racemose inflorescences, very different from the umbellate inflorescences —typical of the order— of the other species.

5. TECOPHILACEAE (Leybold, 1862). This family is circumscribed mainly to the Southern Hemisphere. In Chile there are 3 endemic genera: *Conanthera*, *Tecophilaea* and *Zephyra*, with about 10 species boasting elegant blue or whitish flowers.

Second Order: Liliales

1. ALSTROEMERIACEAE (Demortier, 1829). It includes *Alstroemeria*, *Bomarea* and *Leontochir*. *Alstroemeria* groups around 50 species, 30 or 40 of which occur in Chile between Tocopilla (23° south lat.) and Patagonia (55° south lat.), and from, the coastal area to the vegetation line at the Andes Mountain Range. *Bomarea*, by contrast, has about 150 species distributed in the American tropics; there are only 3 species in Chile, of which 2 are mainly Peruvian (*B. engleriana* and *B. involucrosa*). The southern boundary of their range runs along the high mountains of Arica, Tarapacá Region. *Leontochir* is a monotypical genus, with *L. ovallei*, a rare plant occurring only in a tiny coastal strip of the Atacama desert.

2. IRIDACEAE (A.L. de Jussieu, 1789). It is represented in Chile by about 10 genera and 30 species. They are perennial forbs. Only 3 genera present bulbs: *Calydorea*, *Herbertia* and *Tigridia*. It would be interesting to mention here some Iridaceae with small-sized rhizomes and beautiful flowers: *Sisyrinchium*, *Solenomelus*, *Chamelum* and *Libertia*.

3. ORQUIDACEAE (A.L. de Jussieu, 1789) It groups 7 genera of terrestrial orchids in Chile (*Aa*, *Bipinnula*, *Brachystele*, *Chloraea*, *Codonorchis*, *Gavilea* and *Habenaria*) with around 50 species.

Third Order: Burmanniales

1. CORSIACEAE (Beccari, 1878), a monospecific family for *Arachnites uniflora*, a rare light-brown plant with leafless stems and large, unisexual, zygomorphic, spider-like flowers. It occurs discontinuously in wooded areas between Santiago and Magallanes.

SYSTEMARTICS OF CHILEAN: LILIFLORAE

Order	Family	Sub-family	Tribe	Genus
Asparagales	Amaryllidaceae		Hippeastreae	<i>Rhodophiala</i> <i>Placea</i> <i>Traubia</i> <i>Phycella</i> (+Famatina)
			Stenomesseae	<i>Stenomesson</i>
	Alliaceae	Allioideae	Allieae	<i>Ipheion</i> <i>Nothoscordum</i> <i>Tristagma</i> <i>Zoellnerallium</i> <i>Leucocoryne</i> <i>Pabellonia</i>

Order	Family	Sub-family	Tribe	Genus
		Gilliesioideae		<i>Ancrumia</i> <i>Erinna</i> <i>Garaventia</i> <i>Gethyum</i> <i>Gilliesia</i> <i>Miersia</i> <i>Solaria</i> <i>Speea</i>
	Anthericaceae			<i>Pasithea</i> <i>Trichopetalum</i>
	Hyacinthaceae			<i>Camassia</i>
	Tecophilaceae			<i>Conanthera</i> <i>Tecophilaea</i> <i>Zephyra</i>
Liliales	Alstroemeriaceae			<i>Alstroemeria</i> <i>Bomarea</i> <i>Leontochir</i>
	Iridaceae		Tigrideae	<i>Calydorea</i> <i>Harbertia</i> <i>Tigridia</i>
			Sisyrinchioideae	<i>Chamelum</i> <i>Sisyrinchium</i> <i>Libertia</i>
	Orchidaceae			<i>Aa</i> <i>Bipinnula</i> <i>Brachystele</i> <i>Chloraea</i> <i>Codonorchis</i> <i>Gavilea</i> <i>Habenaria</i>
Burmanniales	Corsiaceae			<i>Arachnites</i>

PART II: SPECIES, THEIR RANGE AND CONSERVATION STATUS

Several authors have studied Chilean geophytes during this past century, and have attempted to explain the relationships existing among them. As a result, many taxa have been created and a number of taxonomic classifications have been proposed. Furthermore, data regarding Chilean bulbous plants are widely scattered in specialized literature, making it difficult to visualize a coherent classification.

