Society and Hydrology in a Chilean Andean Watershed

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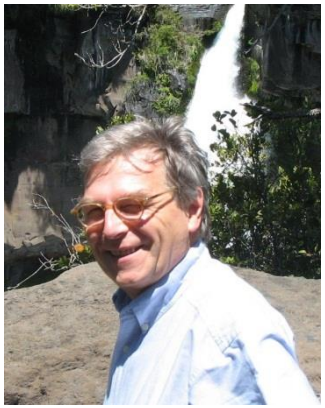
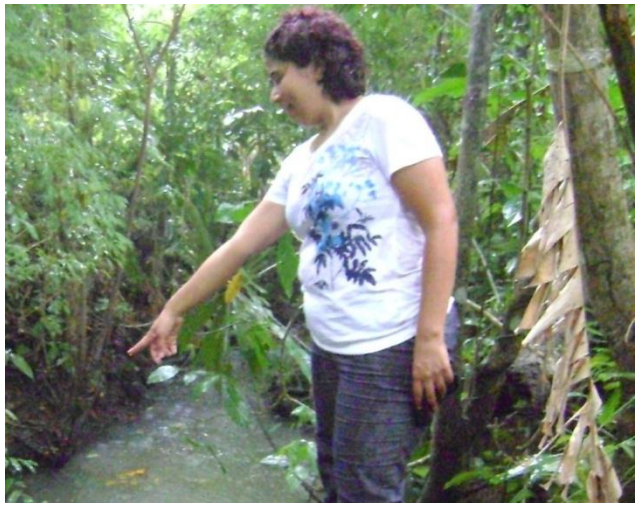
Colaborators





Justification

- Chile has an active tectonic and volcanic geology, however the Andean hydrological systems are poorly understood

- Economical and social expansion produces pressure on Andean watersheds

- Lack of understanding on water and pollutant transfer processes would produces conflicts between stakeholders

Justification

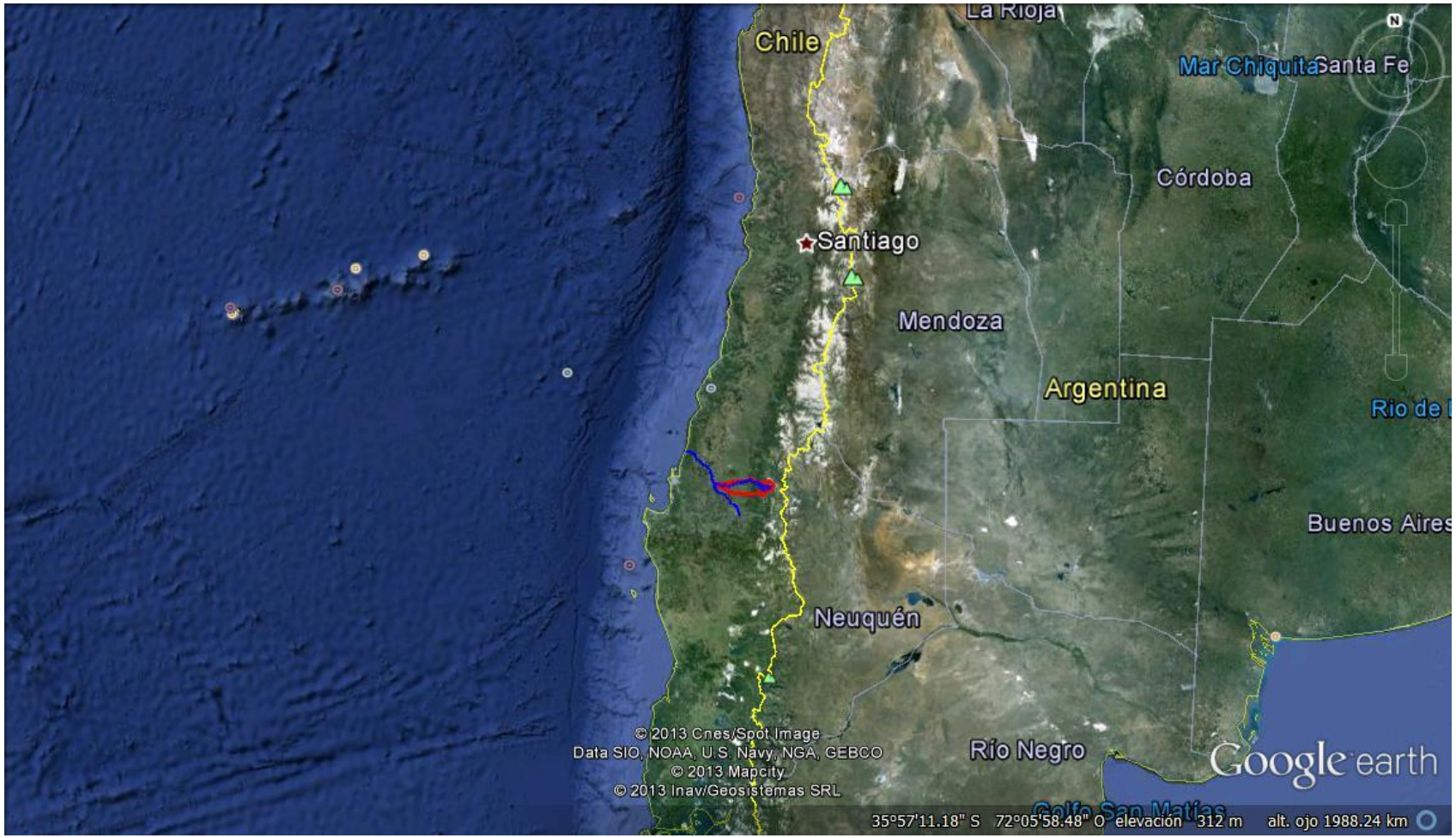
- This research was motivated for the need of understand the hydrological processes of an Andean watershed.

