# CAPTURING THE SPECIFICS OF HYDROLOGICAL BENEFITS OF GREEN INFRASTRUCTURE: RETURN ON INVESTMENT IN QUITO'S WATER FUND FONAG.

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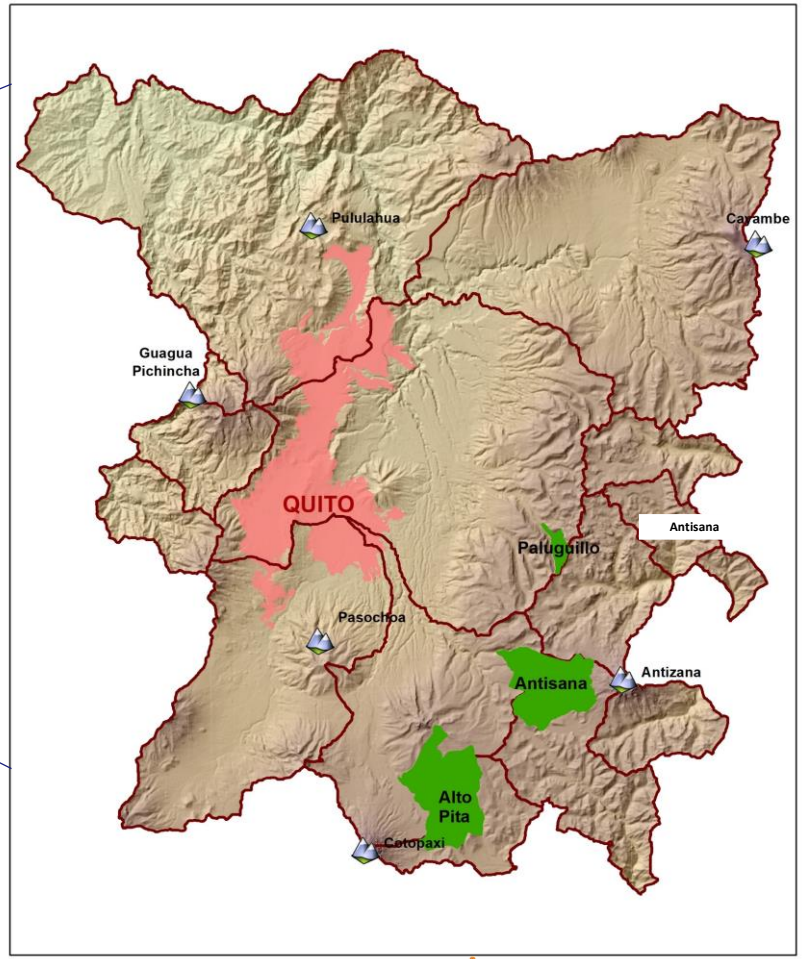
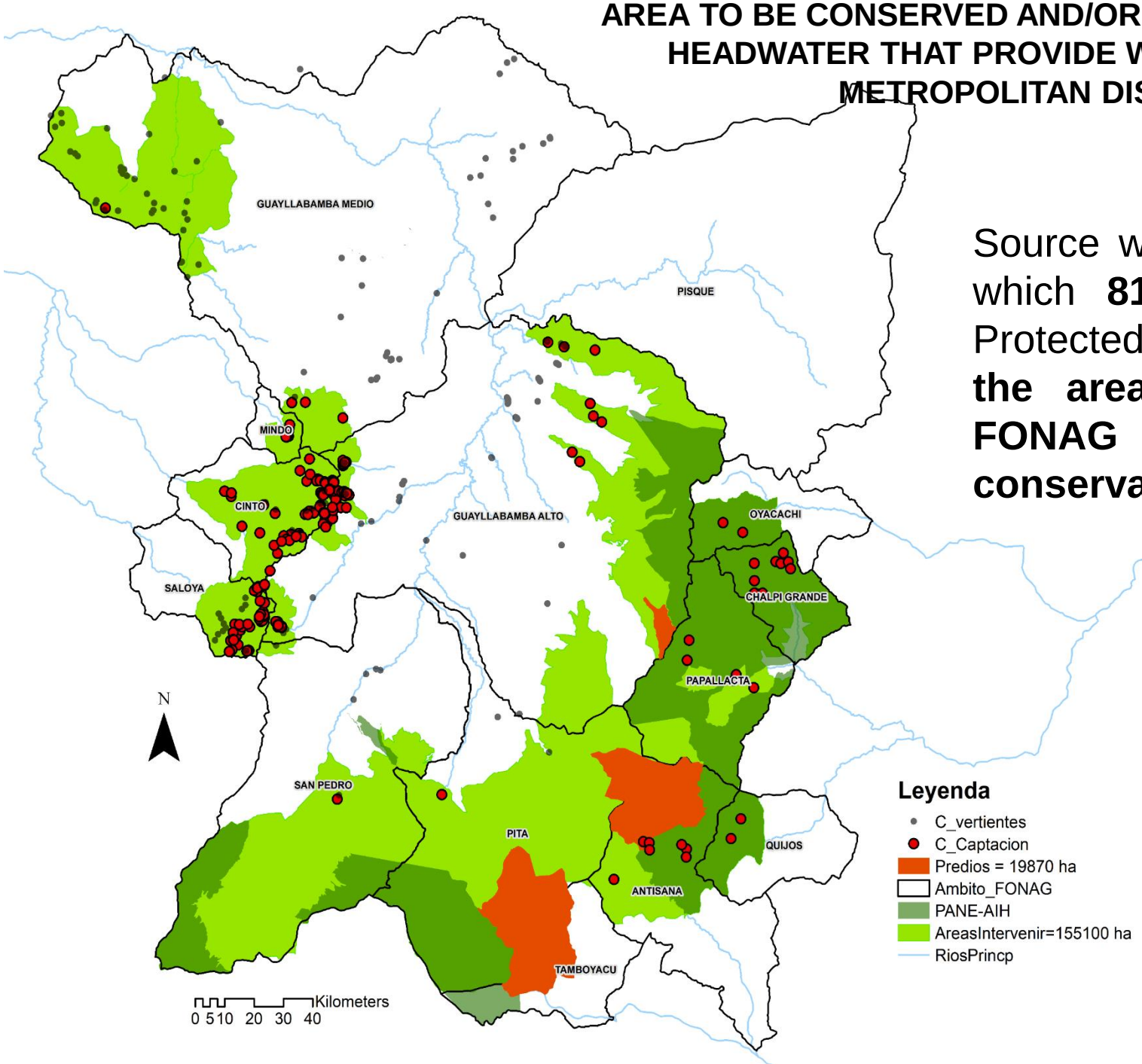
FONAG = Quito's sourcewater areas protection


