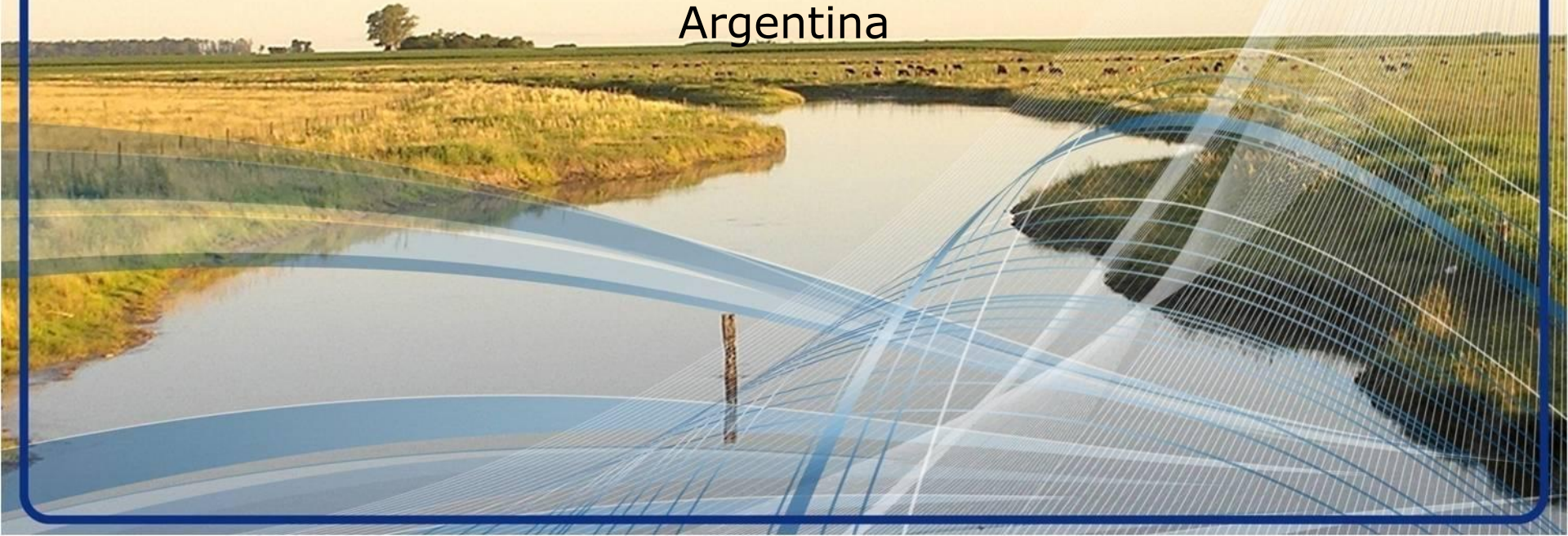


HydroPredict'2010
Prague, Czech Republic, 20-23 Sept

Integrated Hydrological Modelling to Assess Flood and Drought Risk under Climate and Land Use Change

Angel N. Menéndez
INA – Hydraulics Laboratory
Univ. Buenos Aires – Eng. Dept.
Argentina