- However we also learn about social issues and vulnerabilities that affect the people which depends of the watershed

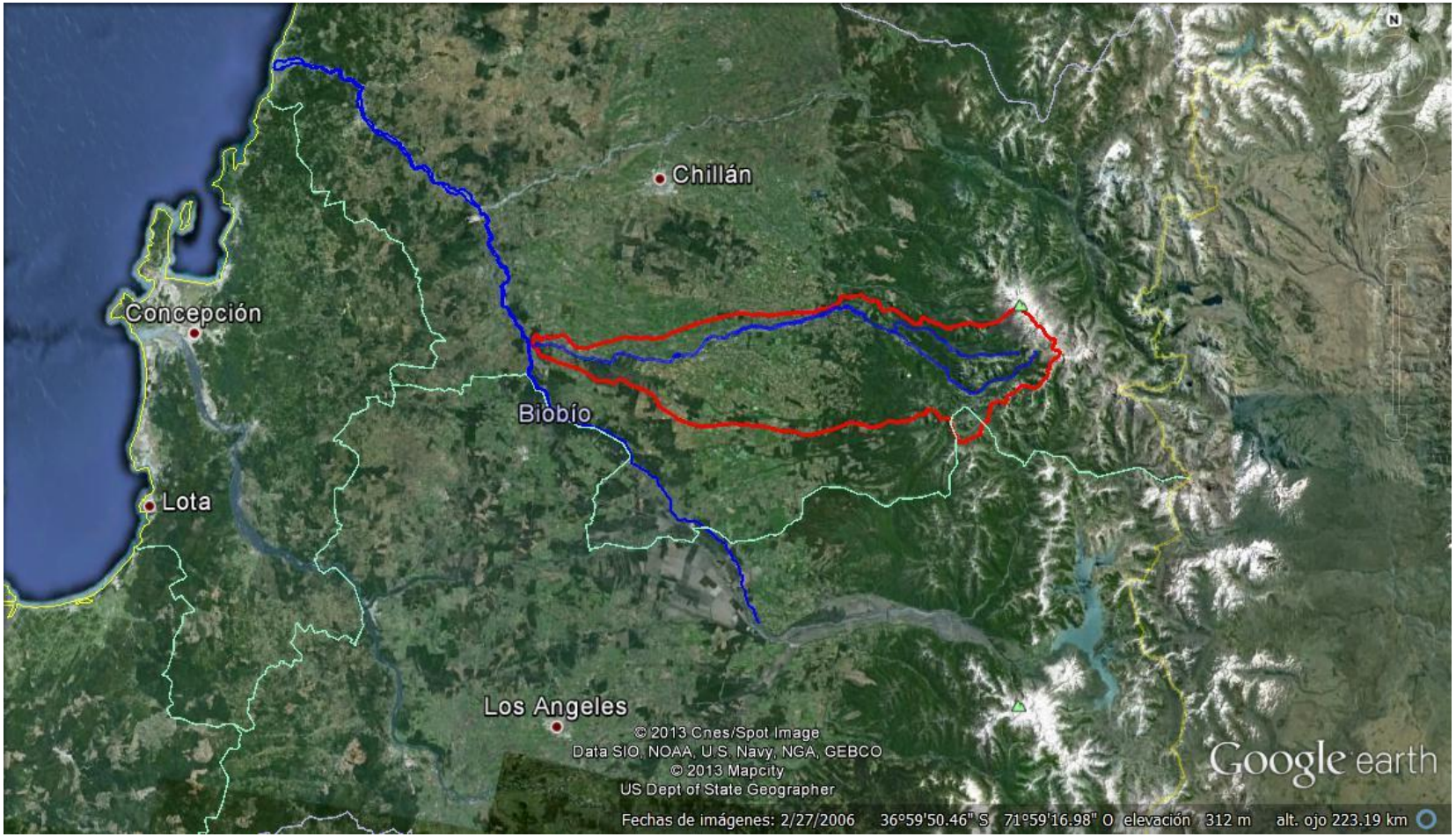
Diguillin Watershed

Diguillin watershed

Diguillin watershed

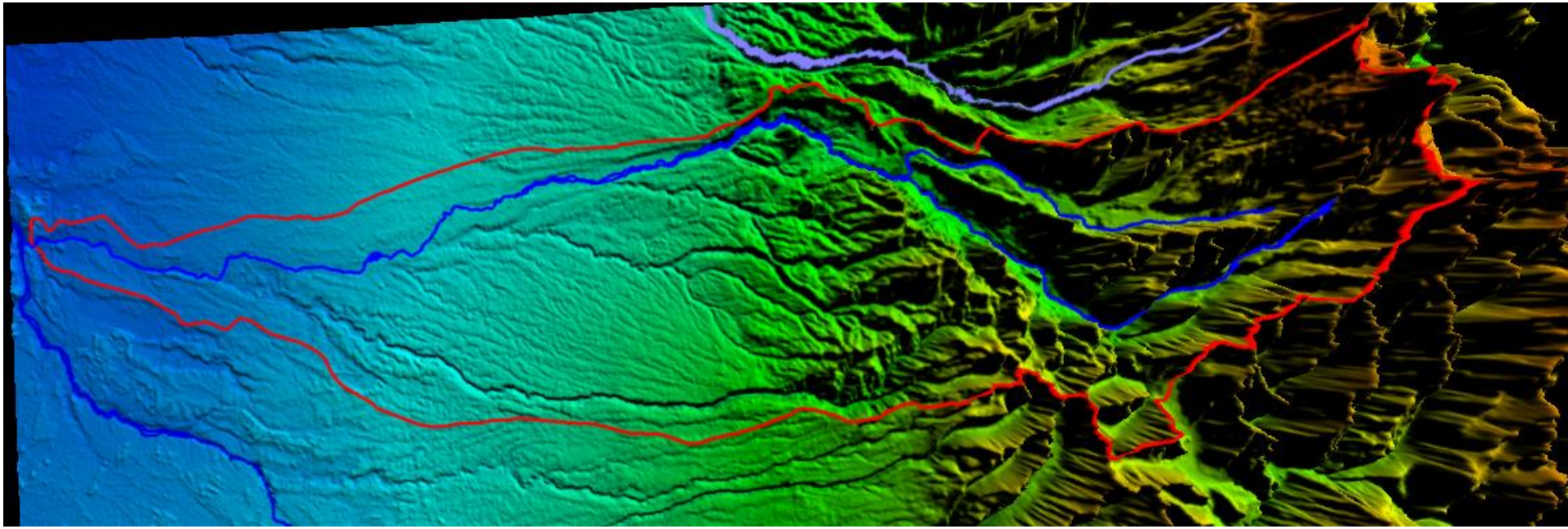


Diguillin watershed



The lower watershed

The lower part of the watershed is an important agriculture area.