Recently, nearly all Chilean bulbous plants were grouped under one large family: Liliaceae (Cronquist, 1981). That same year, Dahlgren and Clifford proposed a very convincing organization for the group, particularly effective for classifying Chilean petaloid geophyte monocotyledons. This

arrangement is based on a comparative analysis of morphology, anatomy, phytochemical characteristics, origin and evolution, geographic range and other characteristics inherent to natural species.

Very little has been done regarding the conservation status of Chilean bulbous plants. In 1976, Ravenna published his study "Iridaceae, Amaryllidaceae y familias relacionadas amenazadas por la actividad del hombre en el Neotrópico Americano" ("Iridaceae, Amaryllidaceae and related families threatened by man's activities in the American Neotropic"). In 1971, Muñoz Pizarro published his book "Chile, Plantas en Extinción" ("Chile: Endangered Plants"), where he discusses about 70 endangered plant species, including around 10 bulbous plants. He describes classic cases of total loss, such as that of *Tecophilaea cyanocrocus*, one of the most beautiful Chilean bulbous plants.

Geophytes, particularly Amaryllidaceae, are a special group in terms of conservation, as some of their characteristics make them especially vulnerable. These factors are separate from the problems caused directly or indirectly by man and are connected rather with their biology: they need a long time to attain reproductive maturity, are genetically incompatible, sensitive to disease and have very specific requirements for their development (Koopowitz, 1986).

Many specialists in Chile believe that all plants of this kind are **Vulnerable**. Many species, although occurring profusely in their habitat, are severely threatened by man. The expansion of farming and urban areas, overgrazing, erosion and intentional burning, among others, are deeply disturbing the biological communities.

Direct actions on the populations, such as bulb extraction and flower chipping for commercial purposes, are also significant, as in the case of *Leucocoryne spp.*, *Placea spp.*, *Alstroemeria spp.*, *Pasithea coerulea*, *Phycella bicolor*, etc., which arrive by the millions to the towns' flower markets.

The list below attempts to place known Chilean species under one of the IUCN Conservation Categories: Extinct (Ex), Endangered (E), Vulnerable (V), Rare (R), Out of Danger (O), and Insufficiently Known (K).

CHILEAN BULB SPECIES, RANGE AND CONSERVATION STATUS

Species	Range	Conservation Status
AMARYLLIDACEAE		
PLACEA		
<i>amoena</i>	Ovalle, Tulahuén	R
<i>arzae</i>	Santiago hills, Renca	V
<i>davidii</i>	Maipo river valley, Met. Reg.	R
<i>germainii</i>	Valparaíso hills, La Campana	R
RHODOPHIALA		
<i>advena</i>	Metropolftan Region & Reg. V	O
<i>ananuca</i>	Atacama Region (Caldera, Copiapó)	O
<i>andicola</i>	Antuco, Linares, Andes Mtn's at Chillán	R
<i>angustifolia</i>	Santiago, Maipo river valley	K
<i>araucana</i>	Andes Mtn's at Araucanía	R
<i>bagnoldii</i>	Southern Reg. II-Reg. IV	O
<i>bakeri</i>	Andes Mtn's at Talca	R
<i>berteroana</i>	Rancagua	K
<i>biflora</i>	Valdivia, near San José	K
<i>chilense</i>	South, sandy sites	K
<i>colona</i>	IX Region, from Renaico to Temuco	R

