“TOPOGRAPHIC and TOURISTIC CARTOGRAPHY of NATIONAL PARKS and RESERVES”

INSTITUTO GEOGRÁFICO NACIONAL
REPÚBLICA ARGENTINA

9th ICA Mountain Cartography Workshop, 22-26 April 2014
Hi Banff Alpine Centre, Banff National Park, Alberta - CANADA

RESUME

• THIS PRESENTATION WILL SHOW YOU THE METHODOLOGY THAT INSTITUTO GEOGRÁFICO NACIONAL (IGN) IS BEGINNING TO EMPLOY THIS YEAR FOR THE PRODUCTION OF TOPOGRAHIC AND TOURISTIC MAPS OF NATIONAL PARKS AND RESERVES.

• THE MAP WAS POSSIBLE THANKS TO THE PARTICIPATION OF THE NATIONAL PARKS ADMINISTRATION (APN). THEY ADDED GEOGRAPHICAL INFORMATION REGARDING TOURISTIC ACTIVITIES AND SOME NICE PICTURES

• THE BACK OF THE MAP HAS A LANDSAT 8 SATELLITE IMAGE AND SOME INFORMATION PROVIDED BY THE APN

• THE RESULT IS A PROTOTYPE OF A TOPOGRAPHIC AND TOURISTIC MAP OF “LOS ALERCES NATIONAL PARK AND RESERVE” AT 1:100,000 SCALE

OBJECTIVES

- **To develop the methodology** for the production of the topographic and touristic official maps of all national parks and reserves located in mountain regions

- **To design these maps with the participation of the National Parks Administration**, who will provide us with different information about touristic activities in different formats included in both sides of the map.

- **To make** the map in an **appropriate size**, easy for transportation and printed in **water-proof folding paper**

- **To offer tourists updated information** to easily find their way through the park

NATIONAL PARKS ADMINISTRATION

- IS THE NATIONAL ORGANISM RESPONSIBLE FOR THE PROTECTION OF THE NATURAL AREAS THAT ARE UNDER ITS CONTROL

- IT IS RESPONSIBLE FOR 34 PROTECTED AREAS, 20 OF THEM LOCATED IN MOUNTAIN REGIONS

- THE SMALLEST HAS AN AREA OF 10 HECTARES AND THE BIGGEST HAS AN AREA OF 727,000 HECTARES

CHOSEN PARK

"*LOS ALERCES NATIONAL PARK AND RESERVE*"
AS OUR FIRST PROTOTYPE

REASONS:

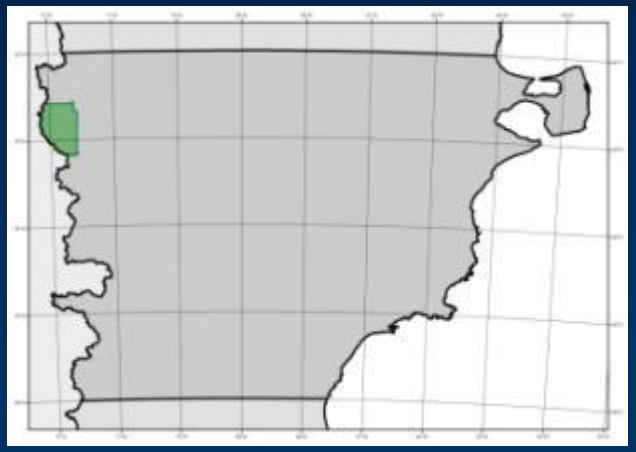
• IT IS ONE OF THE MOST BEAUTIFUL PARKS VISITED BY TOURISTS FROM MANY COUNTRIES

• THIS PARK WAS REPRESENTED FOR LAST TIME IN 1977 BY THE IGM. WE UNDERSTAND IT IS INMEDIATELLY NECESARY TO GENERATE A NEW UPDATED AND BETTER QUALITY VERSION

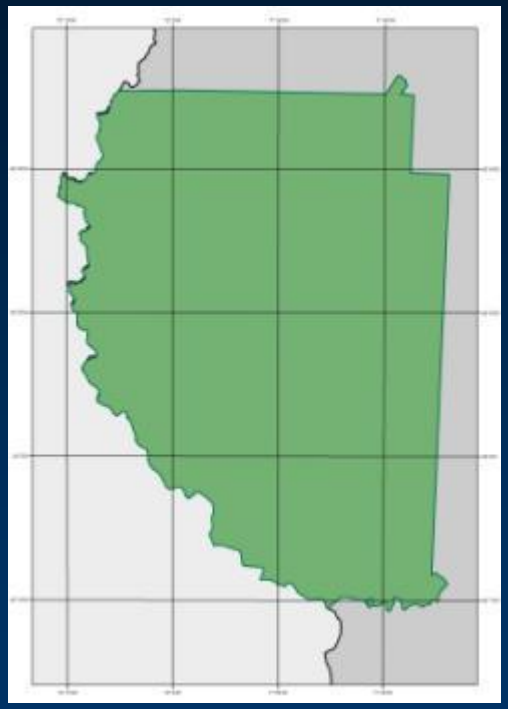
• THERE ARE OLD CARTOGRAPHY AVAILABLE

LOCATION

Chubut in Argentina



The Park in Chubut



Los Alerces NP

THE PARK IS LOCATED IN THE: **PATAGONIA REGION**
CHUBUT PROVINCE (at the NW)