- Irrigation water is administrated by the *Junta de Vigilancia del Río Diguillín* (JVRD), which integrate the water rights owners.

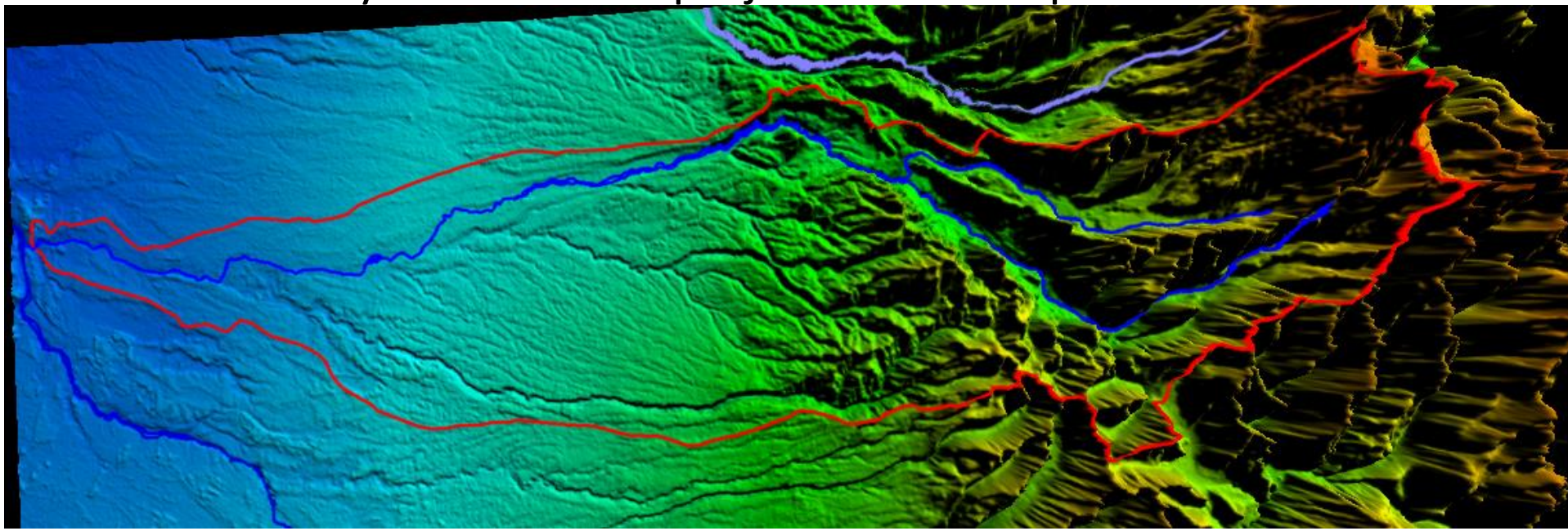
- The lower part of the watershed receives water from a neighbor watershed by a large convey channel

- High inversion on agriculture and irrigation
  - World's highest yield on Sugar Beat
  - Blueberry, wheat, corn and horticultural products

- High dependency on water availability and quality.

