

## **ENVIRONMENTAL EDUCATION PROGRAM OF LAKE VILLARRICA**

### **Introduction**

In Chile, there are more than 300 lakes, all known for the beauty and transparency of their waters. Some of these lakes, like Lake Villarrica, are being subject to contamination, principally by the entrance of chemicals like nitrogen and phosphorus, deviates of the businesses of silviculture, cattle farms and agriculture. There also exists a series of related environmental problems associated with the recreational use of these lakes that has lead to the contamination of the beaches by rubbish and sound pollution caused by boating and other factors.

For Chile, the lakes represent a natural heritage of great importance due to their source of income from activities like fishing, tourism, fish farms and others. Lake Villarrica is one of the principal centers of tourism in this country and represents the main source of income for a great number of families in the communities of Curarrehue, Pucón and Villarrica. In the basin of Lake Villarrica live about 60,000 people, mostly located on or around the waters edge.

Most authorities agree that environmental education, both formal and informal, represents a central and critical factor for the short and long term protection of the lakes, because only through this education it becomes possible to create and promote values that allow the change of habits, practices and general conduct that have contributed to the degradation of the environmental quality of these precious lakes and their associated habitats.

It has been noted, that currently in Chile there does not exist any planning or environmental study programs in the grade school or high school levels that refer to the protection of the areas lakes, their associated ecosystems or their watersheds, as well as the benefits that can be derived from the protection of these resources.

Because of this current lack of an environmental curriculum for these grade levels, it has become of vital importance to develop a methodological program that incorporates the theme of the preservation of the lakes and their associated watersheds into the study plans and programs of all grade level students. To meet this need, it has become paramount to include such activities as environmental education into the areas educational programs in order to create a conscience that is sensitive to the growing environmental issues that they will face now and into the future.

## **II. DIAGNOSIS OF THE PROBLEM.**

### ***The Process of Pollution Lake Villarrica***

The Lake Villarrica belongs to the hydrographic basin of the Tolten River and has a total area of 2,920 square kilometers. This lake is of glacial origin and is located at 230 meters above sea level. It has a surface area of 175.9 kms<sup>2</sup>, a perimeter of 71,2 km and a maximum depth of 165 meters. There are currently three communities within the basin: Curarrehue, Pucón and Villarrica.

One of the principal problems in the area is the introduction of phosphorus into the lake(s) due to the deforestation of the valley, establishment of the cattle prairie and on a smaller scale, agriculture.

A study conducted by the Austral University of Valdivia in 1991, determined that the concentration of total phosphorus average at the time was 25.4 ug/l. Although in Chile, there still does not exist a formal system for the classification of lakes into types based on trophic status, with the preliminary plan being directed toward the environmental quality of continental waters. Using this system, Lake Villarrica would be given a value belonging to a mesotrophic lake since it is above 20 ug/l for total phosphorus. All of the antecedents that can be found indicate that Lake Villarrica, when the Spanish arrived was ultra-oligotrophic as its classification type.

Additionally, there exist other kinds of environmental problems which have a relation to the areas recreational activities such as beach contamination by rubbish, noise contamination by motorboats, water contamination by oils and gas products from the boats and illegal fishing, among others.

### ***The deficiencies in Environmental Education and development of an ecological conscience***

Formal and informal Environmental Education has been shown to be one of the keys to the protection of the natural resources in general and lakes in particular. Through this education, it is possible to change habits, conduct, attitudes and values that are not compatible with the quality of life that is acceptable for the normal development and maintenance of human life. Nevertheless, environmental education in Chile is just starting to grow due to the fact that in 1994, environmental education started to be a part of the *Agenda of the Government* when Chile passed Law 19.300 which addresses the Nation's need to address it's environment.

When reviewing the study plans and programs at the grade school levels, it has been noted that ecological and the environmental issues are almost nonexistent. Many important issues such as the areas lakes and their contamination is not mentioned.

It is important at this time to clarify that this situation exists only because the educational system does not have the information, experience or the economic resources to be able to incorporate the theme of the Lakes in their curricula. Within this context, it is important to clarify that the schools have the freedom to develop their own plans and programs within the window of the Basic Objectives and minimum content decreed by the Ministry of Education.

On the other hand, the population has not clearly been informed of the problems of Lake Villarrica or of any of the possible solutions that can be implemented to handle these problems. This is due to the fact that the both the areas municipal authorities and the communities programs do not have the knowledge nor the experience to generate actions that would motivate the community to protect the lake and its basin.

### **III. PROGRAM OBJECTIVES**

#### ***General Objective***

Strengthen the environmental education and awareness of the schools and citizens of Curarrehue, Villarrica, and Pucón to protect Lake Villarrica and its associated basin.

#### ***Specific Objectives***

- a) Develop a program to incorporate the teaching of ecological issues as they relate to the lakes in pilot schools in the communities of Curarrehue, Pucón, and Villarrica.
- b) Develop an application for an educational unit on the theme of the lakes for the grade schools in Curarrehue, Villarrica, and Pucón.
- c) Develop and implement a program of community awareness by the students of the schools.
- d) Strengthen community involvement in the area through a program of monitoring Lake Villarrica so that much needed information can be accumulated and assimilated to both private and public entities.