36’ 57” in West-East direction
37’ 20” in North-South direction

PARK HISTORY AND SOME DETAILS

IT WAS CREATED ON MAY 11, 1937

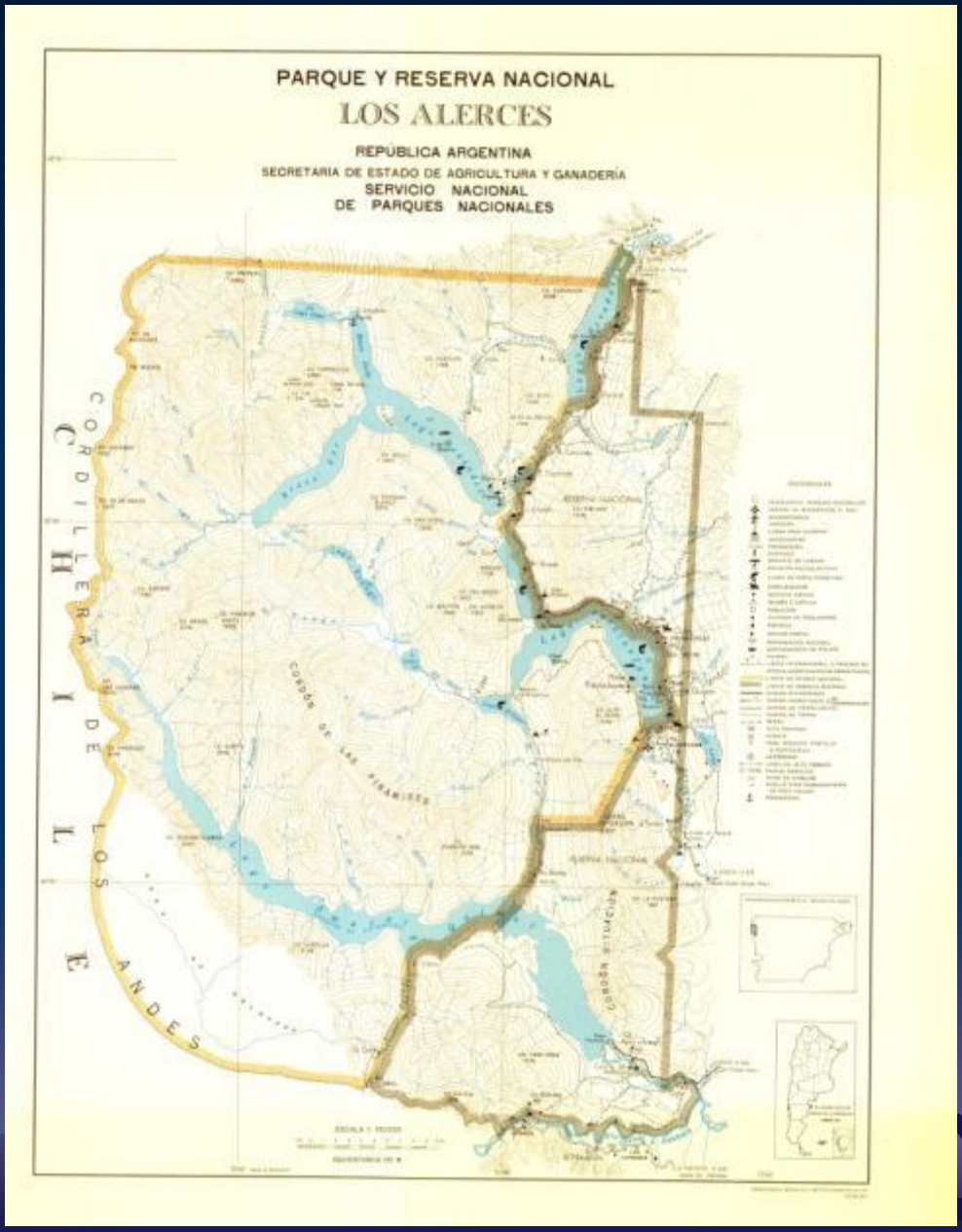
IT COVERS AN AREA OF 263.000 HAS.

IT IS THE FOURTH IN SIZE COMPARED TO THE OTHER PARKS

THE MAIN OBJECTIVE IS TO SPECIALLY PROTECT THE ANCIENT LARCH SPECIMEN OF THE NATURA ANDINIAN PATAGONIA

IN ITS LANDSCAPES THERE ARE SOME VIRGIN FORESTS, LAKES, FALLS, RIVERS, MOUNTAIN CHAINS AND HIGH MOUNTAIN GLACIERS

PREVIOUS CARTOGRAPHY I



SPECIAL FORMAT:

A map of the park's area
Made by the IGM:

PARQUE Y RESERVA NACIONAL LOS ALERCES

- **Edition year: 1977**
- **Scale: 1:150.000**
- **Contour interval: 150 meters**

- **It has a group of touristic cartographic signs specially designed for this map**

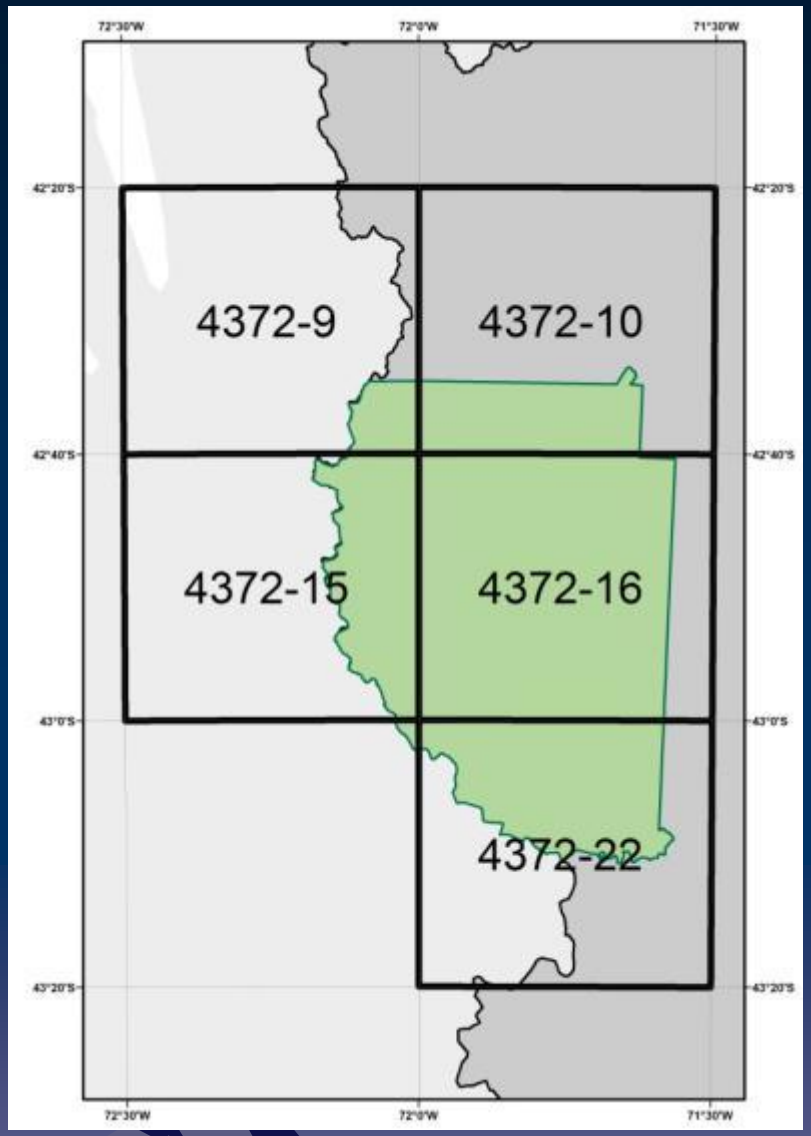
PREVIOUS CARTOGRAPHY II

STANDARD CARTOGRAPHY
Longitude: 30', Latitude: 20'