Species	Range	Conservation Status
<i>consobrina</i>	Andes Mtn's at Santiago	K
<i>fuigens</i>	Andes Mtn's at Santiago	R
<i>gayana=phycelloides?</i>	Andes Mtn's at Santiago	K
<i>laeta</i>	Seaboard at Antofagasta	V
<i>lineata</i>	Metropolitan Region	O
<i>moelleri</i>	Araucanía	K
<i>montana</i>	Talca, San Francisco Mnt. Range	K
<i>ovalleana</i>	Ovalle	K
<i>phycelloides</i>	Chilean Andes Mtn's	K
<i>pratense=laeta?</i>	Atacama desert seaboard	V
<i>purpurata</i>	Andes Mtn's at Linares	K
<i>rhodolirion</i>	Andes Mtn's at San Fernando	K
<i>roseum</i>	Chiloé islands	K
<i>solisii</i>	Maule Region, Chillán	K
<i>sp!endens</i>	Curicó	K
<i>tenuiflora</i>	Metropolitan Reg., Valle Largo	K
<i>tiltilensis</i>	Metropolitan Region, Til Til	R
<i>uniflora</i>	Cachinal de la Costa	K
PHYCELLA		
<i>australis</i>	Maule Region, Talca	V
<i>bicolor</i>	Central Chile, coastal and inland areas	V
<i>ignea</i>	Central Chile mountains	V
<i>scariatina</i>	Coquimbo Region, Hurtado, Tulahuén	R
<i>andina</i>	Andes Mtn's at Santiago, Loma del Viento	V
<i>maulensis</i>	Andes Mtn's at Talca, Laguna del Maule	V
TRAUBIA		
<i>Modesta</i>	Illapel	R
STENOMESSION		
<i>Chilense</i>	Andes Mtn's, Region 1, 3,000 m.a.s.l.	R
ALLIACEAE		
IPHEION		
<i>sessile</i>	Andes Mtn's at Santiago, Las Arañas	R
NOTHOSCORDUM		
<i>inodorum</i>	Cosmopolitan	O
<i>mahui</i>		K
<i>nublense</i>	Ñuble to Valdivia, seaboard and inland	K
<i>serenense</i>	Coquimbo Region, Salala	V
<i>striatellum</i>		K
TRISTAGMA		
<i>berteri</i>	Valparaíso hills	O
<i>bivalvis</i>	Central Chile	O
<i>gaudíchaudiana</i>	Valparaíso hills	K
<i>leichtlinii</i>	Andes Mtn's at Santiago	K
<i>nivale</i>	Central Chile's high-altitude mtn's	O
<i>poepigiana</i>		K
<i>porrifolia</i>	Andes Mtn's at Santiago	V
<i>violacea</i>	Andes Mtn's at San Fernando	K

Species	Range	Conservation Status
ZOELLNERALLIUM <i>andinum</i>	30-35° lat. S., 2500-3500 m.a.s.l.	O
LEUCOCORYNE		
<i>alilacea</i>	Aconcagua to Araucanía 900-1,300 m.a.s.l.	O
<i>angustipetala</i>	Coquimbo Region, 1000-1500 m.a.s.l.	V
<i>appendiculata</i>	Iquique to Caldera, 400-800 m.a.s.l.	V
<i>conforta</i>	Aconcagua and Coquimbo 1000-1 200 m.a.s.l.	R
<i>coquimbensis</i>	Coquimbo to Valparaíso	V
<i>ixicides</i>	Central Chile	V
<i>macropetala</i>	Coquimbo and Atacama	V
<i>odorata</i>	Central Chile	V
<i>paucillora</i>	Aconcagua and Maipo river valleys	V
<i>purpurea</i>	Coquimbo seaboard	V
<i>violascens</i>	Aconcagua and Maipo river valleys	V
PABELLONIA		
<i>incrassata</i>	Antofagasta and Atacama	O
<i>Oxypetala</i>	Coquimbo and Atacama, inland plañís	K
ANCRUMIA		
<i>Cuspidata</i>	Coquimbo Region	O
ERINNA		
<i>gilliesioides</i>	Metropolitan Region, San Ramón	O
GAPLAVENTIA		
<i>graminifolia</i>	Metropolitan Region, Renca hills	E
GETHYUM		
<i>Atropurpureum</i>	Metropolitan Region, Peñalolén	E
GILLIESIA		
<i>curicana</i>	Andes Mtn's at Curicó, Las Tablas	R
<i>gaudichaudiana</i>		K
<i>graminea</i>	Valparaíso Region	V
<i>monophylla</i>	Araucanía Region	K
<i>montana</i>	Antuco Volcano	K
MIERSIA		
<i>chilensis</i>	Aconcagua to Maule	V
<i>corneta</i>	Region V, El Melón	R
SOLARIA		
<i>Miersioides</i>	Santiago, Valparaíso, Linares	K
SPEEA		
<i>humilis</i>	Santiago, Valparaíso	R
<i>triloba</i>	Metropolitan Region, Chicauma, 1,700 m.a.s.l.	R

Photograph: Michael Willets



Azulillo (*Tecophilaea cyanocrocus* Leyb.) Formerly occurred in the metropolitan Region, but now is considered extinct in the wild due to over-collection of bulbs.