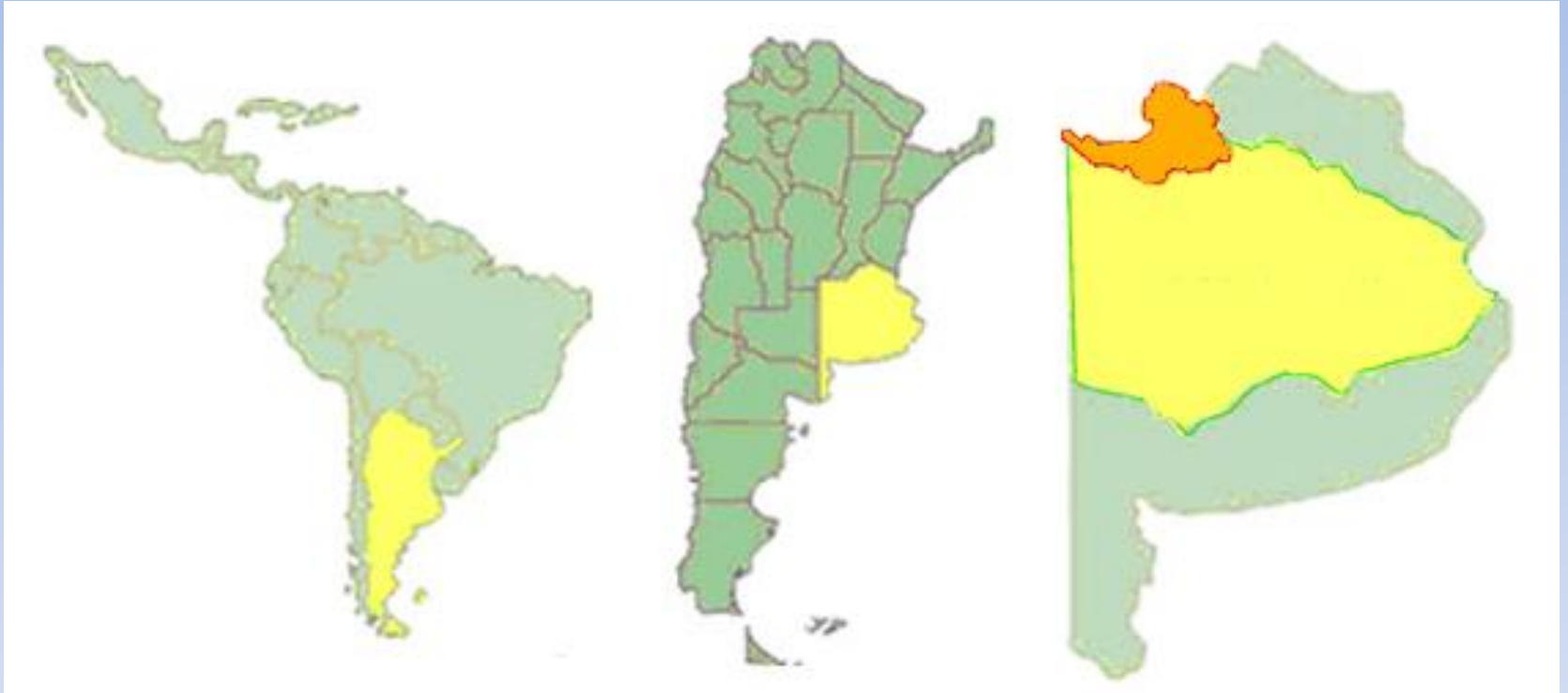
PRESENTATION

- The Salado Basin
- Implementation of Hydrologic Model
- Calibration of Hydrologic Model
- Model Scenarios
- Conclusions

PRESENTATION

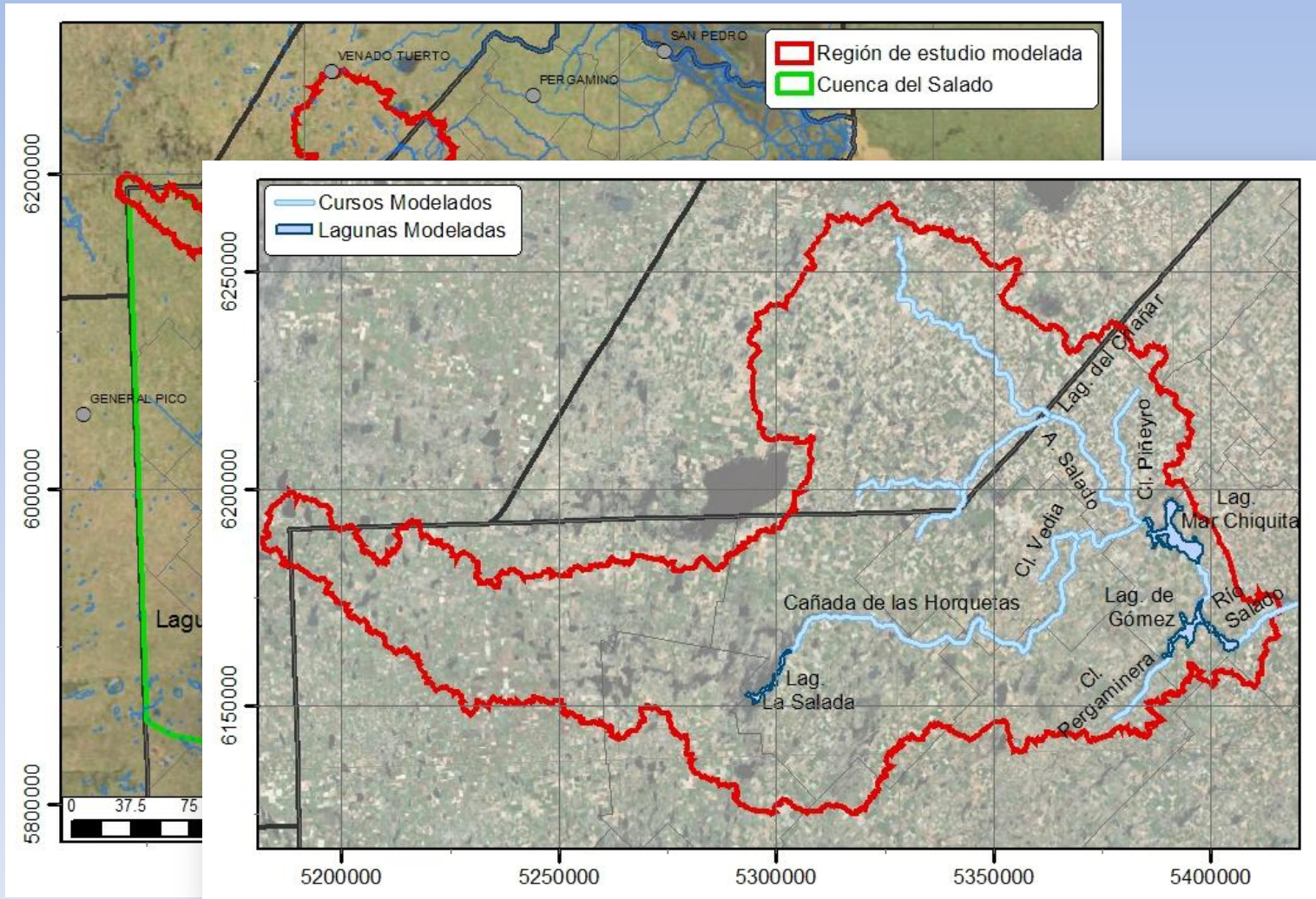
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Salado Basin (Argentina)