5 maps at 1:100.000 scale
Made by the IGM:

4372-9, Cerro Chato, 1981
4372-10, Lago Rivadavia, 1981
4372-15, Paso Navarro, 1981
4372-16, Villa Futalaufquen, 1981
4372-22, Complejo Hidroeléctrico Futaleufú, 1982

Contour interval: 50 y 100 meters



PREVIOUS CARTOGRAPHY III

INTERNATIONAL BOUNDARY CARTOGRAPHY

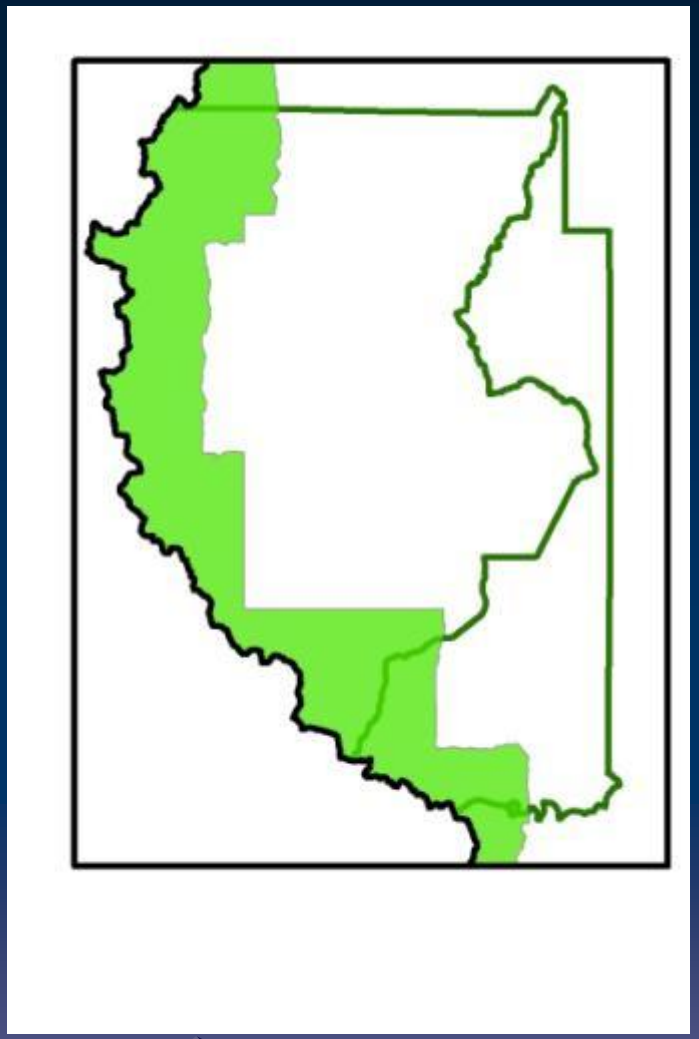
6 topographic maps at 1:50.000 scale
Made by:
International Boundaries National Commission
CONALI
Edition Year: 1995

This is not public information
Only a few National Organisms can use it
IGN had to respect the boundary line that this Commission defined

Section VII-10
Section VII-9
Section VII-8
SectionVII-7
Section VII-6
Sección VII-5

Contour interval

50 meters



SCALE DEFINITION

THE PARK SIZE

Measures of the park are:

Longitude direction: 50 km

Latitude direction: 69 km

The park area at 1:100.000 scale:

Width: 50 cm

High: 69 cm

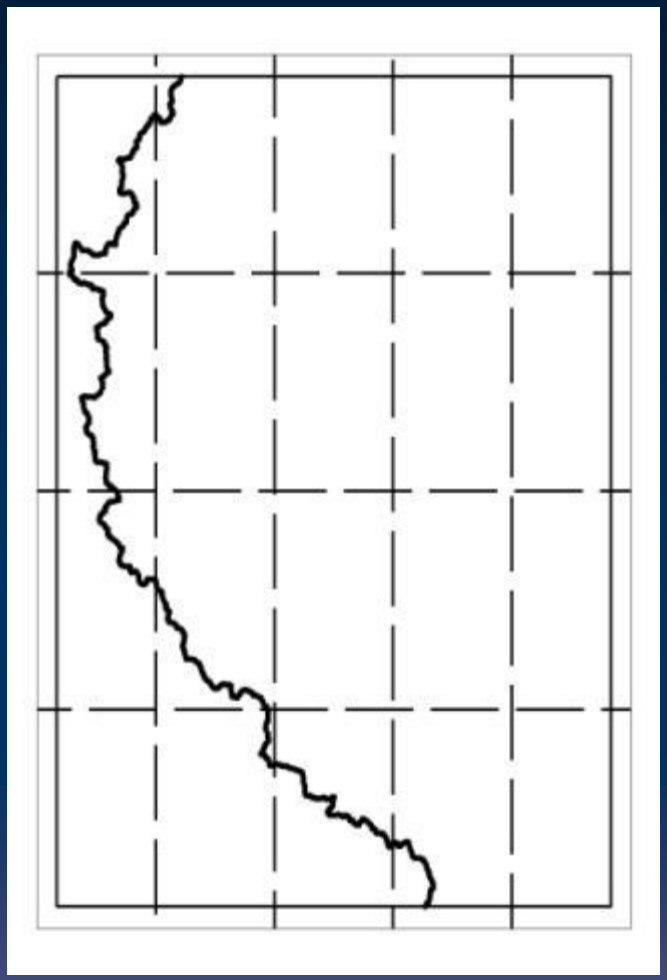
Plus the small border:

Width: 56 cm

High: 76 cm

The map size: 60 x 80 cm

Folded map size: 12 x 20 cm



INFORMATION USED FROM NEW TECHNOLOGIES

DIGITAL ELEVATION MODEL:
Argentine DEM of 45 meters pixel size

SATELLITE IMAGE:
LandSat 8, merged between:

- Multispectral, 30 meters (Feb 19, 2014)
- Panchromatic, 15 meters

GIS APN:
Different shapes regarding touristic information and forest areas

DEFINITION OF REFERENCE AND PROJECTION SYSTEMS TO USE

PROJECTION SYSTEM:

Gauss Kruger, 1st strip

Transversal Mercator, Meridian tangency: 72 º W

REFERENCE SYSTEM:

POSGAR 07 (Argentine Geodetic Positioning, 2007)

ELIPSOID:

WGS 84

ALTIMETRIC DATUM:

Referred to the medium see level as hypsometric horizon, adopted in 1924 for the tide instrument located in Mar del Plata City