Photograph: Adriana Hoffmann J.



Many species of *Copiapoa* have unusual shapes such as *Copiapoa longistaminea* Ritter. Cacti are vulnerable due to excessive collection.

Photograph: Adriana Hoffmann J.



There are many "Country Lilies" of the genus **Alstroemeria** in Chile; the one shown here, (*Alstroemeria werdermannii* Bayer) occurs in the coast of Atacama.

Species	Range	Conservation Status
ANTHERICACEAE		
PASITHEA <i>coerulea</i>	Tocopilla to Valdivia	O
TRICHOPETALUM <i>plumosum</i>	Antofagasta to Central Chile	O
HYACINTHACEAE		
CAMASSIA <i>biflora</i>	Antofagasta to Valparaíso and Argentina	O
TECOPHILACEAE		
CONANTHERA <i>bifolia</i>	Central Chile	O
<i>campanulata</i>	Antofagasta and Central Chile	O
<i>minima</i>	Biobío Region, Mulchén	K
<i>sabulosa</i>	Coquimbo Region, sandy coastal areas	V
<i>simsii</i>		K
<i>tenella</i>	Central Chile, San Antonio	R
<i>trimaculata</i>	Central Chile	V
<i>urceolata</i>	Huasco seaboard	R
TECOPHILAEA <i>Cyanocrocus</i> <i>violaeflora</i>	Metropolitan Region Coquimbo to Santiago	EX O
ZEPHYRA <i>elegans</i>	Iquique seaboard to Coquimbo	O
ALSTROEMERIACEAE		
ALSTROEMERIA <i>andina</i> (complex)	26-31° lat. S, 2900-3700 m.a.s.l.	R
<i>angustifolia</i> (complex)	31-33° lat. S.	O
<i>aurea</i> (complex)	36-42° lat. S., 200-1800 m.a.s.l.	O
<i>crispata</i>	29-30° lat. S., 1100-1300 m.as.l.	R
<i>diluta</i> (complex)	35° (Talca)	K
<i>excerens</i>	34-36° lat. S., 1500-21 00 m.a.s.l.	K
<i>garaventai</i>	El Roble and Vizcacha mountains, 2,000 m.a.s.l.	V
<i>graminea</i>	25-27° lat. S., costa 0-400 m.a.s.l.	V
<i>hookeri</i> (complex)	35-37° lat. S., 0-300 m.a.s.l.	O
<i>kingii</i>	27-28° lat. S., 0-750 m.a.s.l.	V
<i>leporina</i>	29-30° lat. S., 900-2000 m.a.s.l.	V
<i>ligtu</i> (complex)	33-38° lat. S., 0-800 m.a.s.l.	O
<i>magenta</i>	31-32° lat. S., 0-700 m.a.s.l.	V
<i>magnifica</i> (complex)	29-33° lat. S., 0-200 m.a.s.l.	V
<i>modesta</i>	29-31° lat. S., 200-1500 m.a.s.l.	V
<i>pallida</i>	33-34° lat. S., 1500-2800 m.a.s.l.	O
<i>patagonica</i>	46-54° lat. S., 0-900 m.a.s.l.	V
<i>paupercula</i> (violacea)	22-27° lat. S., 0-200 m.a.s.l.	V