170,000 km²
(A1: 15,000 km²)

Salado Basin (Argentina)



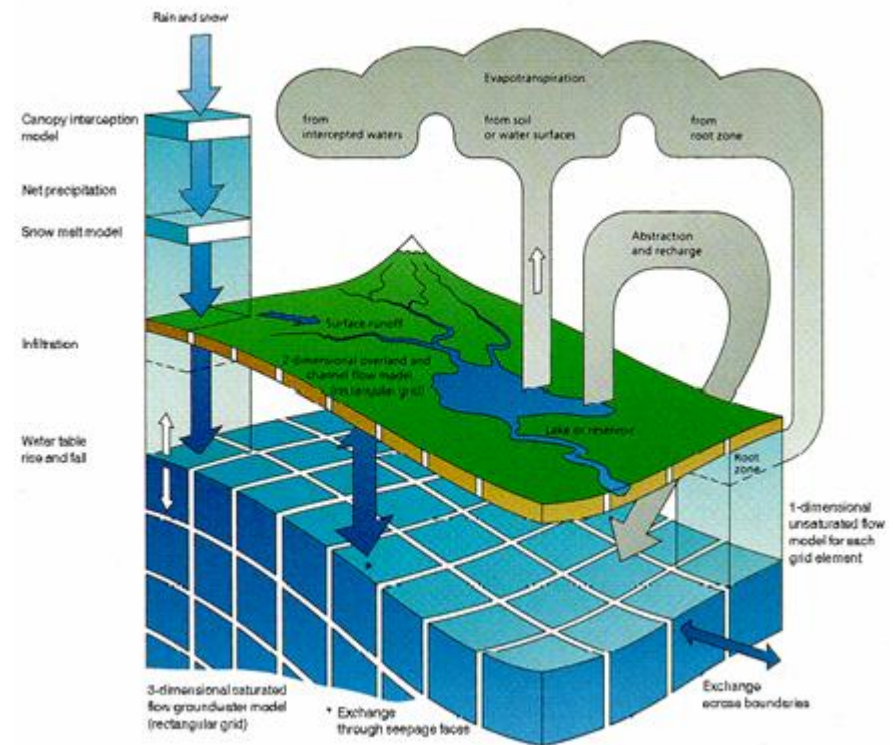
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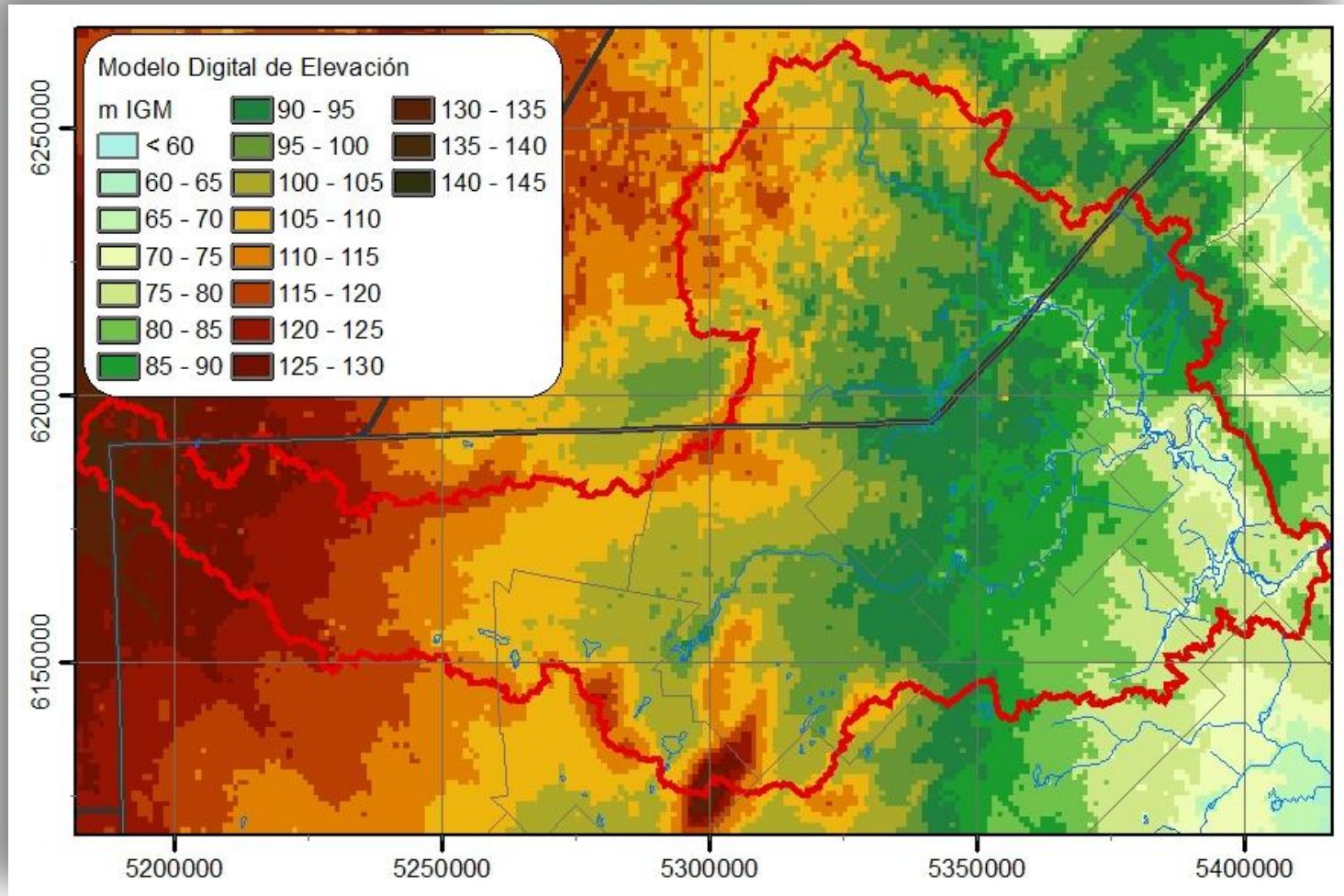
HYDROLOGIC MODEL