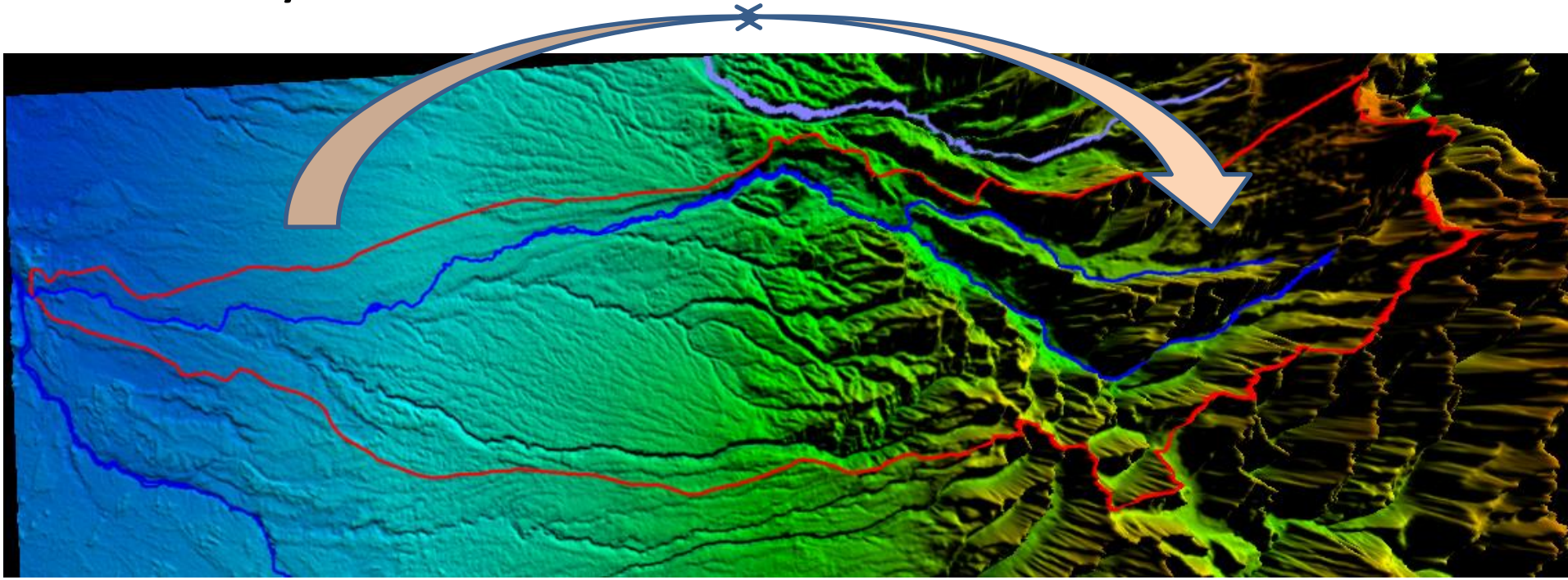
The upper watershed

- The headwater has two main rivers:
  - The Renegado creek, where there are an important tourism area (Sky, trekking and thermal waters)
  - The high Diguillin river where there are a natural reserve and several hydro-electrical projects in development.



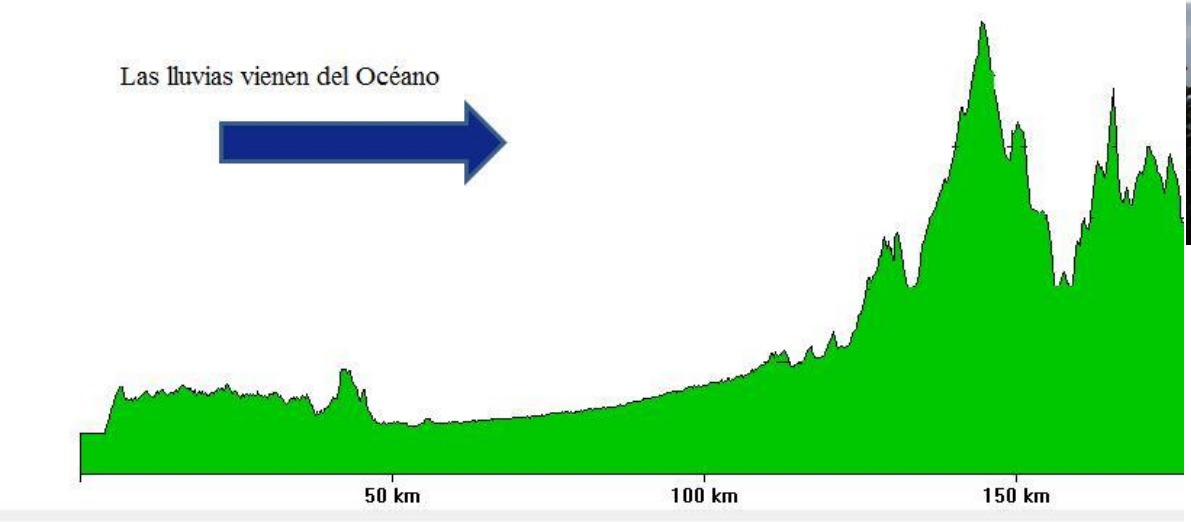
Lower and upper watersheds

- Both areas has not road connection.
- In spite that are part of the same watershed, socially are different territories