#### **IV. PROGRAM ACTIVITIES ASSOCIATED WITH THE SPECIFIC OBJECTIVES**

***a) Elaborate a program to incorporate the teaching of ecological issues as they relate to the lakes in pilot schools in the communities of Curarrehue, Pucón, and Villarrica.***

- Compile study plans and programs for both grade school and high school levels  
Analyze the plans and programs for the Basic Objectives and minimum content decreed by the Ministry of Education.
- Hold workshops with professors and experts in Limnology and related professionals to discuss the content and approach to incorporate the theme of water pollution into the educational program.
- Finalize the plan based on the input of the experts mentioned above
- Hold a workshop that facilitates discussion among teachers, professionals, parents and local ecology groups.
- Present and give the plan to the pilot schools
- Follow the application of the plan and elaborate on it as needed

***b) Development and application of an educational unit on the theme of the lakes for the grade schools in Curarrehue, Villarrica, and Pucón.***

- Create the content of proposed educational unit
- Discuss the plan with the areas teachers and related professionals
- Elaborate the educational unit (teacher's manual, student's text, posters, video or CD)
- Hold workshops to train the teachers
- Apply the educational unit (classroom and field trips)

***c) A program of Community awareness by the students***

- Create a program to sensitize the community

This program would have a radio program, ecology fairs, the passing out of flyers to the community, workshops and discussions where the members of the community may talk about the protection of Lake Villarrica

- Execute the program to sensitize the community

***d) Strengthening community involvement through a program of monitoring Lake Villarrica***

- Create a comprehensive community monitoring program for the lake

The Program of Community Monitoring will consist in the community by self-registering and training community members about the general qualities of the lake (pH, temperature, rain gauging, water levels, color identification, turbidity, etc.). In addition these registered volunteer monitors will take water samples that will be sent to the General Direction of Water (DGA) for its detailed analysis. All of the results collected through the program will be forwarded to the National Commission of the Environment (CONAMA) once a month for its analysis and discussion.

- Hold discussions among the Environmental Committees, Councils, local and regional authorities
- Design a water quality manual for the volunteers
- Train the volunteers
- Develop the program
- Give the regional and local authorities a report of the activity

## **V. EXPECTED RESULTS**

Putting this project into effect should give the following results:

- The incorporation of the theme of lake and water pollution in 20 grade schools.
- Development of an education unit on the lakes in 20 grade schools.
- Have 20 professors trained in teaching this material
- Have 400 students who have studied this unit
- The population of Curarrehue, Pucón and Villarrica will have been informed of the problems that affect Lake Villarrica and of possible solutions to these problems
- The Environmental Committees (councils) in Villarrica and Pucón will be strengthened and a new committee will have been created in Curarrehue.

## **VI. STAGES OF THE PROGRAM.**

The program has four stages which are described below:

First Stage:

- Rent an office, purchase equipment and furniture.
- Detailed preparation about planning of the Program in general

Second Stage:

- Meeting with seed schools (to visit 30 schools and choose 20)
- Informative meeting with local and regional Authorities
- Informative meeting with Environmental Committees (Councils)
- Press conference to introduce the Program.

Third Stage:

- To prepare and deliver a proposal which incorporates the theme of the preservation of the lakes into plans and programs of study to be implemented in selected schools.
- Development of Educational Unit.
- Training for the teachers targeted for the Program.

Fourth Stage:

- Carry out the continuation and the incorporation of materials directed toward the preservation of the lakes “theme” into the plans and programs of the area
- Development of the Educational Unit
- Elaboration and development of the Program to Sensitize the community
- Elaboration and development of a Program of Monitoring for the community
- Evaluation of the Environmental Education Program of Lake Villarrica
- Preparation of a workshop to be held for each community involved presenting the results of the program.
- Publication of the program and its results on the web of the National Commission of the Environment (CONAMA).

## VII. MEASURING THE EXPECTED RESULTS

- *The incorporation of the theme of lake and water pollution in 20 grade schools.*

**The results will be measured through the objectives and activities listed above with relation toward the preservation of the lakes theme into the plans and programs of study for each school.**

- ***Development of an education unit on the lakes in 20 grade schools.***

The results of the Program will be measured through a test of the students before the application of the program and after the completion of the program. These tests will be analyzed and evaluated by an external professional in this field.

- ***Have 20 professors trained in teaching this material***

This evaluation will be accomplished by applying a test to the professors before the performance of the program and another after the completion of the program. These tests will be analyzed and evaluated by an external professional in this field.

- ***Have 400 students who have studied this unit***

This result will be evaluated with a list of the students who participated in the different activities of the program.

- ***The population of Curarrehue, Pucón, and Villarrica will have been informed of the problems that affect Lake Villarrica and of possible solutions to these problems***

The results will be measured with a survey community opinion of the lake, the resource and the Program before and after the completion of the program.