## AREAS OF INTERVENTION




FONAG
FONDO PARA LA PROTECCIÓN DEL AGUA

# AREA TO BE CONSERVED AND/OR RESTORED : ANDEAN HEADWATER THAT PROVIDE WATER FOR QUITO METROPOLITAN DISTRICT.




Source water áreas, are around **236.600 ha**., of which **81.500 ha** are located within National Protected Areas. The remaining **155.100 ha, are the areas of interest for EPMAPS, where FONAG should concéntrate its efforts in conservation and restoration.**

**We aim at covering the full sourcewater área of 155.100 ha in the coming 62 years.**

# FONAG IMPLEMENTS A VARIETY OF INTERVENTIONS:

1. It manages around 20.000 ha of "own" land, purchased by Quito's water utility EPMAPS or FONAG itself. 18 paramo rangers are based on this land and in other strategic protected areas.

2. It establishes conservation agreements with private and community owned land, looking for conservation of the most sensitive water source areas and promoting sustainable productivity.

3. It restores degraded, mostly historically overgrazed, paramo. Restoration strategies can be passive, i.e. e effective elimination of threats, or active, i.e. planting native paramo vegetation, and wetland restoration.

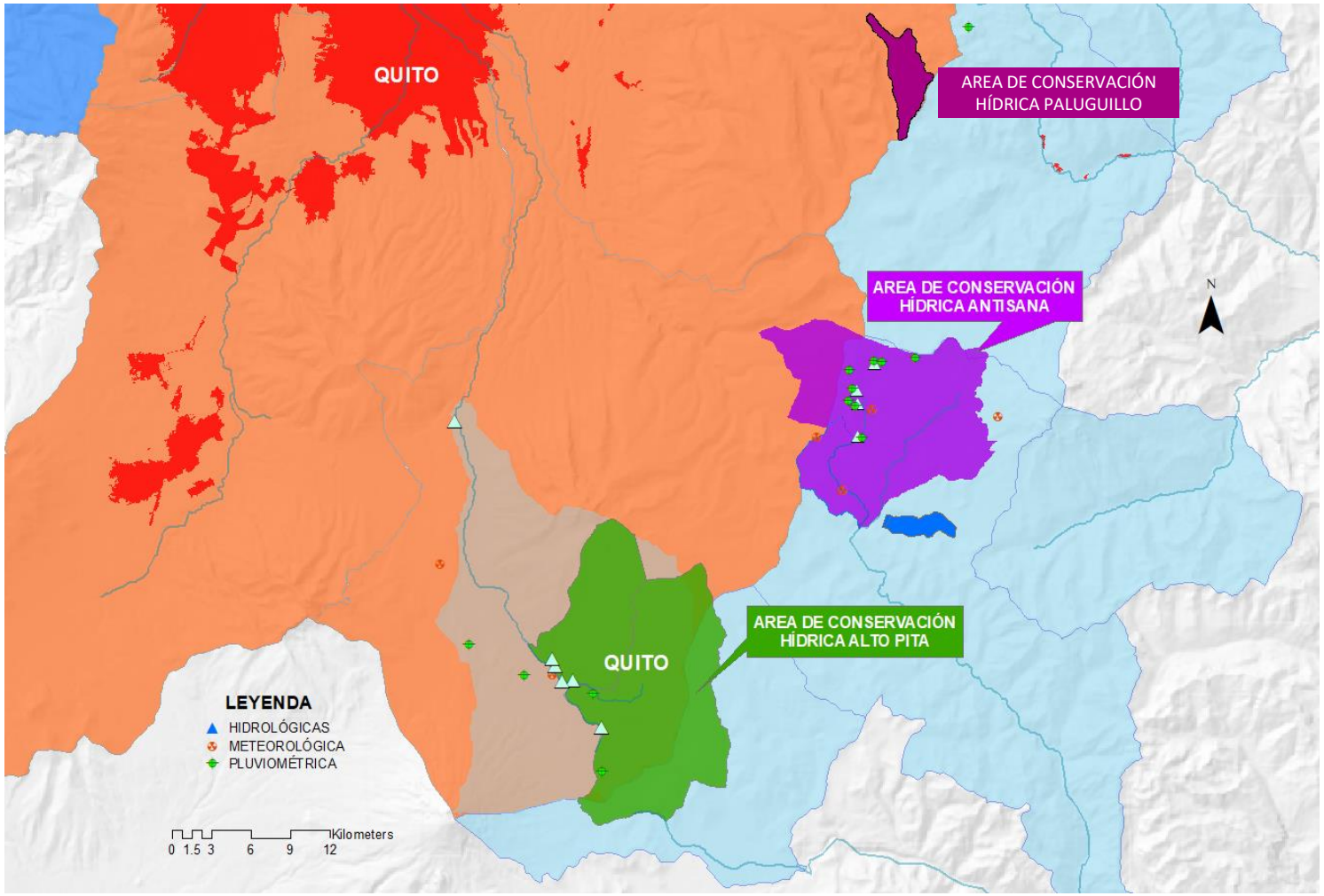
4. It generates relevant information for optimal decision making by FONAG itself and other stakeholders in the catchments: FONAG operates a hydrometeorological network that fills historical gaps; collaborates with the water authority on water uses and authorizations; and generates socioeconomic information in intervention areas.

5. It runs a cutting edge environmental education program in rural schools and communities, in coordination with the education authority.

6. It creates an enabling environment for research partners to study relevant processes in its intervention area.

7. It monitors the impact of its interventions, including water quantity and quality, allowing for quantification of the return on investments its constituents make, and preparing its potential task of implementing water footprint compensation of interested stakeholders.