PREVIOUS CARTOGRAPHY

GEO–REFERENCIATION (HOMOGENIZATION)

Transformation of Different Projection and Reference Systems

MAP OF THE PARK (made by the IGM in 1977)

Unknown data

Referenced by similar terrain details

STANDARD CARTOGRAPHY AT 1:100.000 SCALE (made in 1981/2)

These have been made in the same parameters that we chose for the new map

BOUNDARY CARTOGRAPHY (made by CONALI IN 1995)

For this case, the 6 maps are en two different reference systems

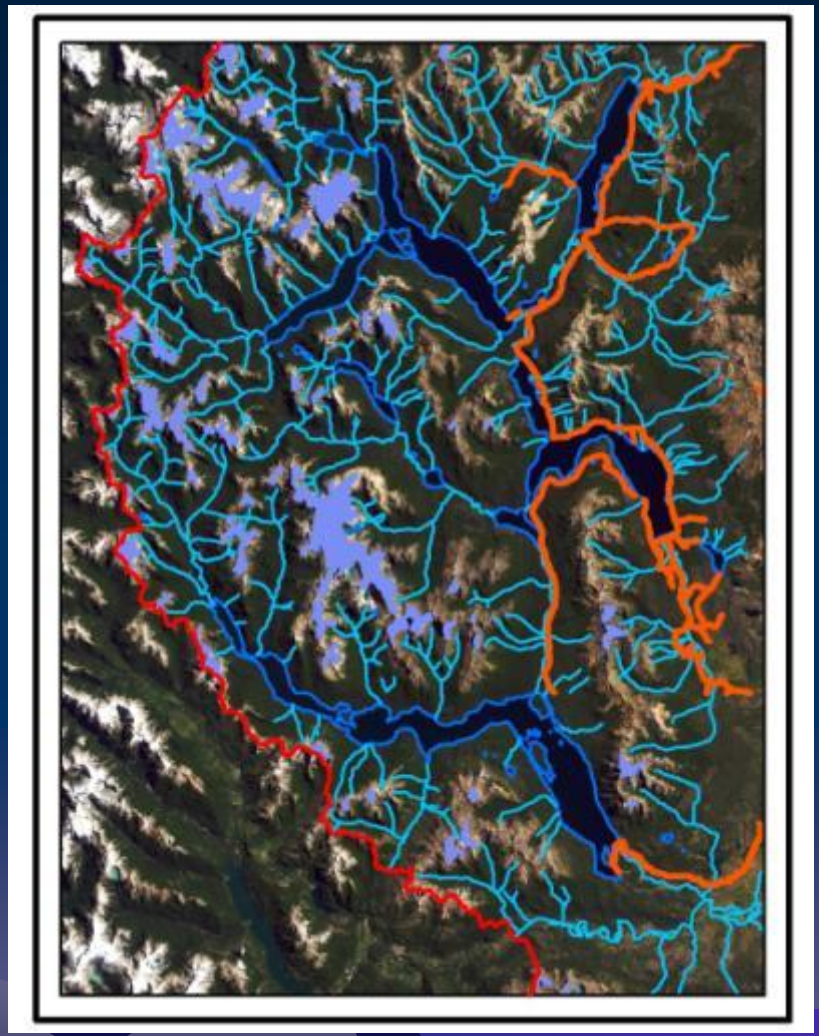
The parallel of 43° is that separated both systems

With the known parameters it was possible to adjust these maps in the selected system

SATTELITE IMAGES

THE SATTELITE IMAGES WERE USED FOR THE CAPTURE OF:

Lakes
Rivers
Streams
Roads
Snow Areas



FOR MORE DETAILS:

We also used the Imagery package provided by ESRI Company through ArcGis 10 software for the capture of more details when it was necessary:

The Buildings' Position
Some Parts of Thin Trails into the Forest
The Secondary Streets in Little Villages
And a Few More Things.

DIGITAL ELEVATION MODEL

ORIGINAL DATA:
The original DEM is from the SRTM (Shuttle Radar Topography Mission) with 30 meters cell size.

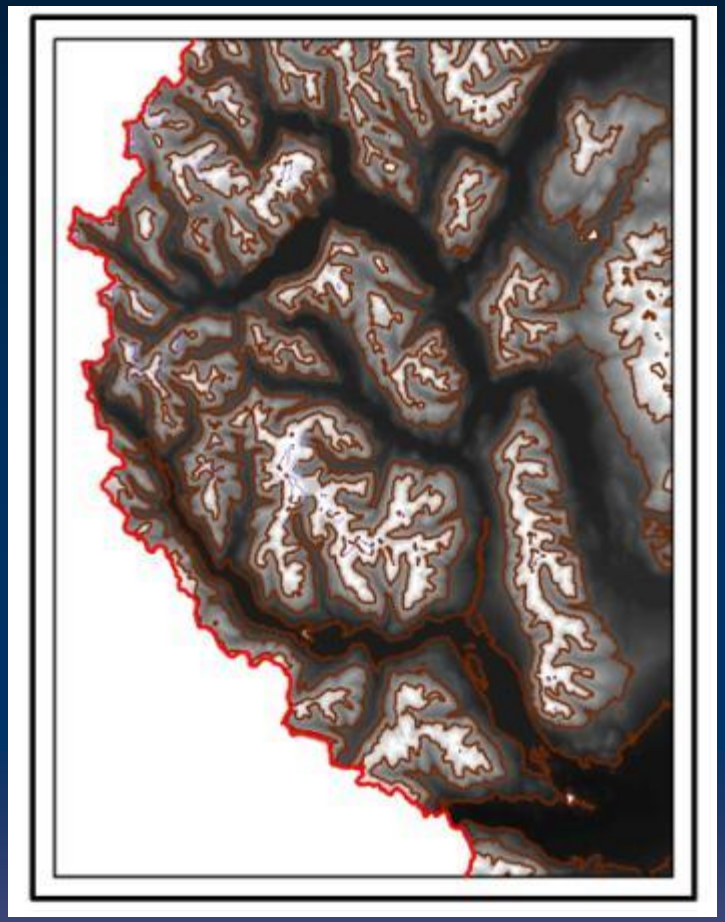
FROM THAT THE IGN CREATED OTHER DEM:
Resolution: 45 meters

DEM SUB - PRODUCTS:

- CONTOUR LINES
- SHADOW RELIEF MODEL
- FOREST AND SNOW AREAS (*)