- Integrated surface and groundwater
- Spatially distributed
- Time continuous

MIKE SHE

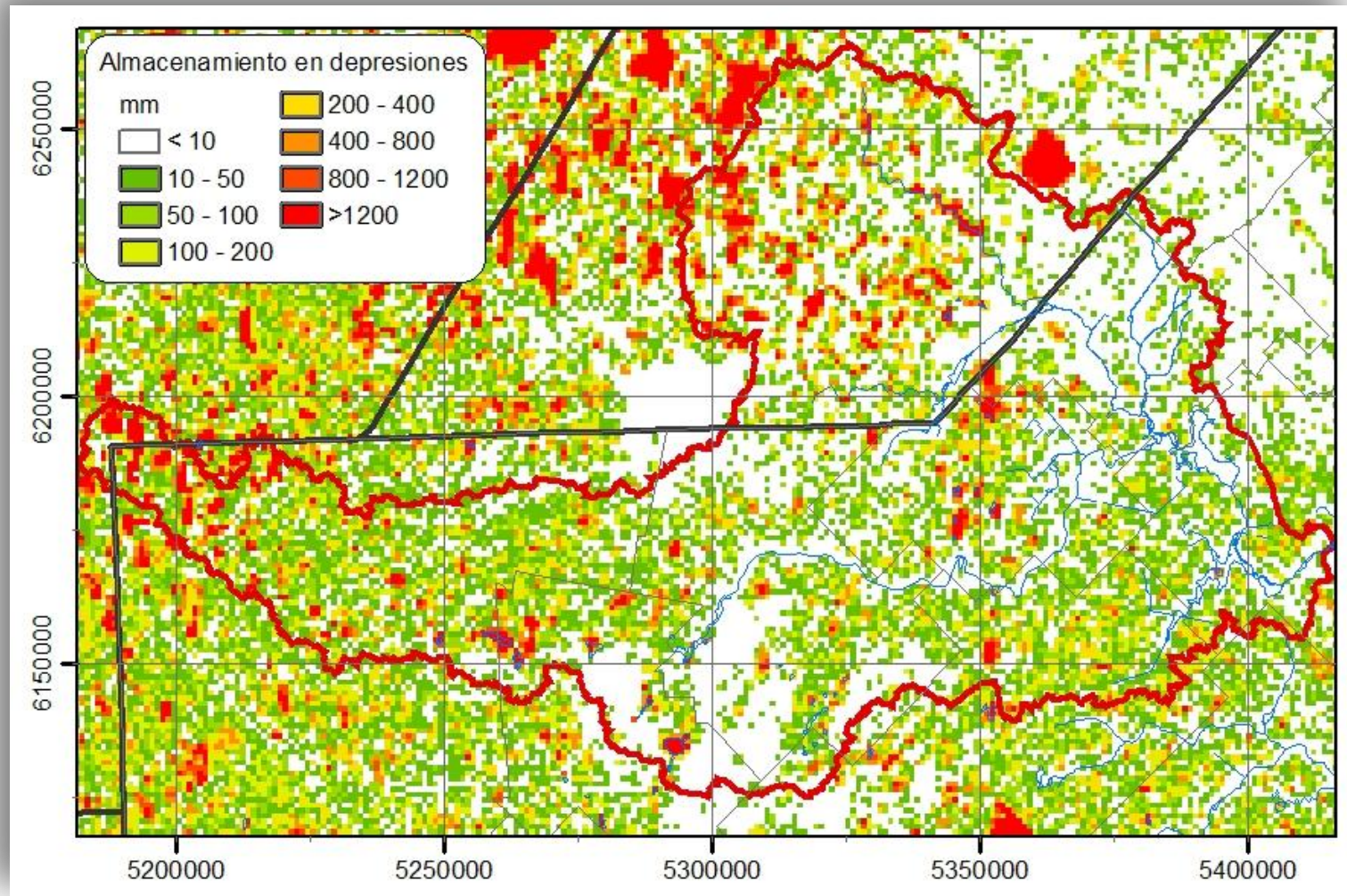


DEM for Land Surface

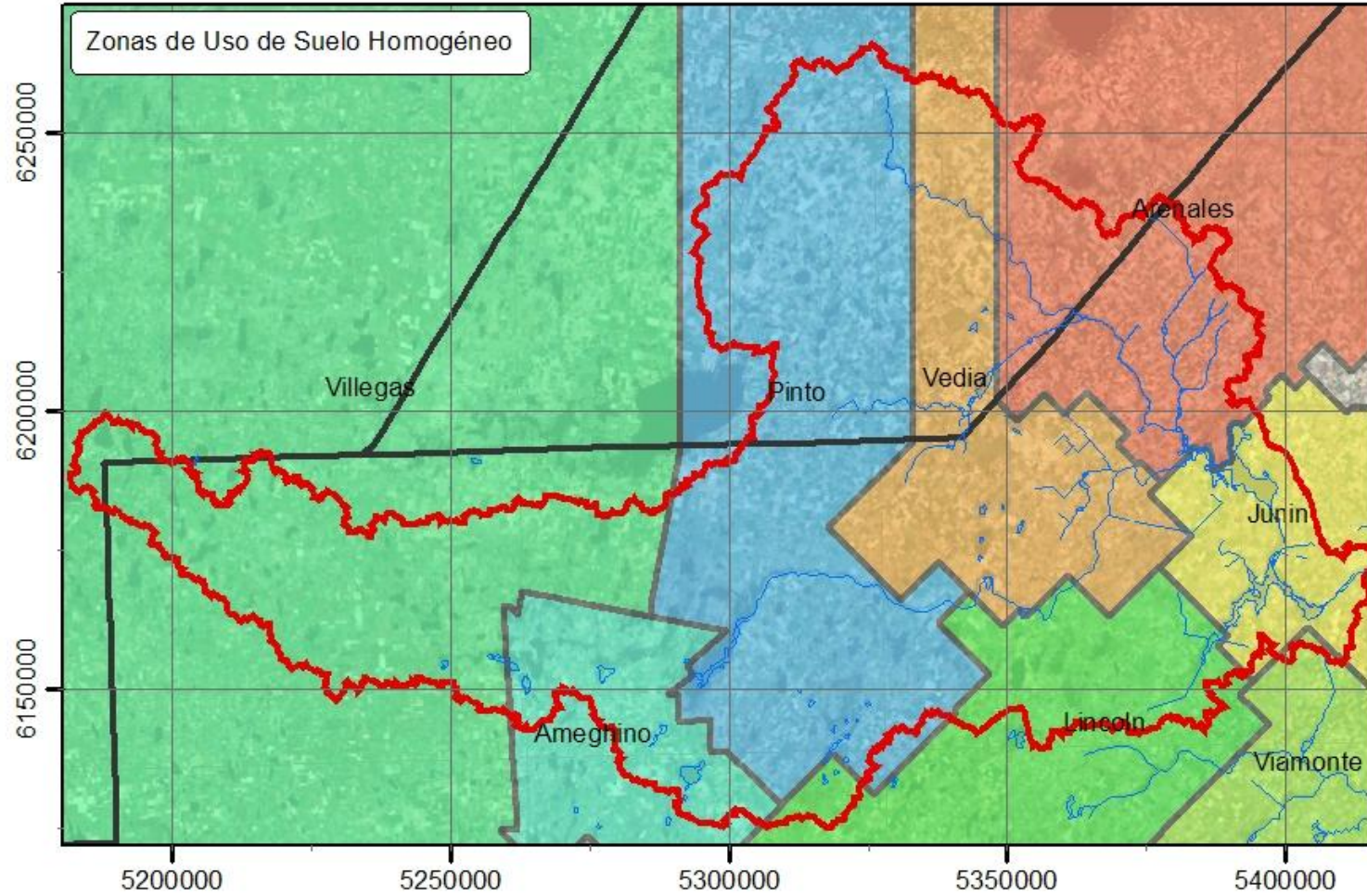


(SRTM)