# IMPACT MONITORING

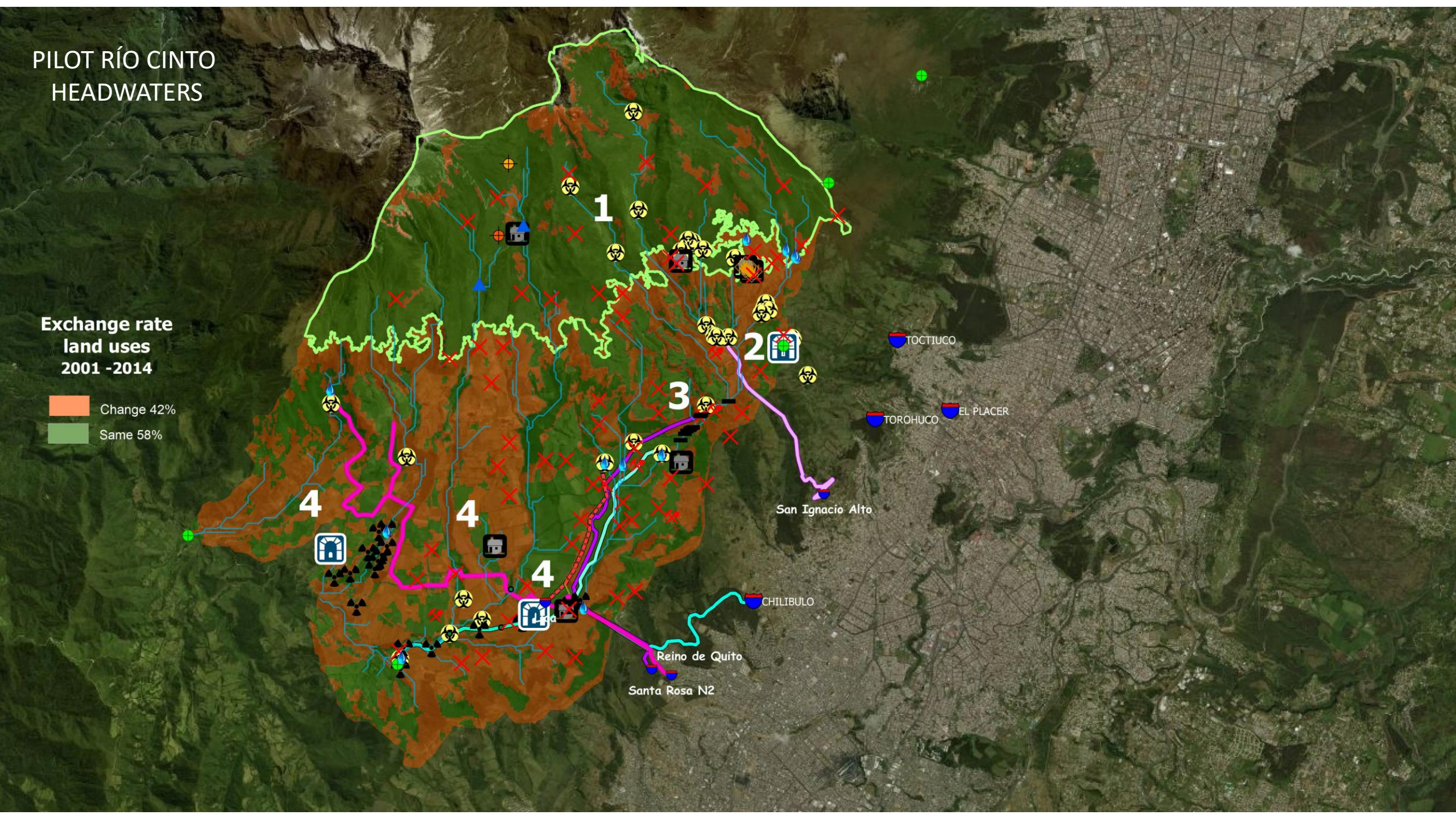



## Monitoring for what?

- **Evaluation of benefits of our interventions in terms of water quality and water quantity**
- Understanding of key processes for performance of water related ecosystem services.
- Return on investment.

# PILOT "RETURN ON INVESTMENT" STUDY IN RIO CINTO HEADWATERS

- Large number (>50) of intakes
- Delivers abt 8% of Quito's water demand for Water Utility EPMAPS
- Full portfolio of interventions for 5 year period, following thorough threat and trend analysis
- Thorough analysis of which parameters and conditions represent benefits to EPMAPS
- Specific modelling approaches for most relevant parameters, own


PILOT RÍO CINTO
HEADWATERS
Exchange rate
land uses
2001 -2014
Change 42%
Same 58%
1
2
3
4
4
4
TOCTIUCO
TOROHUCO
EL PLACER
San Ignacio Alto
CHILIBULO
Reino de Quito
Santa Rosa N2

