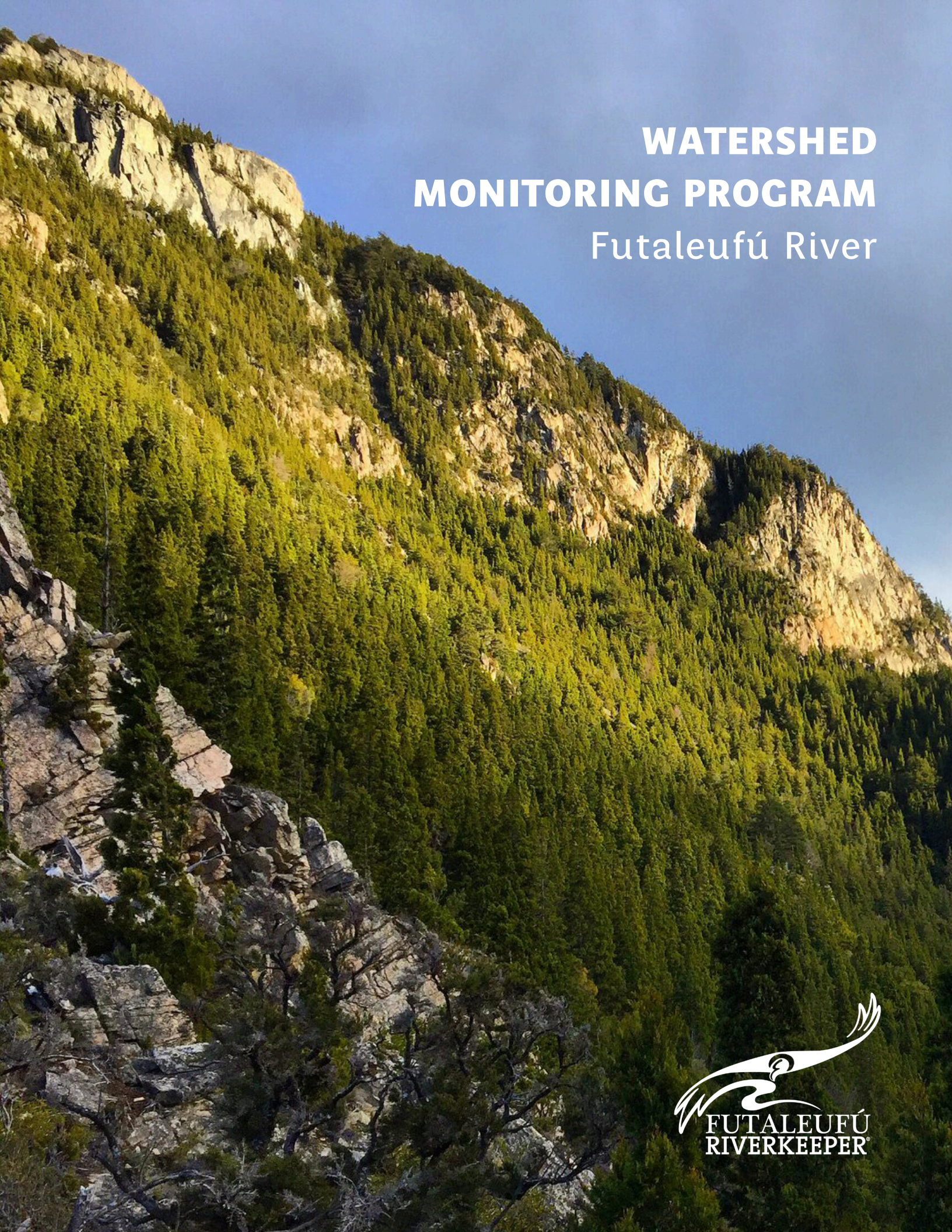


WATERSHED MONITORING PROGRAM

Futaleufú River

FUTALEUFÚ RIVERKEEPER®

INTRODUCCIÓN

A strong monitoring program is essential for any watershed facing threats that put its communities at risk. Whether those threats are dams, infrastructure, pollution or other forms of development, permanent harm to both the watershed and its people can occur. In pristine watersheds like the Futaleufu that are facing rapid development, the need to establish a water monitoring program is even more urgent. When in place, a water monitoring program establishes baseline water quality measurements and will for a first line of defense detecting and identifying emerging water quality issues.