- ***The Environmental Committees & Councils in Villarrica and Pucón will be strengthened and a new committee will have been created in Curarrehue.***

## **VIII. ORGANIZATIONS WHO WILL COORDINATE THE PROJECT.**

The National Commission of the Environment (CONAMA)  
 The General Water Direction of Araucanía Region (DGA)  
 The Maritime Government  
 The Regional Fishing Direction (SERNAPesca)  
 The Regional Secretary Ministerial of Education  
 The Environmental Committees & Councils of Villarrica and Pucón  
 The Tourism Board of Villarrica and Pucón  
 The Catholic University of Temuco

## IX.- CALENDAR OF ACTIVITIES

Stages	Activities	Month																
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	
<b>First Stage</b>	▪ Rent an office, purchase equipment and furnitures	X																
	▪ Detailed preparation about planification of the Program	X	X															
<b>Second Stage</b>	▪ Meeting with seed schools (will visit 30 schools and choose 20)		X	X														
	▪ informative meeting with local and regional Authorities		X															
	▪ informative Meeting with Environmental Committees (Councils)		X															
	▪ Press Conference for broadcast the Program		X															
<b>Third Stage</b>	▪ To prepare and deliver a proposal about incorporates the theme of preservation of lakes into plans and programas of study of selected school			X	X	X	X	X										
	▪ Elaboration of Educational Unit			X	X	X												
	▪ Capacitation for Teachers					X	X	X	X									
<b>Fourth Stage</b>	▪ To carry out the continuation to the incorporation of preservation of the lakes theme into plans and programs of study							X	X	X	X	X	X	X	X			
	▪ Development of Educational Unit					X	X	X	X	X	X	X	X	X	X			
	▪ Elaboration and development of a Programa to Sensitize the community					X	X	X	X	X	X	X	X	X	X			
	▪ Elaboration and development of a Program of Monitoring community				X	X	X	X	X	X	X	X	X	X	X			
	▪ Evaluation of the Environmental Education Program of Lake Villarrica																X	
	▪ Realization a workshop for each community and one's regional for giving to know the results of the program																X	
	▪ Publication of the program and its results in the web of the National Commission of the Environment (CONAMA)																X	X

## X.- BUDGET

ITEM	QUANTITY	Monthly Expenses (Pesos \$)	Total Expenses in 16 months (Pesos \$)	Total Item (Pesos \$)	Total Item (US \$)
<b>STAFF</b>					
Professional	1	\$ 800,000	\$ 2,800,000		
Technician	1	\$ 450,000	\$ 7,200,000		
Secretary	1	\$ 200,000	\$ 3,200,000		
Consultants	5		\$ 2,000,000		
				\$25,200,000	US\$ 48,743

<b>RUNNING EXPENSES</b>					
Telephone					
Electricity/drinking water					
Heating	16 months	\$ 50,000	\$ 800,000		
Rent an office	16 months	\$ 100,000	\$ 1,600,000		
Writing materials		\$ 15,000	\$ 240,000		
Car maintenance (oil, license, insurance, wheels, etc.)	16 months		\$ 1,500,000		
				\$ 4,140,000	US\$ 8,007

<b>EQUIPMENT</b>					
Car	1		\$ 5,000,000		
Motor Boat	1		\$ 3,908,000		
Life jacket	10		\$ 189,000		

<b>SAMPLE EQUIPMENT</b>				
Secchi Disc for determinate of the turbidity in natural courses of water,	1		\$ 49,088	
Kemmerer type water sampler	1		\$ 291,200	
Sampler of sediment	1		\$ 664,989	
Apstein type plankton collection net	1		\$ 115,361	
Polyester lines of 50 m,	3		\$ 64,896	
Messenger of stainless steel for Kemmerer water samplers	3		\$ 223,272	
Office Equipment Computer(Olidata W)	2		\$ 759,900	
Computer Table	2		\$ 110,000	
Desk and Chair	3		\$ 404,400	
Card filer	1		\$ 95,000	
Library	3		\$ 414,000	
Printer	1		\$ 68,000	
Fax	1		\$ 129,000	
				\$ 12,486,106 U\$ 24,151

<b>PUBLICATIONS/DIFFUSSION</b>				
Monitoring Program Manual	40		\$ 400,000	
1 Educative CD	20		\$ 2,000,000	
Posters	500		\$ 400,000	
Brochures	1,000		\$ 400,000	
Radial Program	24		\$ 991,000	
				\$ 4,191,000 U\$ 8,106

<b>CAPACITATIONS</b>				
Equipments			\$ 700,000	
Terrain visits	40		\$ 1,600,000	
Rent an office			\$ 900,000	
Incidental expenses			\$ 1,000,000	
				\$ 4,200,000 U\$ 8,123
				\$ 50,217,106 U\$ 97,131

**Nota: 1 US= \$ 517 (Equivalent to February 3th of 2000)**