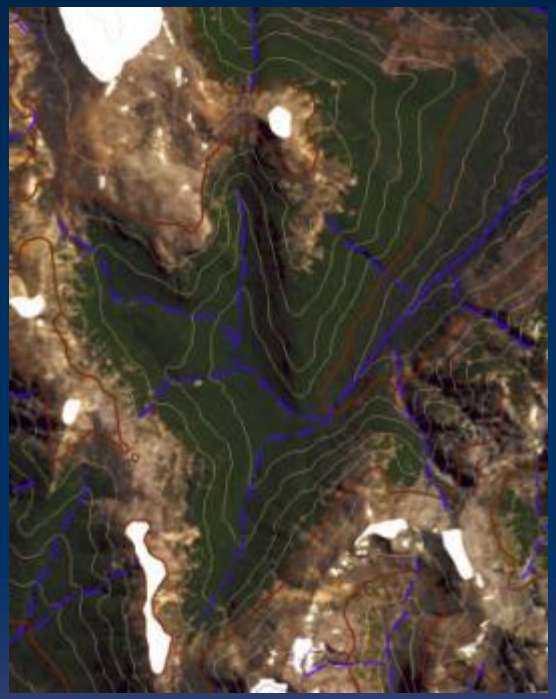
(*) With polygons previously vectorized from the satellite image

The contour lines generated from this model has a contour interval of 100 meters



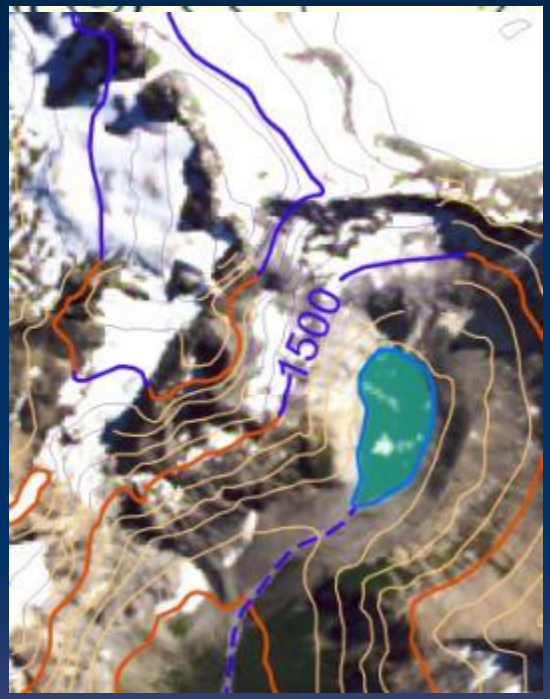
COMPARISON:
Contour lines with the satellite image

In general: good results



A few mistakes specially in:

big slopes



flat areas

All mistakes were corrected by handly vectorization from the old cartography

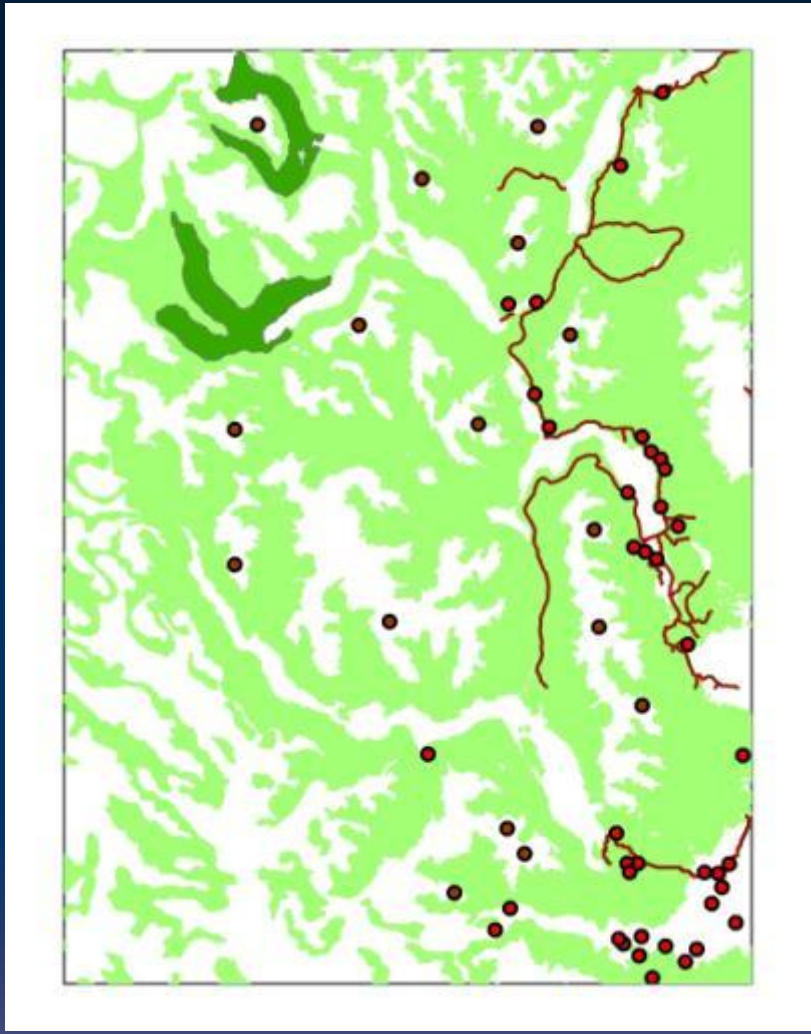
GIS APN

The most important geographical elements that we represented in this map have to do with touristic information

All this data was provided by the APN

Examples:

Park ranger offices
Geographical names
Trails into the forests
Forest areas
Names of farms



PLACEMENT OF GEOGRAPHICAL NAMES

The criteria was to place all geographical names the way they were in our old cartography.

Except when they don’t coincide with the information from APN.

In these cases we respect their information

SOME CHANGES:

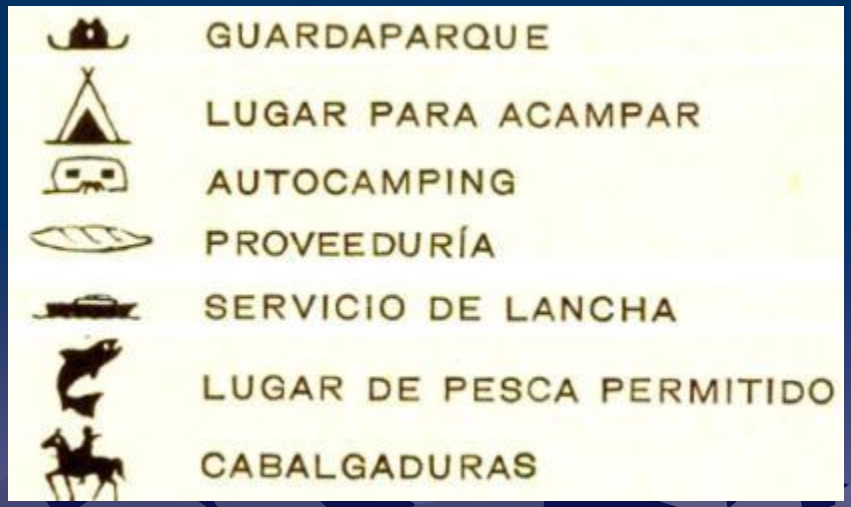
Regarding the names of the peaks and their height, in this opportunity these sizes were incremented so the users could read them better than in our official cartography