To address this issue and at the urging of several community members and supporters, Futaleufu Riverkeeper is now embarking on an effort to raise the capital it needs to purchase equipment and launch a citizen-led Water Quality Monitoring Program in Patagonia. This program, combined with Riverkeeper's advocacy work, will protect the Futaleufu for generations to come.

WHAT IS MONITORING?

Monitoring consists of making observations and making measurements that are analyzed and reported to provide information and knowledge about the watershed. Monitoring can take many different forms. Finding the right way forward means understanding current risks to water quality, but also what future risks are likely to look like.

In our watershed, water monitoring is important for many things. These include:

· Environmental protection
· Assisting officials in deciding whether to grant or reject permits
· Managing the health of our waterways
· Identifying and documenting pollution events to be used in litigation
· Identifying further research needs; and community environmental education.

An active and engaged community that keeps its eyes and ears on the river can catch pollution and other threats to the river quickly and take effective actions to address the threats. Accurate information greatly improves advocacy work and enables rapid responses to any new threats to the Futaleufu and its main tributaries.

WHAT ABOUT EXISTING MONITORING?

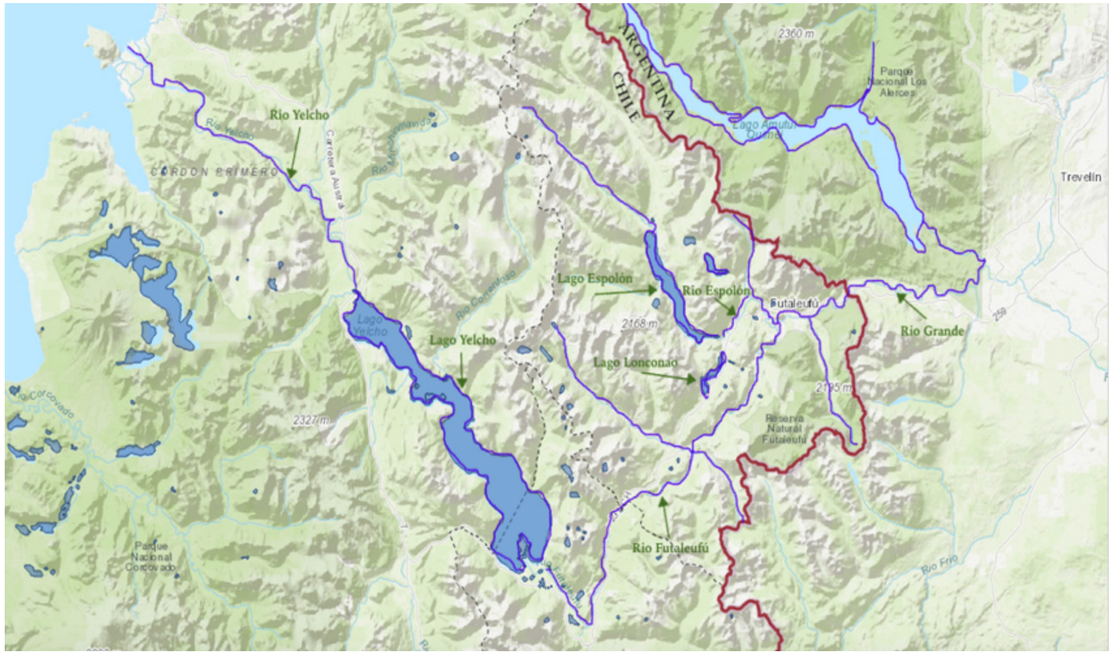
Currently, all monitoring carried out in the watershed is done by public institutions. This includes the DGA (the entity in charge of administering the water rights), which has stations that monitor water flow and water quality. The DGA has five monitoring stations in the province of Palena, and just two in the community of Futaleufú. While water flow is monitored daily, water quality is only measured three times per year. This is unacceptable in our watershed. Futaleufu has a rainy climate for much of the year, carrying runoff from roads and development projects into the river. Both the year-round population and the number of tourists who visit during peak season are also growing. This puts stresses on the town's waste management capabilities.

The DGA makes their data publicly available on the DGA website. However, the data display is not organized, is not consistent and lacks any form of analysis or interpretation. In other words, even if the DGA were collecting the right data, it is useless in helping to set policy or letting people know how the river is doing.