Species	Range	Conservation Status
<i>pelegrina</i>	32-33° lat. S., 0-50 m.a.s.l	V
<i>philippii</i>	28° lat S., Carrizal Bajo, coastal areas	R
<i>polyphylla</i>	28-29° lat. S., 0-800 m.a.s.l.	R
<i>presliana</i> (complex)	37-39° lat. S., 200-2000 m.a.s.l.	R
<i>pseudospathulata</i>	360 lat. S., 1000 m.a.s.l.	K
<i>pulchra</i> (complex)	32-38° lat. S., 0-1000 m.a.s.l.	V
<i>revoluta</i>	33-38° lat. S., 0-1800 m.a.s.l.	O
<i>schizanthoides</i>	30° lat. S., 800-1900 m.a.s.l.	V
<i>spathulata</i>	33-35° lat. S., 2000-3000 m.a.s.l.	V
<i>umbellata</i>	33-34° lat. S., 2000-3000 m.a.s.l.	V
<i>versicolor</i>	34-35° lat. S., 250-1700 m.a.s.l	R
<i>werdermannii</i>	28-29° lat. S., 0-50 m.a.s.l	R
<i>zoellnerii</i>	33° lat S., 1500-1800 m.a.s.l. Coastal Mtn.	V
BOMAREA		
<i>engleriana</i>	Andes Mtn's, Region 1, 3500-3700 m.a.s.l., and Peru	R
<i>involuta</i>	Parinacota province, 3500 m.a.s.l., and Perú	R
<i>salsilla</i>	Valparaíso to Valdivia	O
LEONTOCHIR		
<i>ovallei</i>	28°lat. S., Carrizal Bajo, coastal areas	E

(complex) indicates a group of akin varieties

IRIDACEAE

CALYDOREA

xyphioides Hills at the Valparaíso prov. V

HERBERTÍA

lahue Valparaíso to Valdivia (disjunct) V

TIGRIDIA

philippiana Atacama seaboard R

CORSIACEAE

ARACHNITES

uniflora Santiago to Magallanes (disjunct) R

IUCN Categories

O : Out of Danger

V : Vulnerable

R : Rare

E : Endangered

Ex : Extinct in s Habitat

K : Insufficiently Known

GEOPHYTE CONSERVATION STATUS SUMMARY (EXCLUDING ORCHIDACEAE)

Families	N° of Genera	N° of Species	Conservation Status					
			Ex	E	V	R	K	O
Amaryllidaceae	5	41	—	1	8	12	17	3
Alliaceae	14	42	—	4	13	6	12	7
Anthericaceae	2	2	—	—	—	—	—	2
Hyacinthaceae	1	1	—	—	—	—	—	1
Tecophilaceae	3	11	1	—	2	2	2	4
Alstroemeriaceae	3	35	—	1	15	9	3	7
Iridaceae.	3	3	—	—	2	1	—	—
Corsiaceae	1	1	—	—	—	1	—	—
Total: 8 Families	32	136	1	6	40	31	34	24

UICN Categories

O : Out of Danger E : Endangered
V : Vulnerable Ex : Extinct in its Habitat
R : Rare K : Insufficiently Known

CONCLUSIONS

The fore going review of the Conservation Status of Chilean Geophyte Monocotyledons gives rise to both concern and challenge: there are 34 cases of **Insufficiently Known** species, out of a total of 136 species discussed.

This is undoubtedly a difficult, but fascinating, plant group to study. It is a great challenge for the future to complete The data still needed, performing systematic collections for herbaria, in order to become further acquainted with the relationships existing between the taxa, their biology, ecology, conservation problems and, eventually, how to grow them and propagate them.