Depression Storage

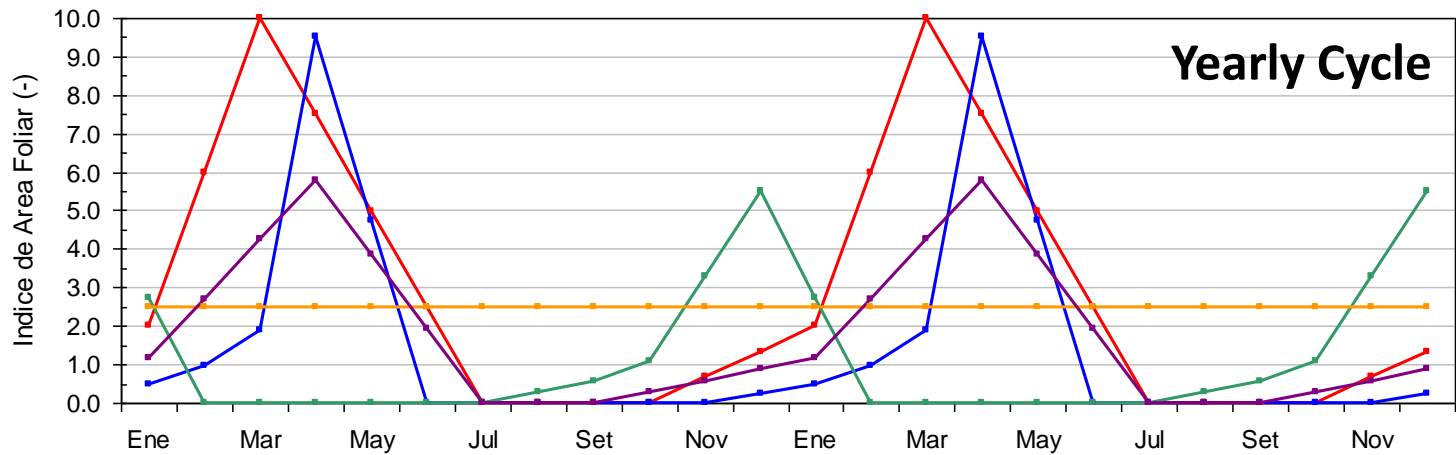


Land Use Map