The only other public institution in Futaleufú that carries out watershed monitoring is CONAF (the National Forestry Corporation). CONAF monitors and reports mainly on forests and vegetation. These reports occasionally include basic information on waterbodies including rivers. But it usually just a registry of bodies of water and it does not monitor the water quality or changes over time on a consistent basis.

We believe Futaleufú deserves a more consistent Water Monitoring Program (WMP). This will seek to answer questions about how we maintain the pristine quality of our watershed and how we react to the rapid changes in the watershed. A strong, reliable WMP will help us achieve three main goals:

· make better decisions about how to best enact conservation efforts
· engage our community so they play an active role in stewardship, and
· protect the watershed and community for future generations.



Proposed Monitoring Area: Binational Yelcho Watershed, Chilean-Argentinian Patagonia. Main Rivers and Lakes in the Chilean side of the watershed are: Futaleufú River, Espolón River, Chico River, Azul River, Espolón Lake, Lonconao Lake, Yelcho Lake, Yelcho River.

BRIEF
DESCRIPTION OF ISSUES AFFECTING THE WATERSHED

Local communities in the watershed are facing several major environmental problems. The town's water treatment plant is over capacity and is polluting the Espolon River. Gravel extraction upstream from the treatment plant is ripping up the riverbanks and putting heavy machinery into the pristine waters of the Espolón. Salmon farming in Yelcho Lake is a constant threat, even though we were successful in organizing and fighting off the first proposal this year. Fragmentation of the territory due to a lack of zoning regulations is resulting in urban sprawl and putting additional stress on infrastructure, including waste collection and water treatment. A new road is being opened up from the village of El Espolón to El Amarillo, at the southern entrance to Pumalin National Park. Informal reports indicate the purpose of the road is to introduce mining into the Upper Espolón. There is also a lack of territorial planning and environmental research, pollution of lakes and wetlands, a rapid increase of the number of tourists visiting the area (which is pressuring ecosystem integrity), among others.

Below is a brief detail of the three most pressing situations that impact these fragile ecosystems and make a strong Water Monitoring Program essential to protect the Futaleufú watershed.

Contamination of Espolón River

The privately-owned water treatment plant has been polluting the Espolón River since, at least, 2015. Riverkeeper and our local partners have filed several complaints about how the company is not treating the wastewater and dumping it into the river. The last complaint resulted in regulatory fines levied against the company by SISS, the government entity in charge of supervising the plant. But despite the complaints and fines, the water treatment plant continues to pollute the river. According to the CEO of the water treatment plant, the current size of the plant cannot sustain the amount of water that enters the system. This is primarily due to:

· Exponential growth of the population in Futaleufú, especially after the eruption of the Chaitén Volcano and construction of over 300 new houses in town.
· Increasing flow of tourists that visit Futaleufú every year (which overloads capacity at the plant), and
· Drainage of rainwater into the sewage system which collapses the treatment plant.

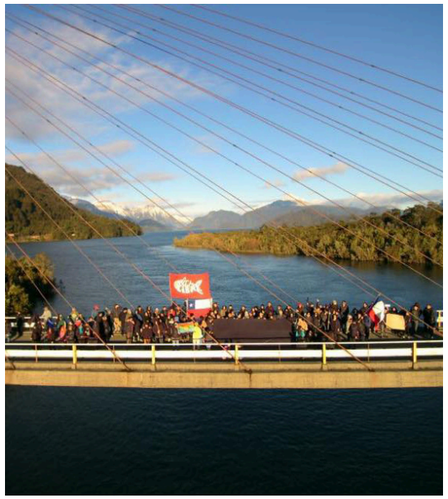
Gravel extraction in the Espolón River

Gravel extraction from the river has been going on for many years in Futaleufú. There have been 3 requests for gravel extraction in the last 5 years, for an approximate amount of 12,200 m3. As a result, we have witnessed significant impacts on the course of the river, water levels, the spread of invasive algae known as didymo, and negative visual impact on the shore. Currently, the Ministry of Public Works through the CMT (Army Corps of Engineers) is requesting that an additional 35,000 m3 be extracted to start building a road. We are requesting more studies on the effects of gravel extraction from the river, in order to ensure the life of the river and stop the damage that such extraction is causing to the whole ecosystem.