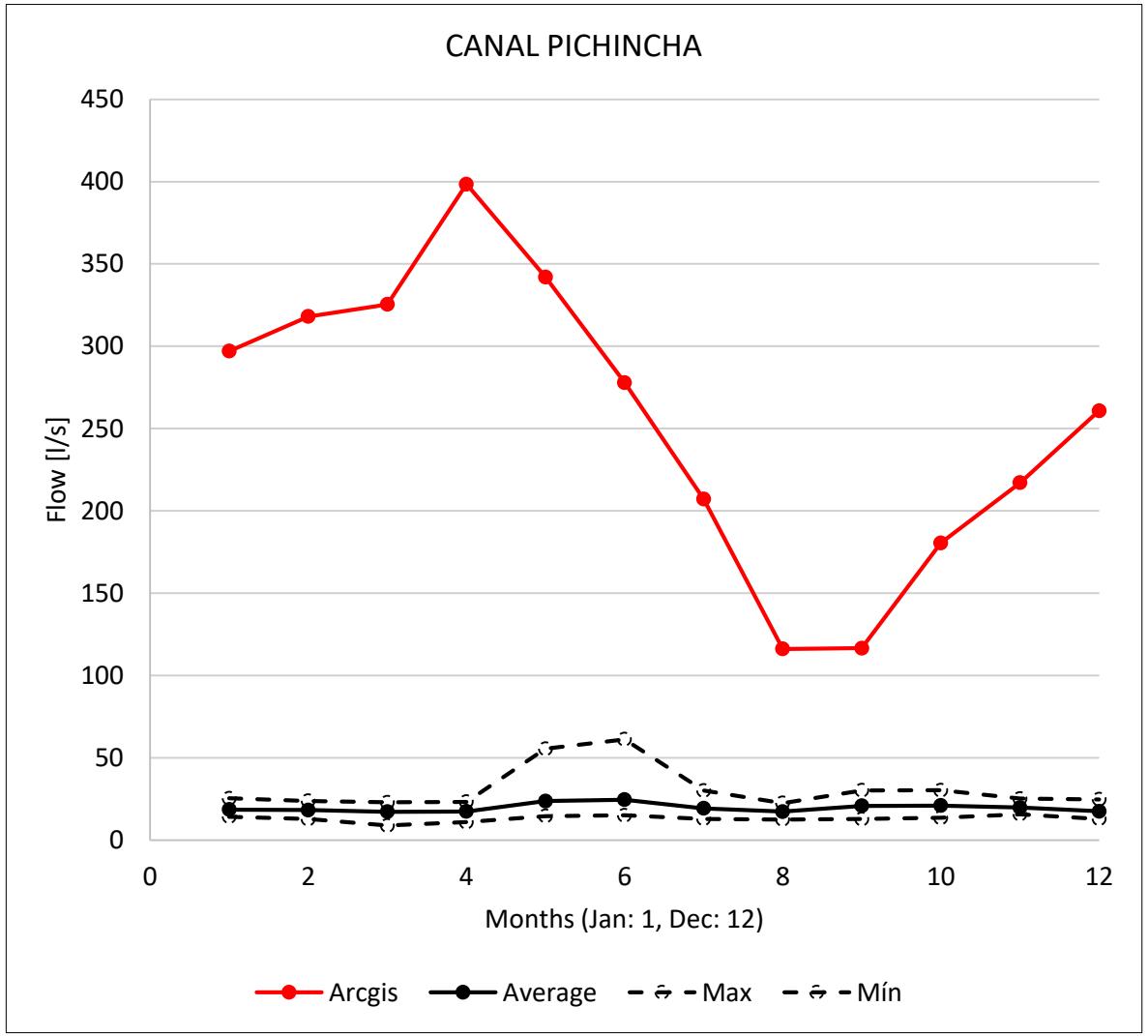
# SCENARIOS

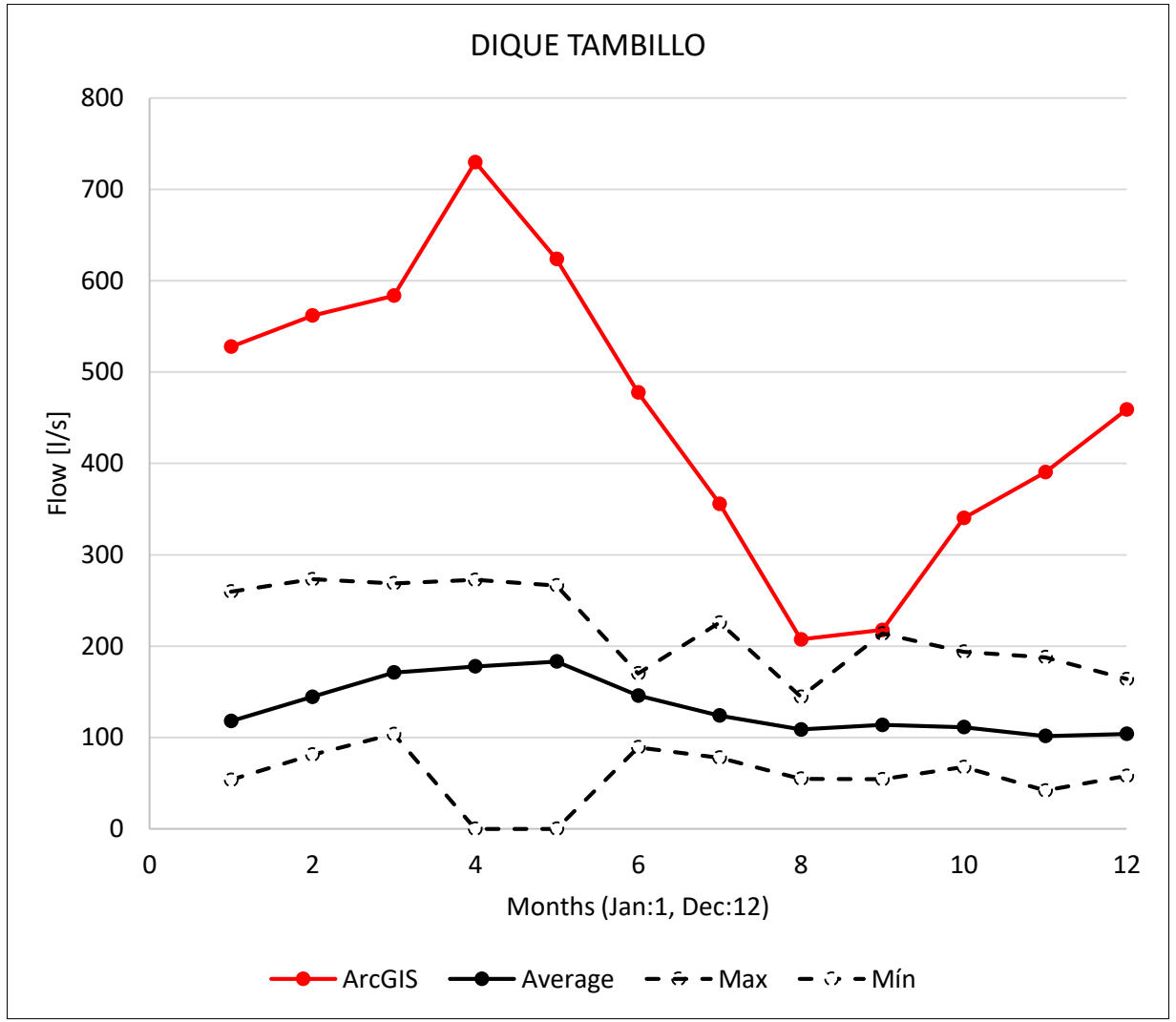
**Base line =** *represents the mean state and trends of climate, hydrology and anthropic activity in recent history:* for climate **2009-2016 and for land use change 2001- 2014.**