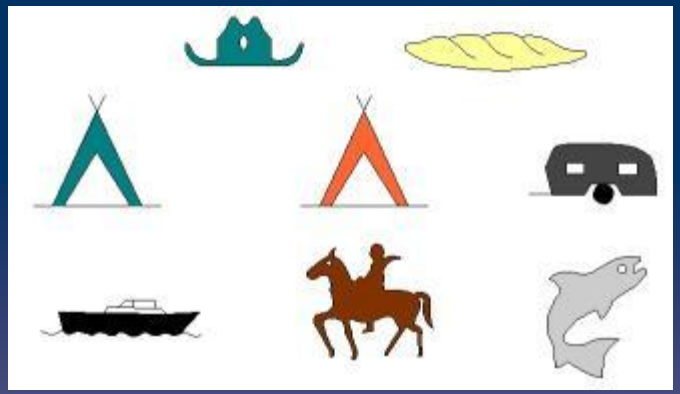
CARTOGRAPHY SIGNS

In general, most of the cartography signs are the same as our orthodoxies signs for the rest of the cartography

Regarding touristic signs, we took the design of the special format map of Los Alerces National Park and Reserve made in 1977. This signs were printed only in black.

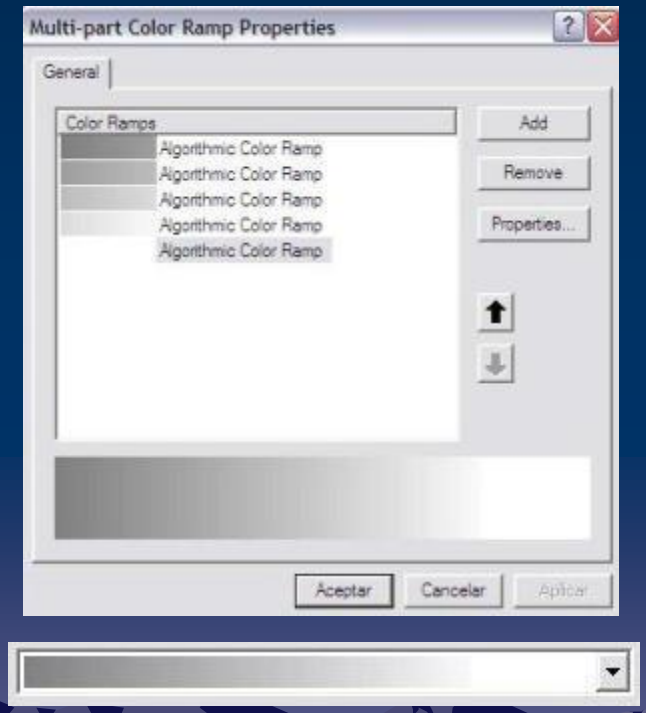
After vectorize it, we took other aesthetic signs and filled them with different colors

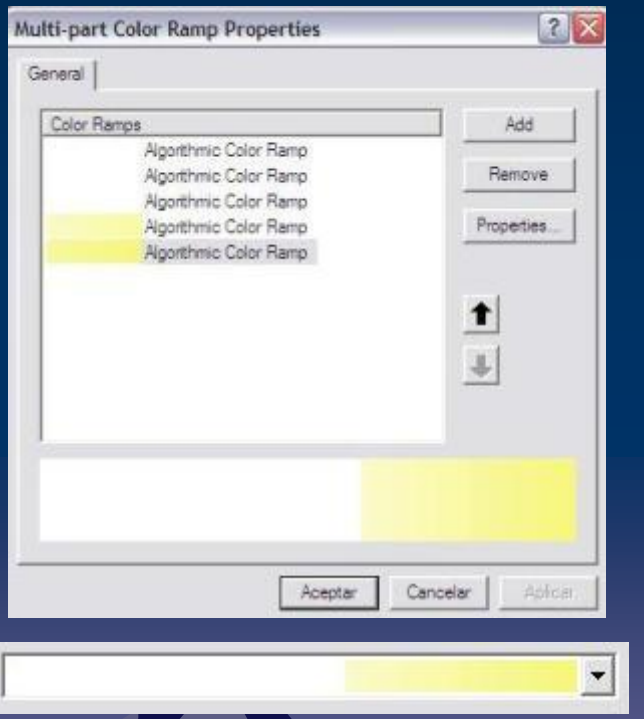




SHADOW

The DEM was processed to generate the hill shading
Parallel to this we created 2 new color ramps in ArcMap
One of them for the shadow and the other for the ilumination
These ramps are algorithmic ramps
They are divided in 5 sectors
Some of them are in white colour





GREY RAMP COLOUR

The grey ramp colour represents the shadow:

The dark grey colour (medium grey: 50% black) starts on the left.

Along the four first sectors, it turns into white. The last sector (fifth) is completely white