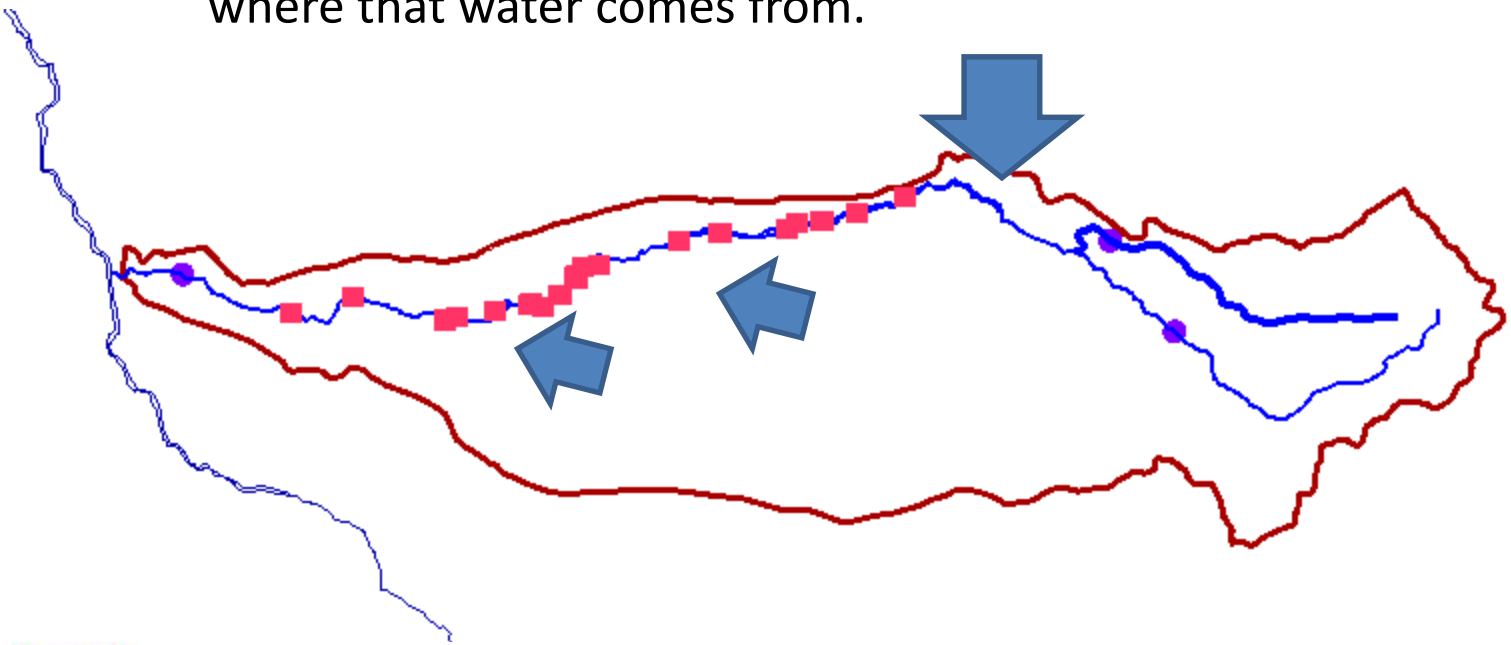
Hydrology of the Diguillin watershed

The classical Chilean hydrology focus on snow accumulation and melting process



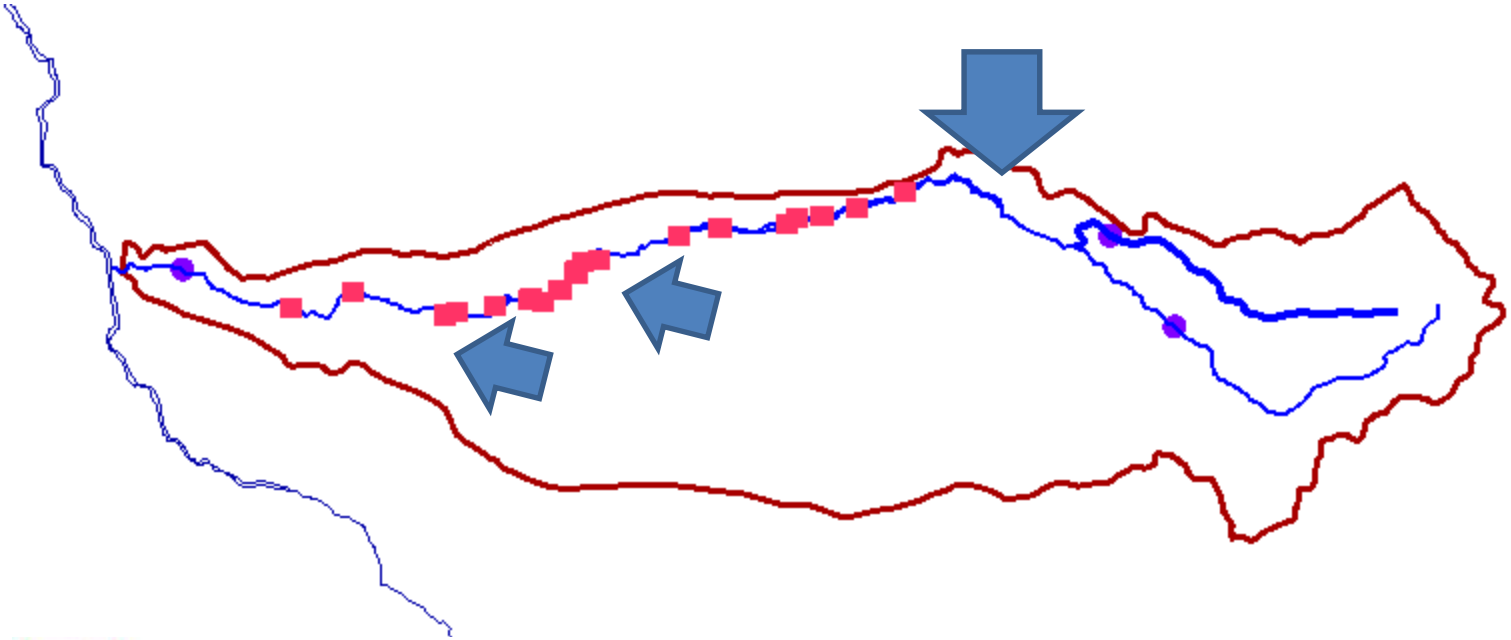
Which is ok, but does not explain low flow conditions at the Diguillin river

- Water balance does not fit
- Irrigation users know the river.
  - They receive more water in some sections, but they do not know where that water comes from.