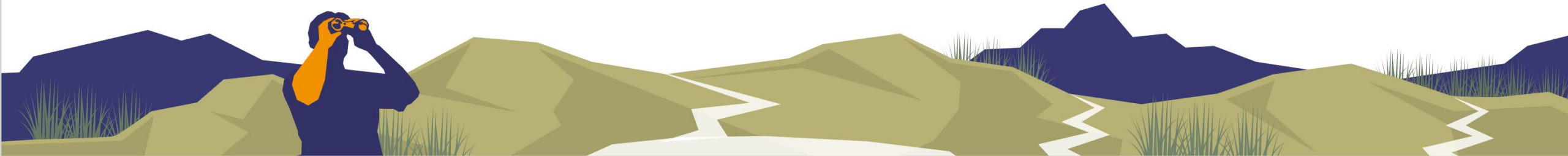
**Scenario of sustainable ecosystem management (SEM) =** when FONAG and its strategic partners like EPMAPS *eliminate threats through its interventions*, advance of agricultural frontier into paramo is stopped and sustainable catchment management implemented. The model considers these actions consolidate there impact on water quality and water quantity in 20 years.

**Scenario without intervention (business as usual -BAU-)**: *no intervention by FONAG, nor sustainable management by other institutions*, threats continue their historical trends, agricultural frontier advances 200 m in altitude, paramo reduced by 26%.

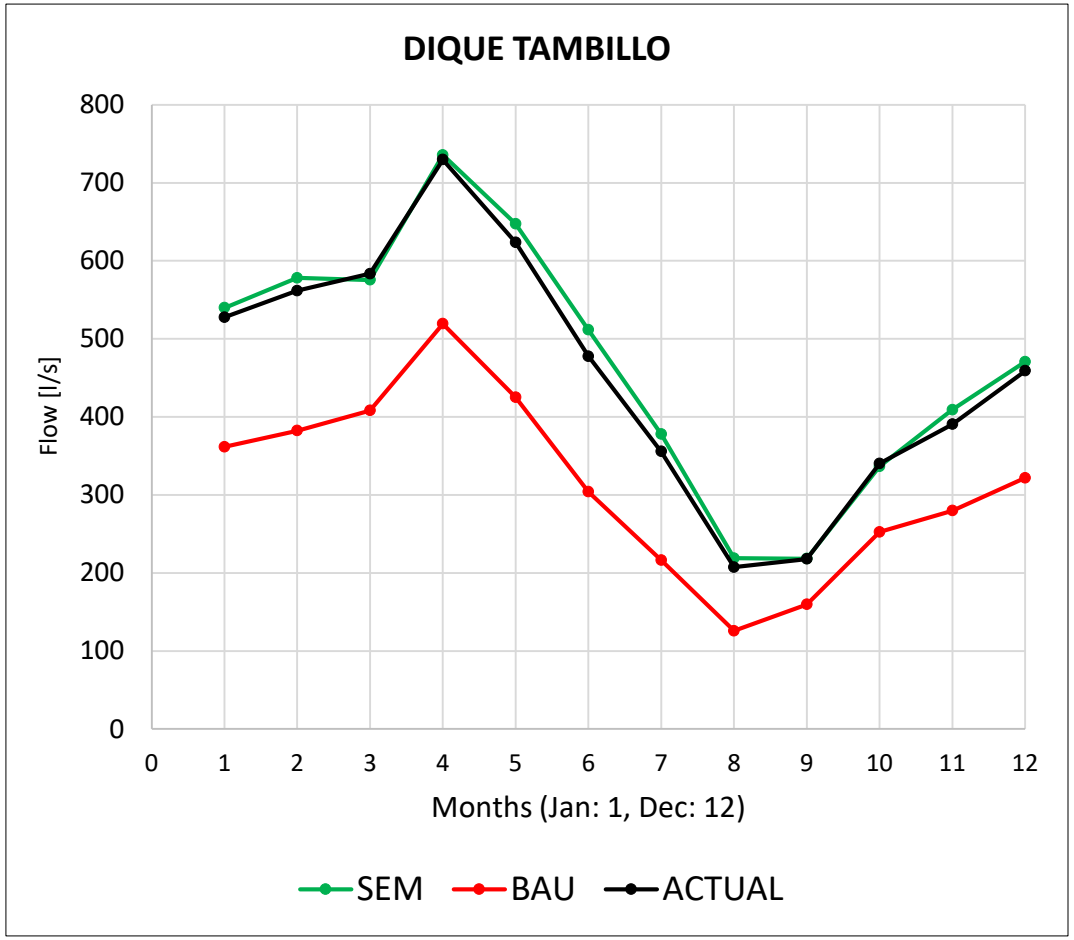
# CALIBRATION WITH OPERATIONAL DATA (Flows)