After that, we applied a 10% contrast and 40% of transparency

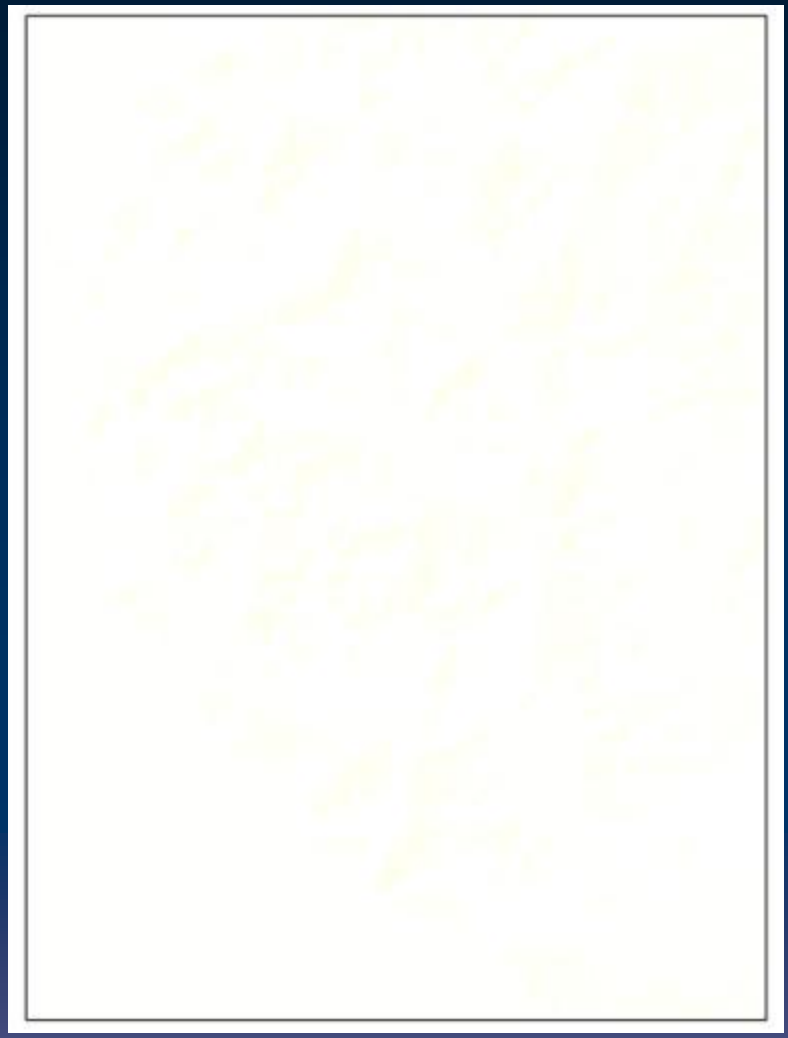
YELLOW RAMP COLOUR

The yellow ramp colour represents the illumination:

The ramp begins (from left to right) with three sectors in white color

Then, along the last two sectors, it starts in white and in lineal form and it is converted into a medium yellow color

After that, we applied 50 % contrast and 88 % of transparency



GREY RAMP COLOUR II

Above the last two layers, we added another one, also in grey color, but with different values of contrast and Transparency

The objective with this is to highlight the darkest areas in a small touch of dark grey

The contrast applied is 30 % and its transparency is 80 %

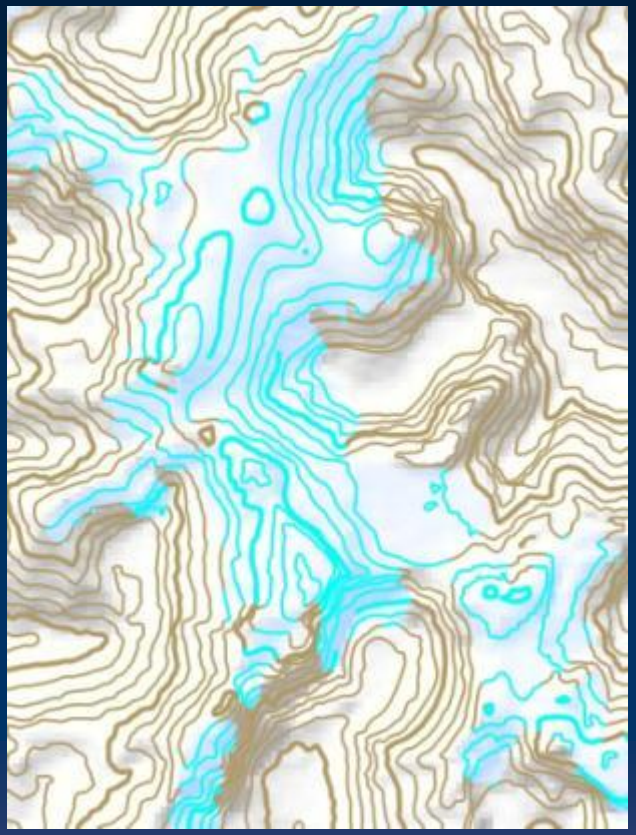
SNOW AREAS

A new raster image was generated from the shadow model for the cartographic representation of the snow areas

Then it was processed, we applied another custom light blue ramp colour

And finally a contrast of 15 % and a transparency of 70 %

It is necessary to place a mask in white color below this



FOREST AREAS

These areas were represented the same way as the snow areas but in green colour
For the case of forest areas we took a determination:
There are five representative kinds of different forests
We decided to highlight the most representative of them all: larches areas

After that, we selected two tones of green, one of them for the larches and the other, in a clear green, for the rest of the forest

The forest areas ramp colour is composed in lineal form
It starts on the left with a very light blue and finishes in a dark green color
Start: Cyan 14 %, magenta 4 % and yellow 9 %
Finish: Cyan 87 %, magenta 40 % and yellow 87 %

The Larches areas ramp colour is composite in lineal form
It starts on the left with a medium green and it finishes in white colour
The darker green: cyan 87 %, magenta 60 % and yellow 80 %

FOREST AREAS

Forest areas

Larches areas

PROCESSING IN PHOTOSHOP

To finish the raster file, it is necessary to applied some filters in a design software

In Photoshop we have to apply two kinds of filters:

1. Surface blur

    Ratio: 2
    Umbral: 10

1. Gaussian blur

    Ratio: 0.5

MARGINALIA INFORMATION

As the Chilean territory wasn't represented, there is an area out of the map, where users can find all complementary information to be able to understand all aspects of the map. It includes:

- Tittle of the map (name of the park)
- What kind of map it is
- The logos of the participant organisms
- Geographical situation of the park
- References about cartographic signs
- Abbreviations
- Initials
- Data used
- Date of edition

Out of the work area, there are coordinate values, main contour lines values and the places names where the routes conduct out of the map