Salmon industry in Yelcho Lake

Marine Harvest, an international fishing company, has held a maritime concession for the installation of salmon cages in Yelcho Lake since 1991. In 2007, an agreement was reached between local residents and the company, pursuant to which the company voluntarily withdrew from intensive fish farming in the lake.

However, in May 2018, the community learned that Marine Harvest had leased its concession to another company called Caleta Bay. This company had the intention of installing 34 cages (20 x 20 meters in size) in which it was expected to deposit 4 million salmon.

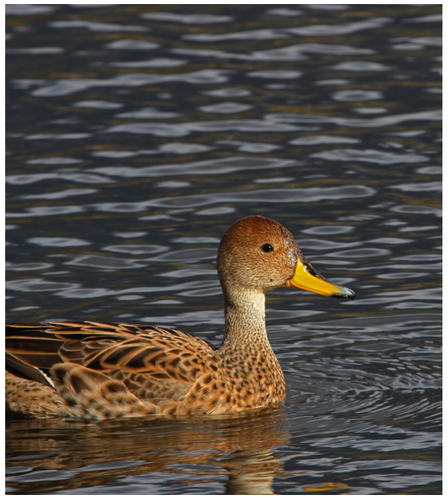


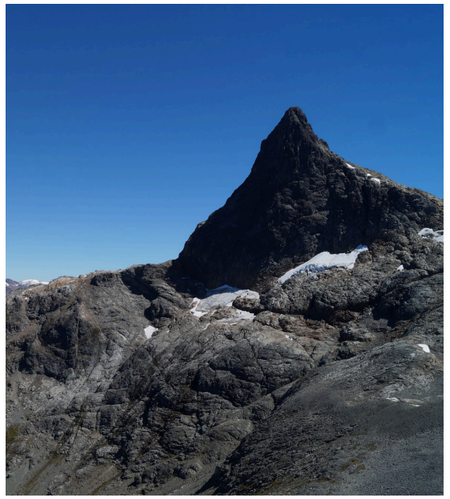
Salmon farming generates intolerable amounts of organic matter for any aquatic system. For each kilogram of food that is supplied to the salmon, 700 grams of organic matter are generated as waste, contaminating the lake bottoms and affecting the aquatic life. This generates organic nutrients, which decreases oxygen (eutrophication) resulting in the flourishing of toxic algae. It has been proven that, in the area surrounding the cages, marine life is severely degraded, creating dead zones.

Thanks to community mobilization and the involvement of several organizations and local and regional authorities, Caleta Bay's efforts in installing salmon cages have been halted for the time being, but the issue of concessions for the salmon farms in Yelcho Lake has not yet been resolved.

OBJECTIVE OF THE MONITORING PROGRAM

Conserve the quality of the surface waters of the Yelcho watershed and the Futaleufú sub-watershed, so that the waters are suitable for human and animal consumption, sustaining aquatic life, irrigation, recreation, aesthetics and the integrity of the entire ecosystem.





DESCRIPTION

The monitoring program will monitor:
1.- Physical aspects of the watershed: water quality, flow, riverbed changes, bio-indicators.
2.- Legal status of the water: water rights and water use.

The Monitoring Program will monitor five variables

1

Monitoring water quality (physical, chemical and biological aspects) according to Chile´s National Standard NCH409. a) Using a water quality meter, collecting and analyzing basic data locally, and b) Sending a sample to a Lab in Puerto Montt, twice per year for a more detailed water analysis, including the presence of metals.

2

Water Flow in different seasons of the year, using a flowmeter.

3

Bio-indicators. This includes conducting bird census in wetland areas. The presence of birds is closely related to the condition of their habitats and many species are especially sensitive to disturbance, which makes them an indicator of alteration or changes in the ecosystem.

4

Historical changes in the riverbed through comparing photos with the SIG (Geographical Information System). Using a drone with special cameras to monitor the watershed by year, seasons and flow. The images obtained from the drone can be divided into layers to show different types of information/variables.

5

Minimum ecological flow. This is related to the monitoring and mapping of water rights.

Periodicity

Monitoring on a monthly basis so that after two years the data collected will allow us to compare it per seasons of the year.