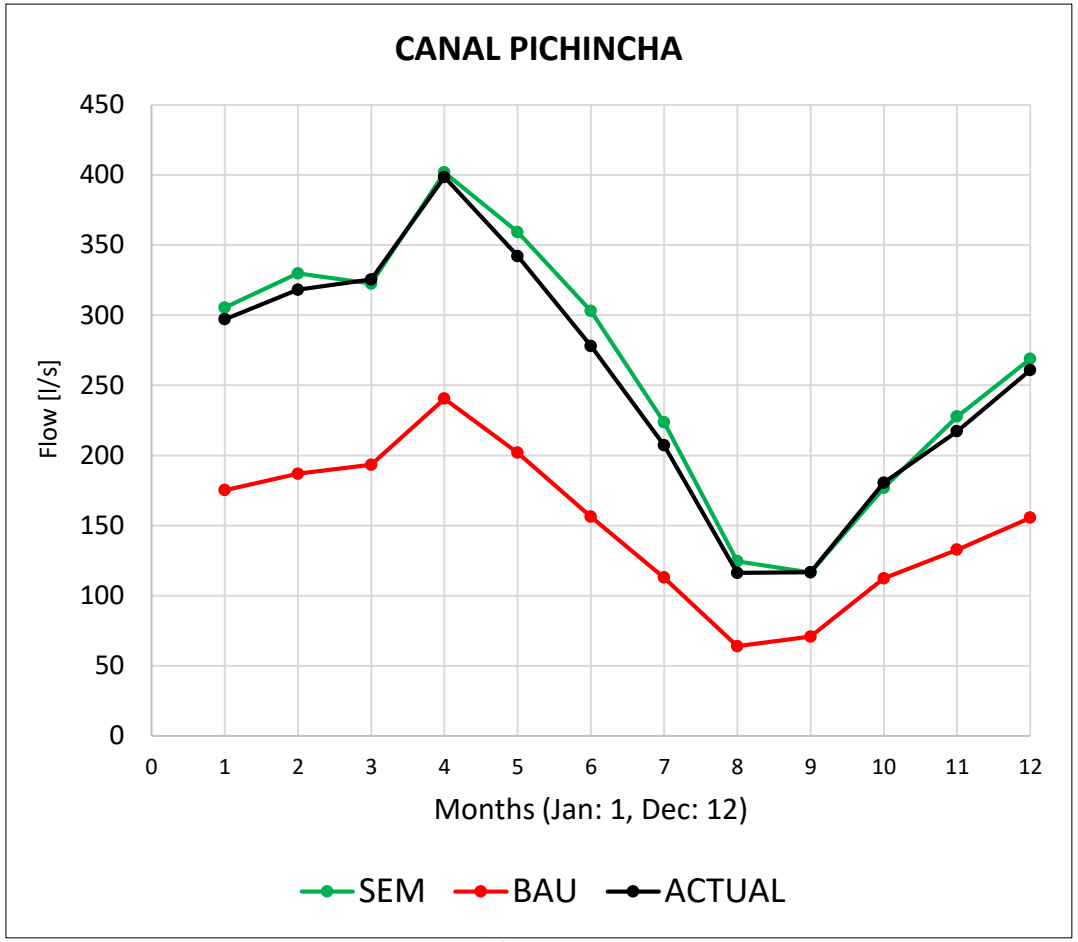


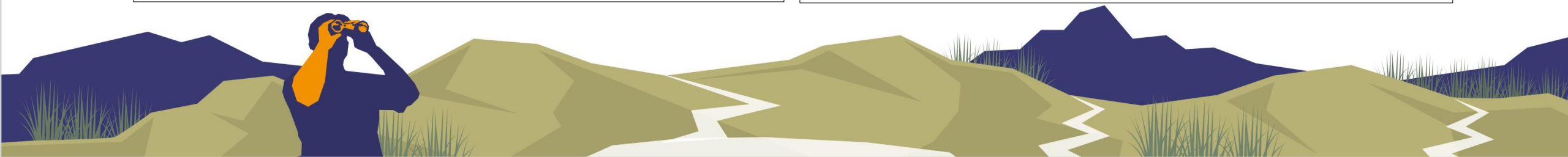



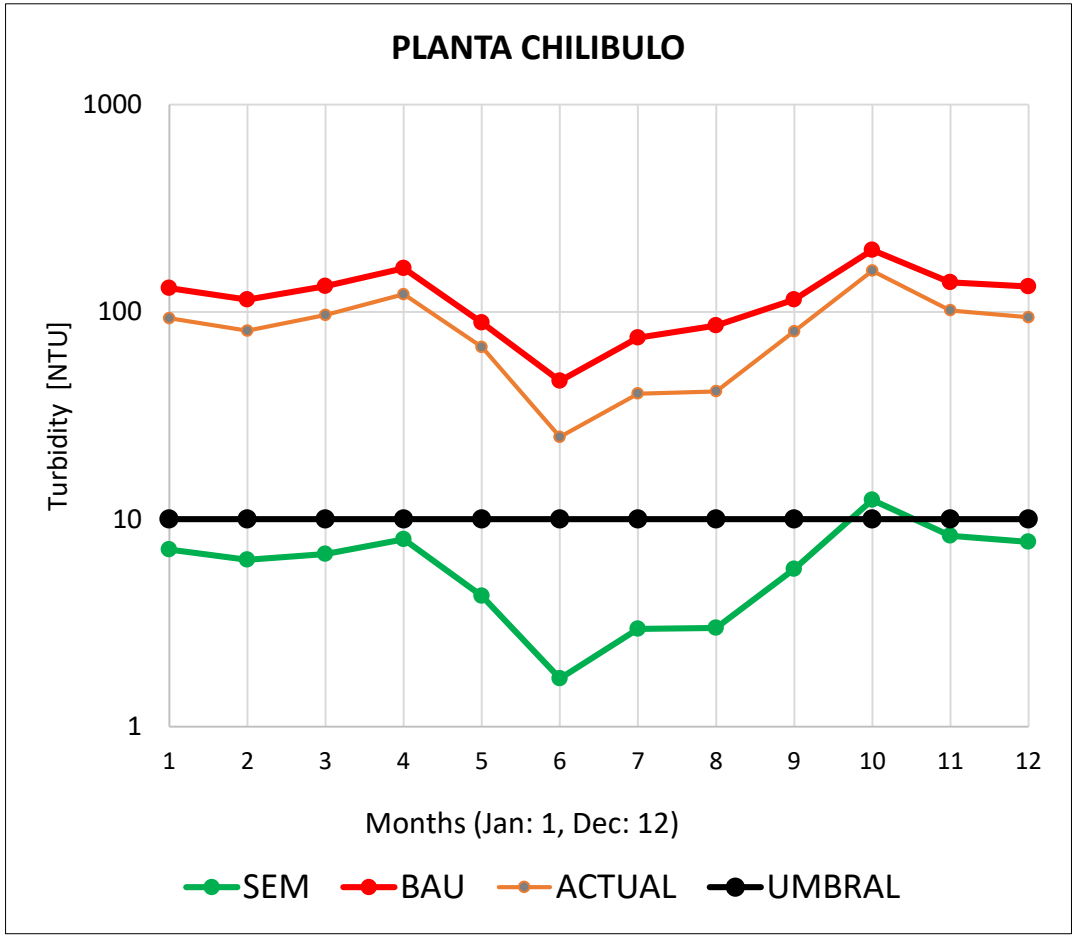
# RESULTS WATER QUANTITY

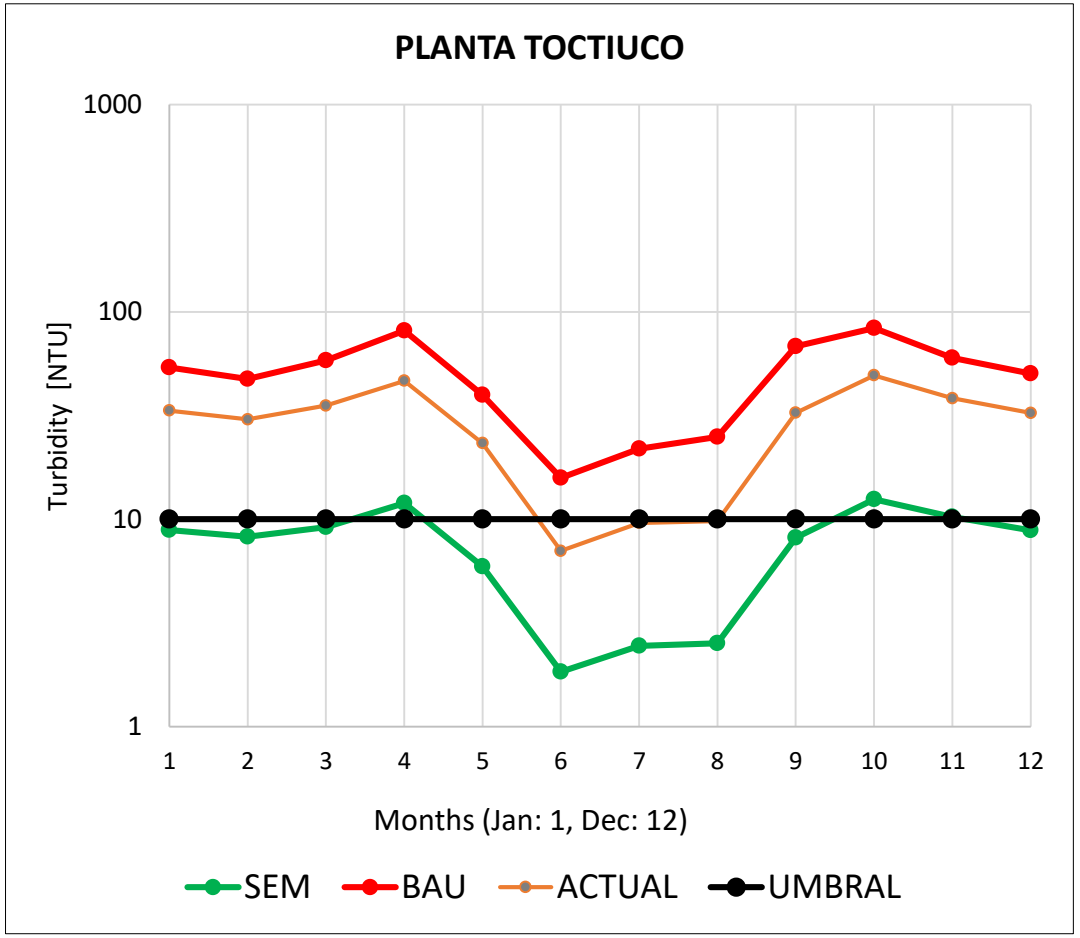


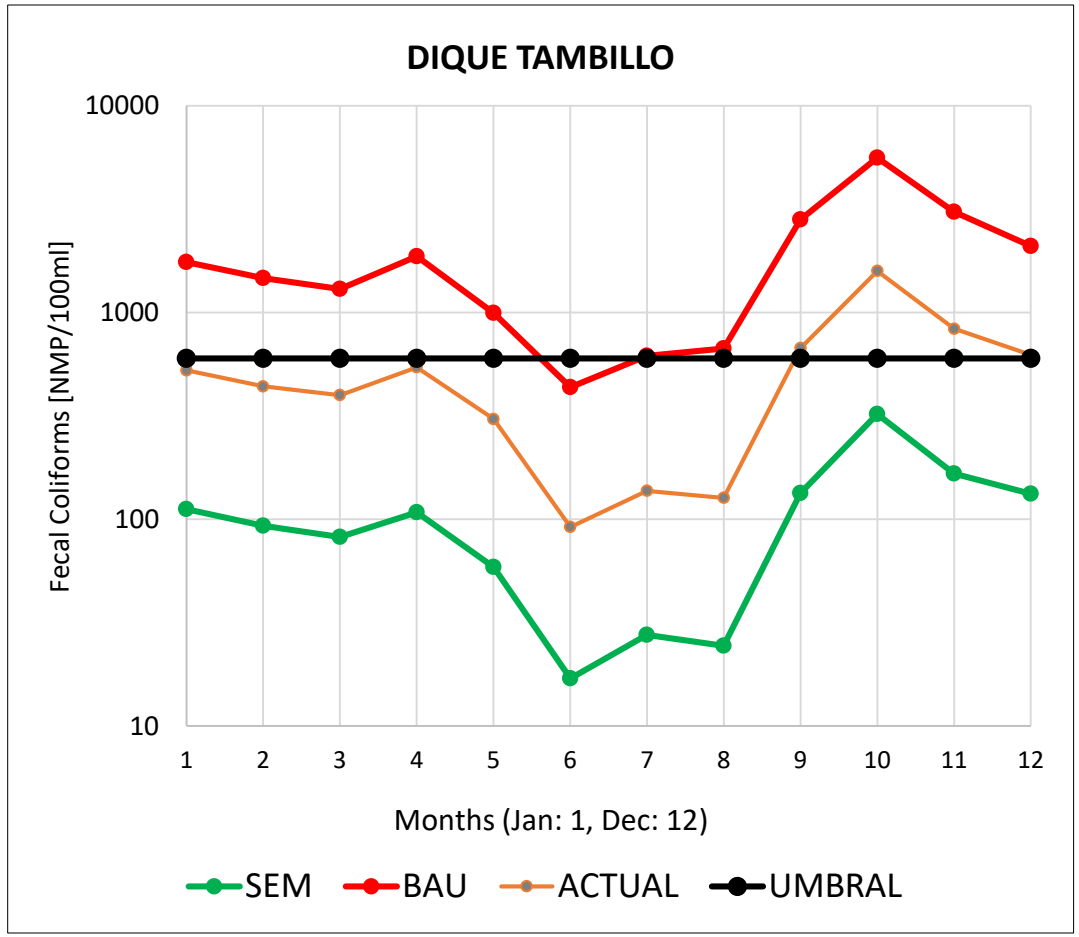



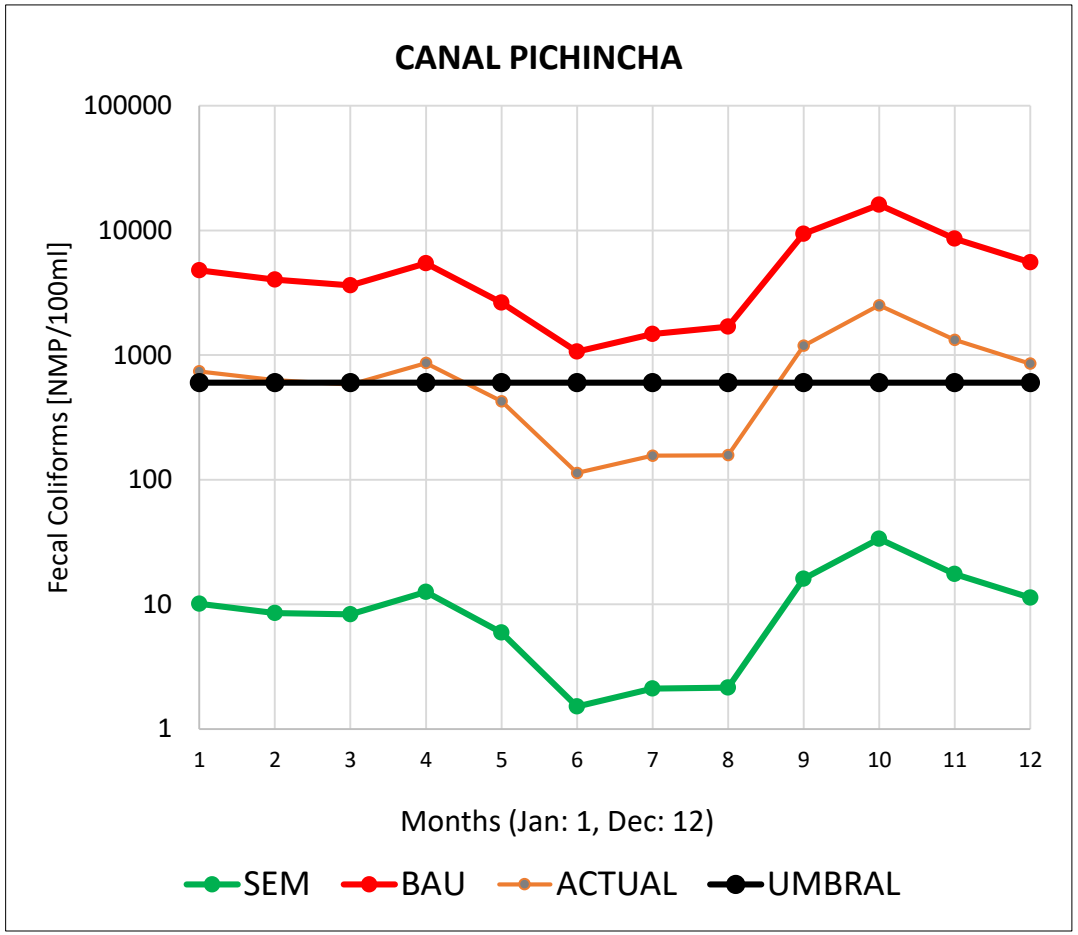
# RESULTS WATER QUALITY - TURBIDITY



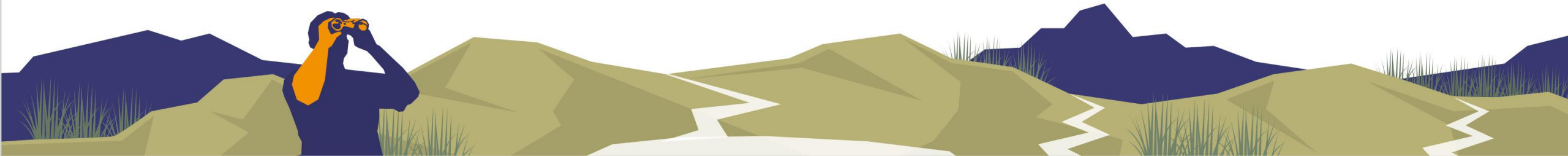
# RESULTS WATER QUALITY (COLIFORMS): THRESHOLDS



# LESSONS LEARNED

- Calibration data for modelling: specific monitoring + **operational data of user**
- In this study case, **water quality benefits** contributed to a positive ROI, more than water quantity benefits.
- Some of the most important benefits were related to parameters usually not modelled
- Non-linear benefits, **0/1** situations
- FIRST thorough analysis of threats/parameters/relevant processes, THEN selection of modelling tool
- ROI in this pilot study was 2.15



# ¡Thank you!

This study was supported by:

The Nature Conservancy

Travel support for BDB to SWWW:

BID