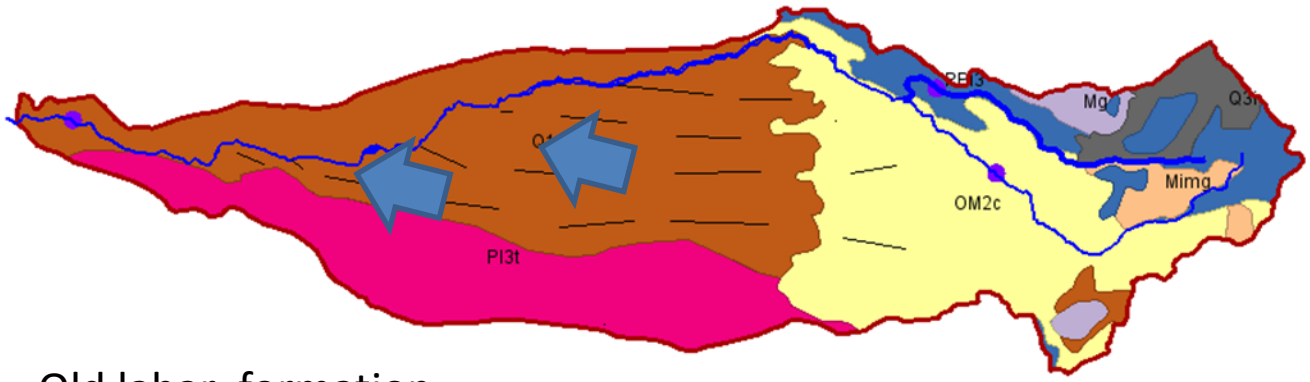
Why the river receive water in specific areas?

- Where the water comes from?



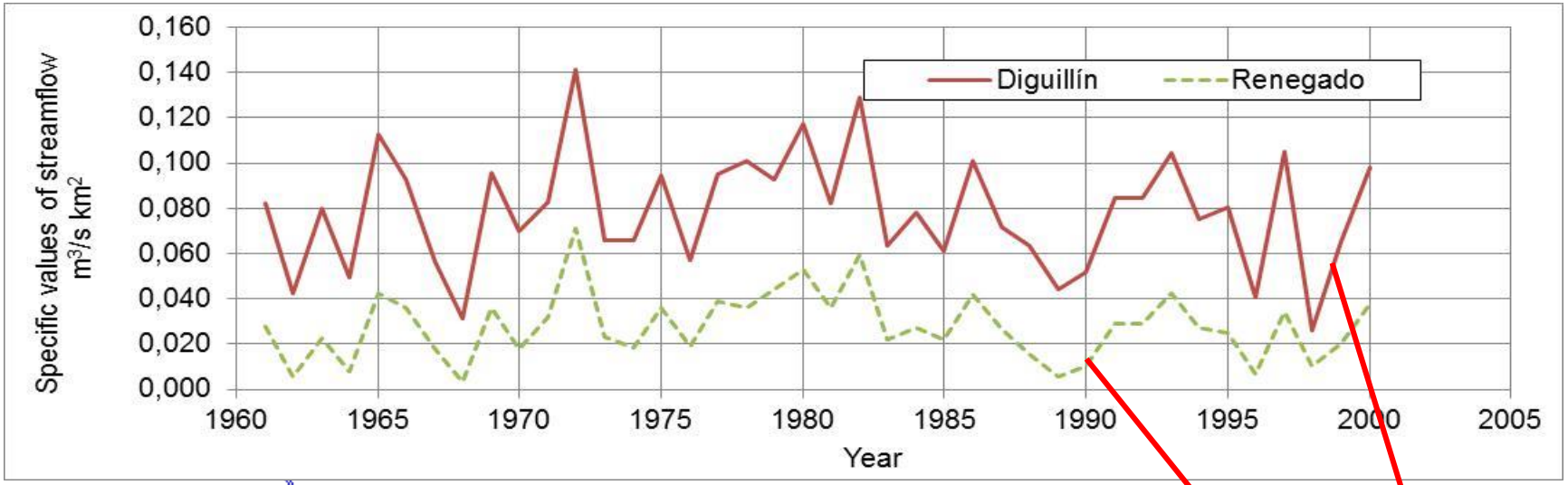
The gaining conditions of the river in the lower watershed are due to the geology.

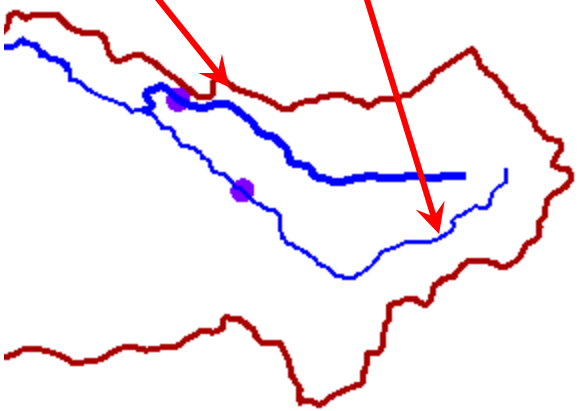
Recent alluvial deposits



Old lahar formation

What happen at the upper part ?