Methodology

The monitoring program involves the participation of different actors at different levels for a more comprehensive picture of the watershed. This means that the data will be provided by trained people and in compliance with the Chilean National Standards and from citizens participating in the Community Monitor Program. The methodology for each variable is the following:

- For Water Quality: Sampling of water for lab analysis and Community monitoring program.
- For Water Flow: Community monitoring program and measurement of water flow.
- For bio-indicators: Bird Census conducted by citizens participating in the Community monitoring program (including working with local schools).
- For historical changes in the riverbed: Photo monitoring for visible issues affecting the watershed using a drone and layers of information obtained from the pictures.
- For Legal status of the water: Geographer will work on geographical references, research and updates of water rights and water use changes over time.
- For Minimal Ecological Flow: Data analysis by Water Monitoring Manager obtained from water flow monitoring (related to legal status of water).

The monitoring process schedule will be organized according to each specific monitoring point and river, due to specific environmental issues that require monitoring.

Training of samplers

This includes use of standard operating procedures base on national standards, use of accredited labs, use of quality assurance and quality control protocols, employing proper data management techniques.

Display of the information collected

The database will be display for public access on the Futaleufu Riverkeeper website.

The whole process of monitoring will result in a document launch per year, that compiles all the monitoring information and analysis, including, without limitation, a digital document to be published on our web page and printed material for local dissemination in the public library and for our own, as well as other locations we can find that agree to display/disseminate such materials.

Data collection points

Place	*Monitoring Schedule*	*Distance from town*
Futaleufú River, El Limite area	Once per month	10 km /6,2 mi
Futaleufú River, Las Escalas area	Once per month	12 km /7,4 mi
Futaleufú River, Puerto Ramírez	Once per month	67 km /41,6 mi
Rio Chico, up and down river	Once per season (Quarterly)	10 km/ 6,2 mi
Espolón River North	Once per season (Quarterly)	15 km / 9,3 mi
Espolón Lake	Once per month	8 km / 4,9 mi
Espolón River SouthEast, lake drain	Once per month	8 km / 4,9 mi
Espolón River SouthEast and Futaleufú river junction	Once per month	3 km / 1,8 mi
Espolón River before and after Water Treatment Plant drain	Once per month and specially after significant rain events and dry seasons	1 km / 0,6 mi
Azul River, up and down river	Once per season	20 km / 12,4 mi
Laguna Espejo	Once per month	1 km / 0,6 mi
Lonconao Lake	Once per month	13 km / 8 mi
Yelcho Lake. Northwest area of the lake	Once per month	107 km / 66,4 mi
Yelcho River	Once per month	140 km / 86,9 mi

Data Management:
Sampling and analysis plan (SAP)
Timeline:

Place	*Monitoring Schedule*											
	1	2	3	4	5	6	7	8	9	10	11	12
Water Monitoring Program Design/Budget	●											
Equipment and supplies purchase		●	●									
Recruiting of samplers		●										
Training of samplers			●									
Sampling				●	●	●	●	●	●	●	●	●
Analysis of data												●
Report of data												●
Posting the data for public access				●	●	●	●	●	●	●	●	●
Systematize the data collected into annual/seasonal reports				●				●				●

Budget:
Below is the detail for a one-year budget of monitoring program. In order to achieve our goals, we need to run the program for at least 3 years (for descriptive and comparative analysis), which requires a total budget of 60K USD.

ITEM	*USD*	*CHL*
Water Monitoring Program Manager/Coordinator	8,784	6.000.000
Training of samplers/funds to bring to Futaleufú a professional trainer (6 days)	438	300.000
Equipment and supplies (water quality meter, lab expenses, flowmeter, drone, software)	5,124	3.500.000
Transportation to the monitoring coordinates (180 km/112 miles per month)	146	100.000
Annual water quality report and a detailed database of measurements available online	470	320.000
Geographer for geographical references, research and updates of water rights and water use changes (once per year)	585	400.000
Professional to analyse and report the bird census	470	320.000
Designer for Analysis Report Graphics/hours	219	150.000
Print Material (maps, high quality pictures, reports)	731	500.000
Project contingency costs @ 20% (rolled into future year operating expense if not required)	2,500	2.100.000
TOTAL	20,043	13.690.000

[683 Chilean Pesos per 1 US Dollar]

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