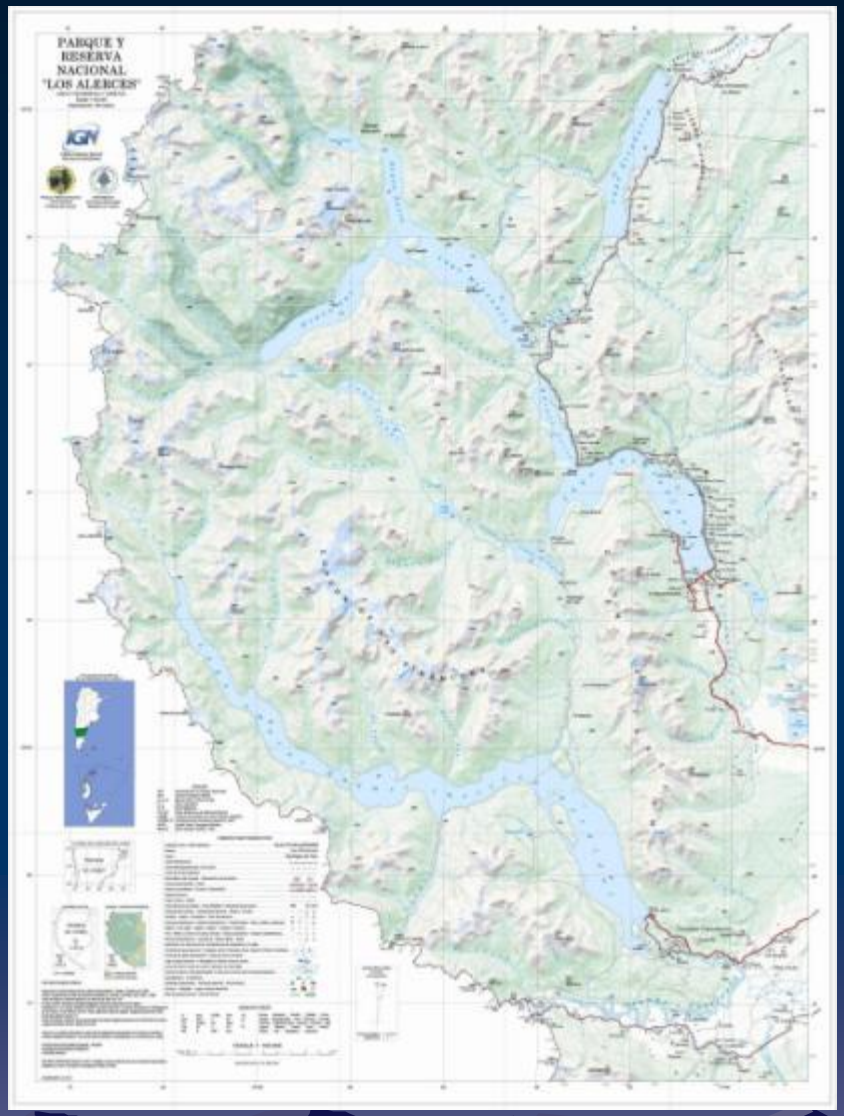
SHEET FOLDED AND BACK INFORMATION

The final product, is presented by a folded form
Its final size is 12 x 20 cm

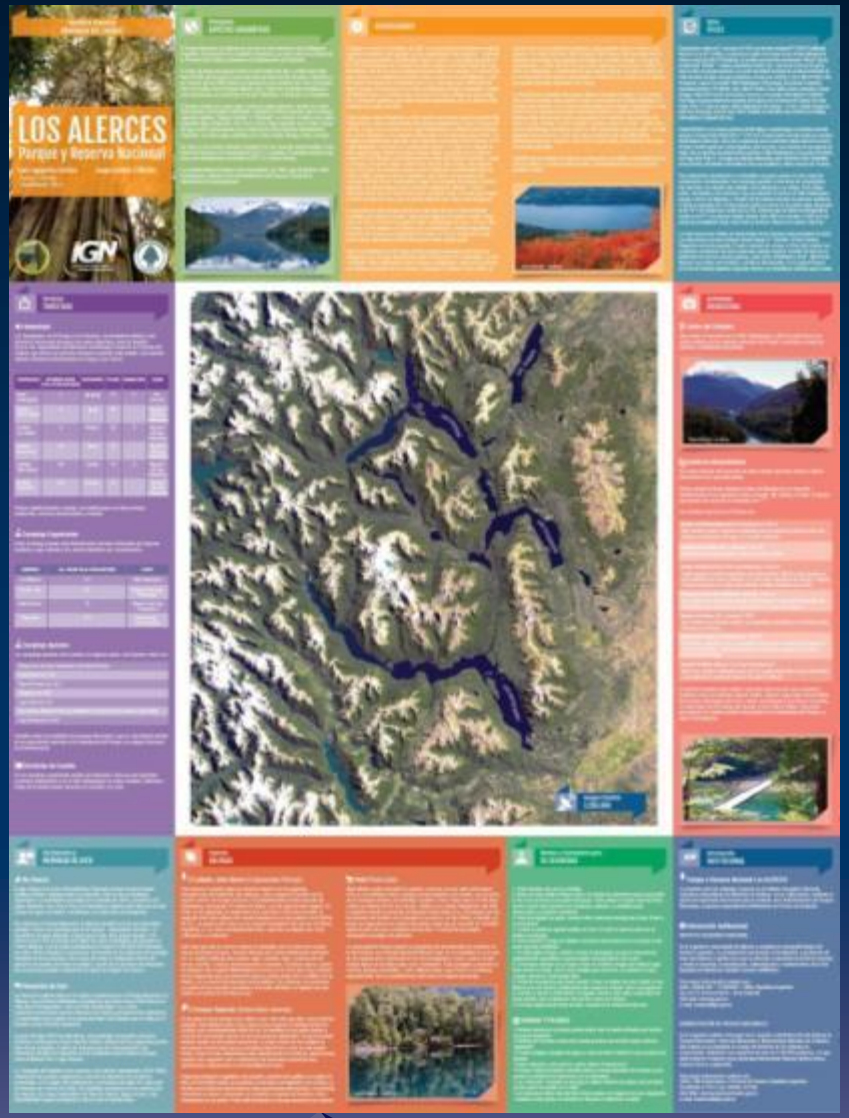
On the other map' side, there is very interesting information:

1. A satellite image of the park area, at 1:200.000 scale
2. Information regarding:
    1. Geographic Aspects
    2. Generalities
    3. Useful Data
    4. Touristic Services
    5. Recreation Activities
    6. Some of its History
    7. Valuable Species
    8. Regulation and habits for your safety
    9. Institutional information and contacts

FINISHED MAP



The map on the front



Back information

DISTRIBUTION

2500 maps will be printed at the IGN printer press to begin with. 1000 of them will be given to the APN so it could distribute them as it better considers.

The rest will remain in the IGN distributed among what it will be sent to the public from the sales department and a few of them to give as gifts in fairs, congresses and exhibitions.

PLEASE...

- The map that I have presented today is not the final version, it is only a prototype, we still have some aspects to work on.
- I would really appreciate it if you can take a look at the map and give me some feedback. This is very important for us because it would be our first product revised by the Commission on Mountain Cartography

CONCLUTIONS

We were able to make our first topographic and touristic map with the colaboration of the APN and with modern representation techniques

We believe our product will have great acceptance and tourists will definitelly use it when the time comes to plan their visit to the park.

A lot of work awaits us and we need to study each case in particular because each park is unique, not only because of its ecosystem but also because of its size and available information

THANK YOU VERY MUCH!

Carlos Osvaldo NELSON

Instituto Geográfico Nacional

República Argentina