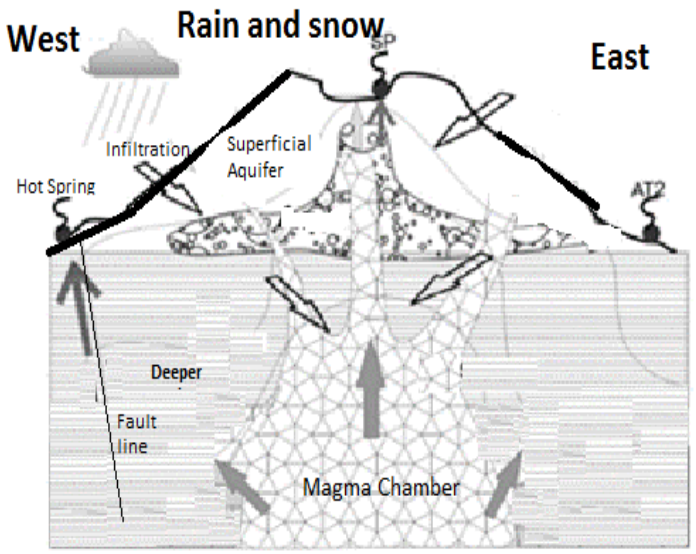




Why the Upper Diguillin has more water than the Renegado creek?

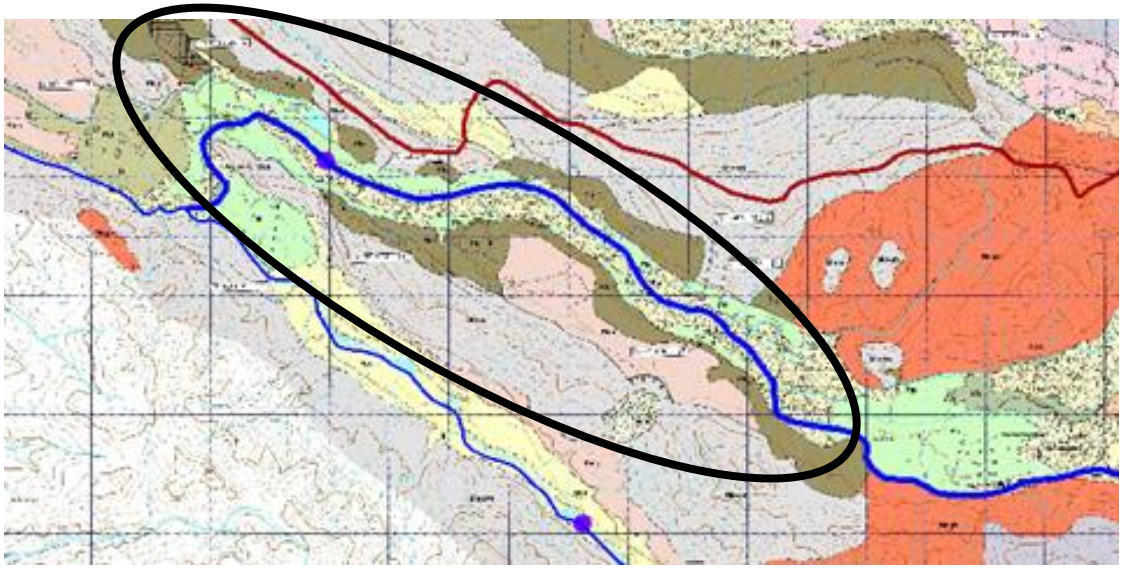
Volcanism controls the hydrology

The upper Diguillin river drains the aquifer located inside the volcanic complex



Peiffer, Y.A,. Taran, E. Lounejeva, G. Solís-Pichardo, D. Rouwet, R.A. Bernard-Romero, 2011. Tracing thermal aquifers of El Chichón volcano–hydrothermal system (México) with 87Sr/86Sr, Ca/Sr and REE, Journal of Volcanology and Geothermal Research, Volume 205, Issues 3–4, 15 August 2011, Pages 55-66, ISSN 0377-0273,

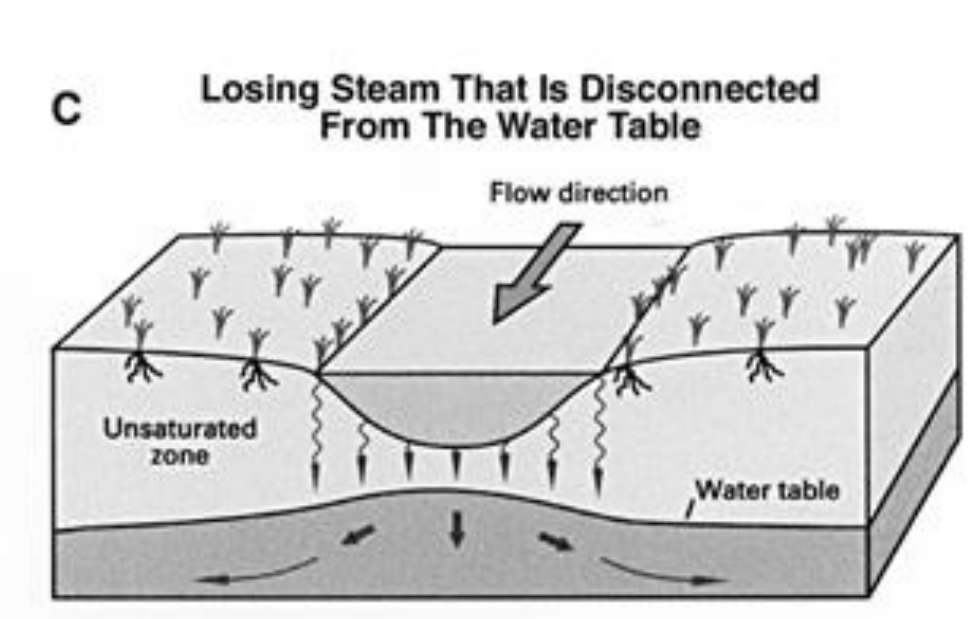
Renegado valley



- Form by recent lava deposits, that produces fracture rock system
- Valley´s soils are thick fractions of volcanic ash that possess sandy texture