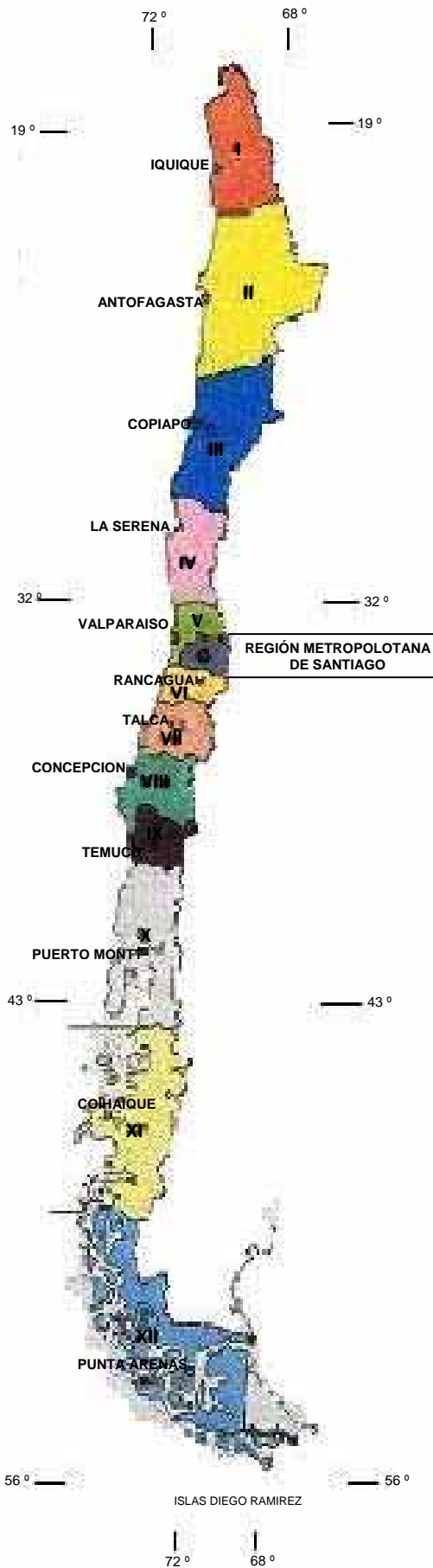
The chemical study of native plants has barely begun, and we still ignore which major compounds geophytes may contain. Only a few of the species mentioned are known to possess edible storage organs. such as in the case of "gnao" (*Conanthera spp.*) "liuto" (*Alstroemeria ligtu*) and *Tecophylaea cyanocrocus* bulbs.

These species have an obvious potential as ornamental plants. Many of them have been cultivated for decades in Europe and the United States, such as the different varieties of *Alstroemeria*, *Placea*, *Rhodophiala*, *Leucocoryne*, etc.

Lastly. I think of the beauty of *Zephyra elegans*, *Leontochir ovallei* *Pasithea caerulea*, *Conanthera spp.*, *Herbertia lahue*, *Calydorea xyphioides*, *Tigridia philippiana* and so many others as a wonderful genetic material for the flower beds of the future.

Acknowledgments

I wish to express my deepfelt gratitude to Dr. Alan Meerow (University of Florida) and to Mr. Carlos Alberto Castillo, of the Plant Life Society, for their comments on the manuscript.



Escala aprox. 1: 16 000 000

CHILE, SUS REGIONES Y CAPITALES

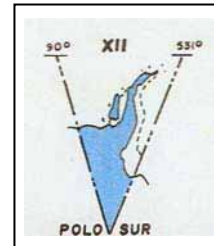
ISLAS ESPORADICAS



CHILE EN SUDAMERICA



TERRITORIO CHILENO ANTARTICO



ESCALA 1 : 90 000 000

AUTORIZADA SU CIRCULACIÓN EN CUANTO A LOS MAPAS Y CITAS QUE CONTIENE ESTA OBRA, REFERENTES O RELACIONADAS CON LOS LÍMITES INTERNACIONALES Y FRONTERAS DEL TERRITORIO NACIONAL, POR RESOLUCIÓN N° 125 DEL 13 MAY. 88 DE LA DIRECCIÓN NACIONAL DE FRONTERAS Y LÍMITES DEL ESTADO.

LA EDICIÓN Y CIRCULACIÓN DE MAPAS, CARTAS GEOGRÁFICAS U OTROS IMPRESOS Y DOCUMENTOS QUE SE REFIERAN O RELACIONEN CON LOS LÍMITES Y FRONTERAS DE CHILE, DE ACUERDO CON EL Art. 2°, LETRA g) DEL DFL N° 83 DE 1979 DEL MINISTERIO DE RELACIONES EXTERIORES.

This book was scanned and digitized, with the permission of the author, by **Mónica Matus Ardiles** in the Jardín Botánico Nacional de Viña del Mar, Chile.

In order to make this work it was necessary to carry out an adaptation of the following programs: ACDSee, Acrobat Distiller, Acrobat PDFMaker, Adobe Acrobat, Microsoft Office Word and OCR with the intention of presenting this book via Internet with the best quality and smallest file size, respecting faithfully the original text.

August, 2007.