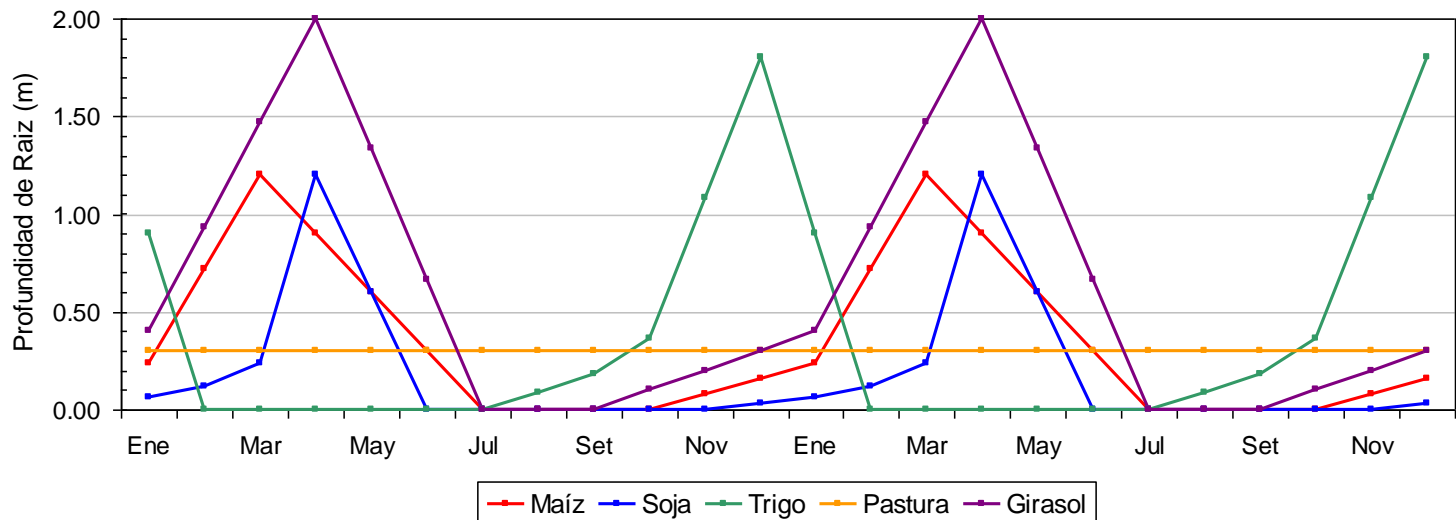


Land Use

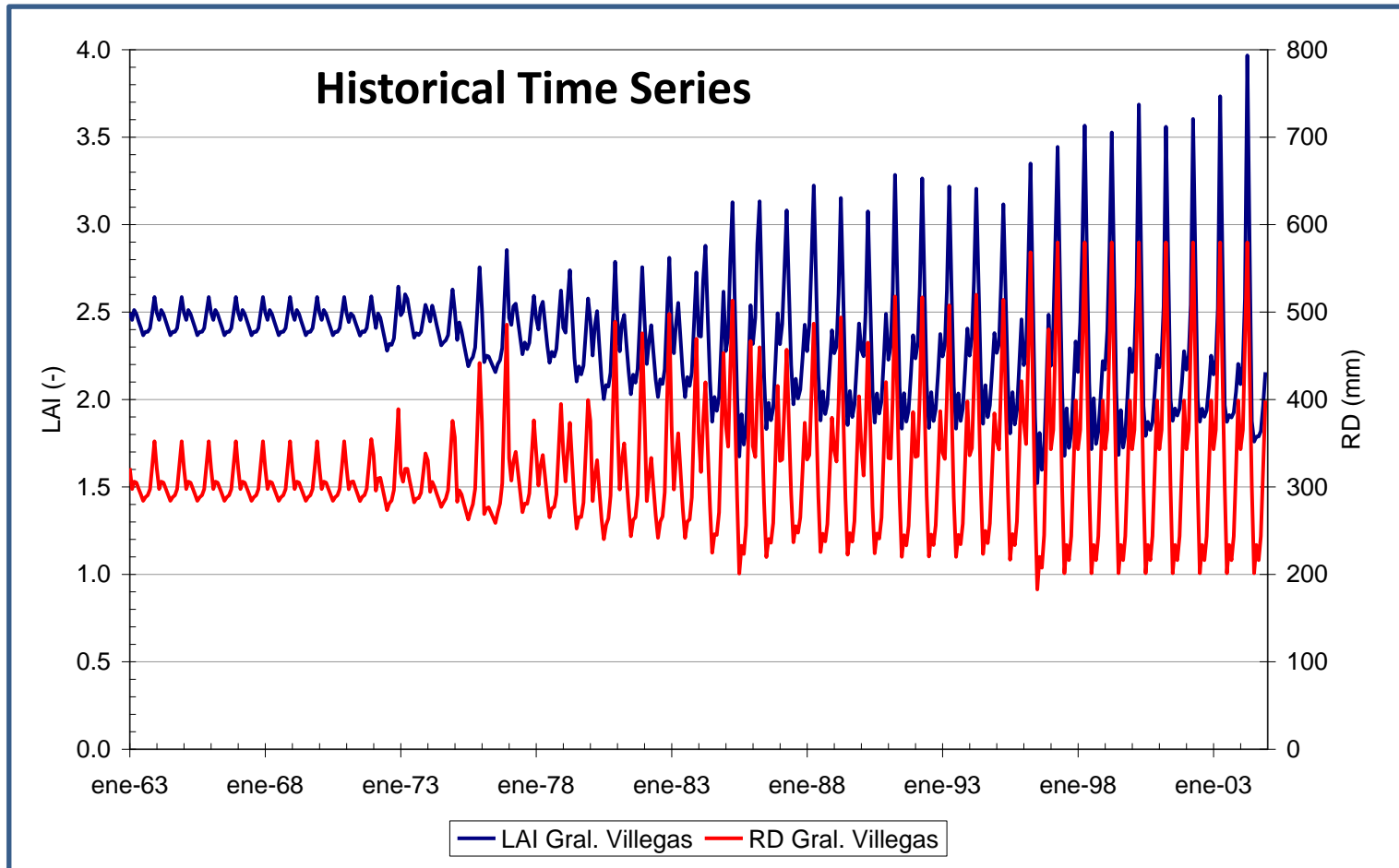