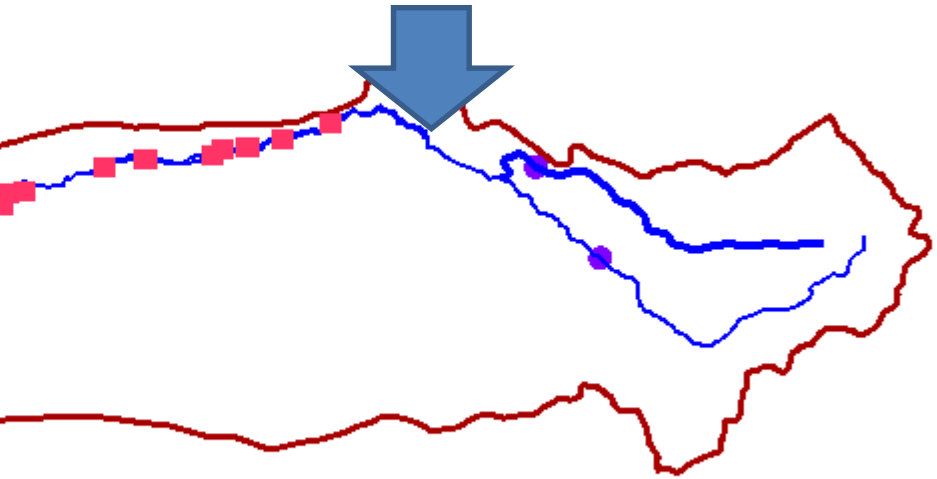
Renegado valley

- Surface runoff is limited by the highly permeable soils favoring infiltration and deep percolation to the fracture rock system that compose the base of the watershed
- The Renegado creek is a loosing stream



- Groundwater from the Renegado Valley discharge directly at the Diguillin river as large fractured rock springs, distributed in a section of that river.

- That discharge keeps a minimum flow at the river during dry years (JVRD)



Comments

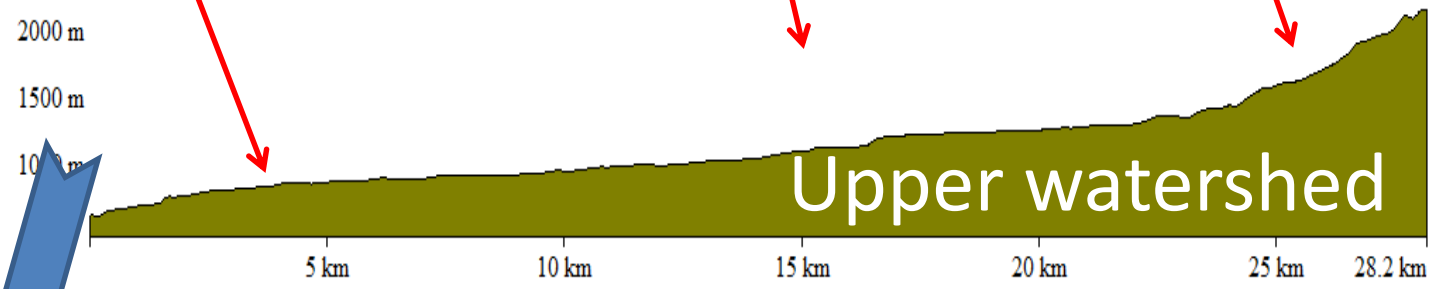
- The Renegado Valley is under a strong pressure for second-housing development
- Some land developers at the Renegado valley are pushing hard to obtain water rights from springs and from the creek.
- However most of the people, has no clue about the water situation, they are using illegal extractions, which are elsewhere at the watershed, drying the Renegado creek.

Comments

- The highly permeable soil and the fractured rock system at the Renegado watershed, where there is an important development of tourism and construction of weekend houses, produces questions about the fate of pollutants introduces to the systems by wastewater infiltration from septic tank.

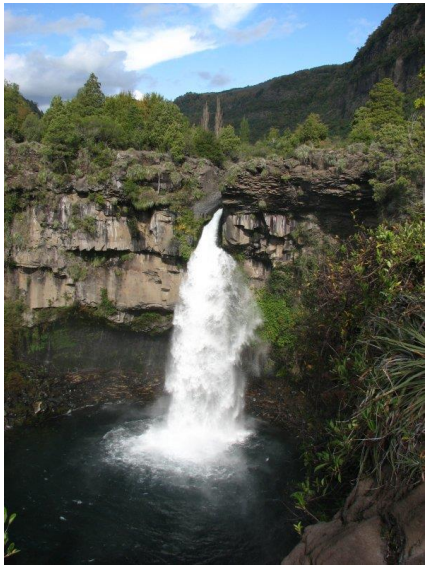
- The pathways between pollutant recharge areas and springs discharge are unknown and most be identified to improve the sustainable develop of the whole watershed.

- The watershed is connected by the river and the acequias



Lower watershed

Thanks



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