LAI



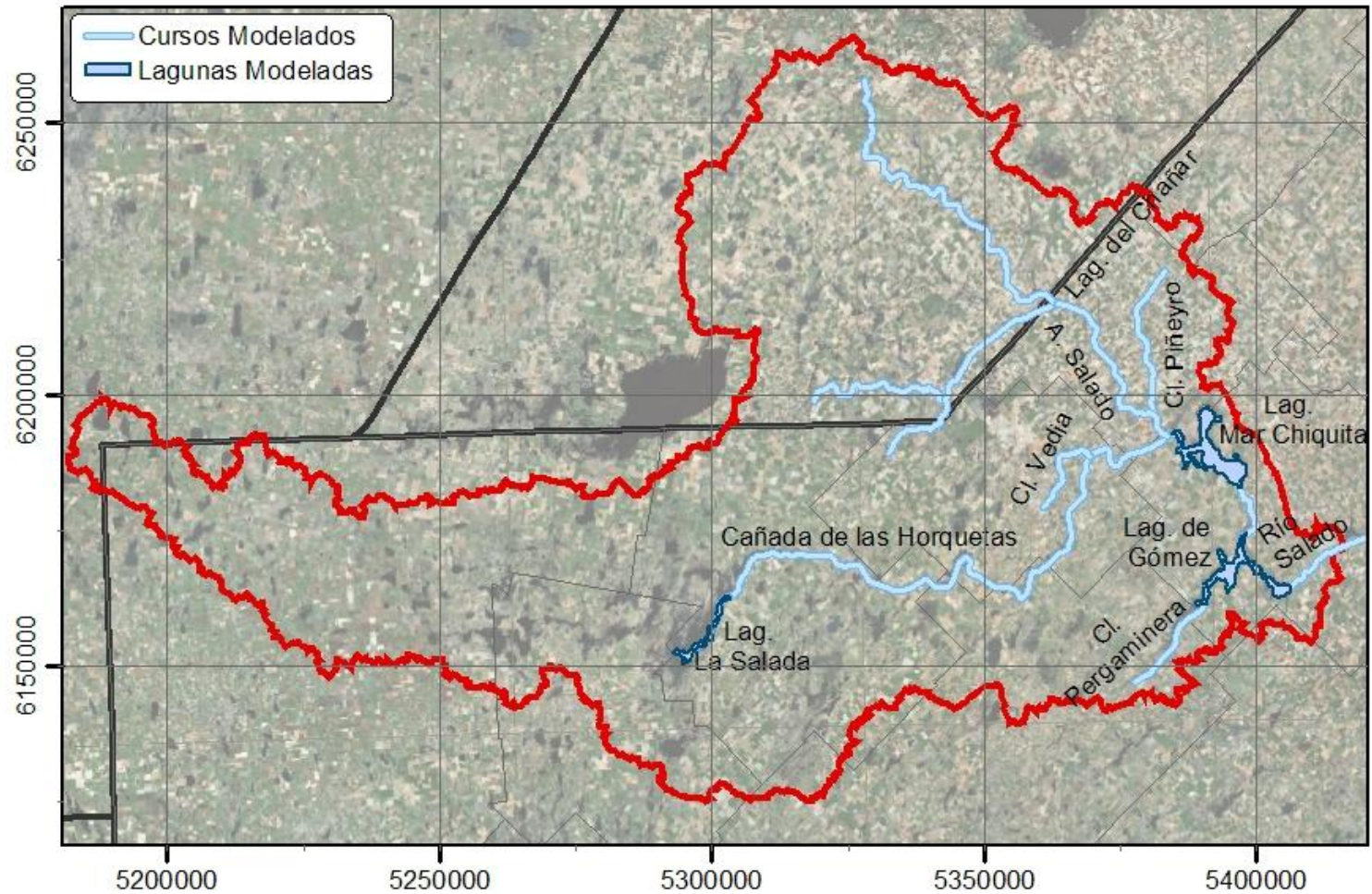
RDF



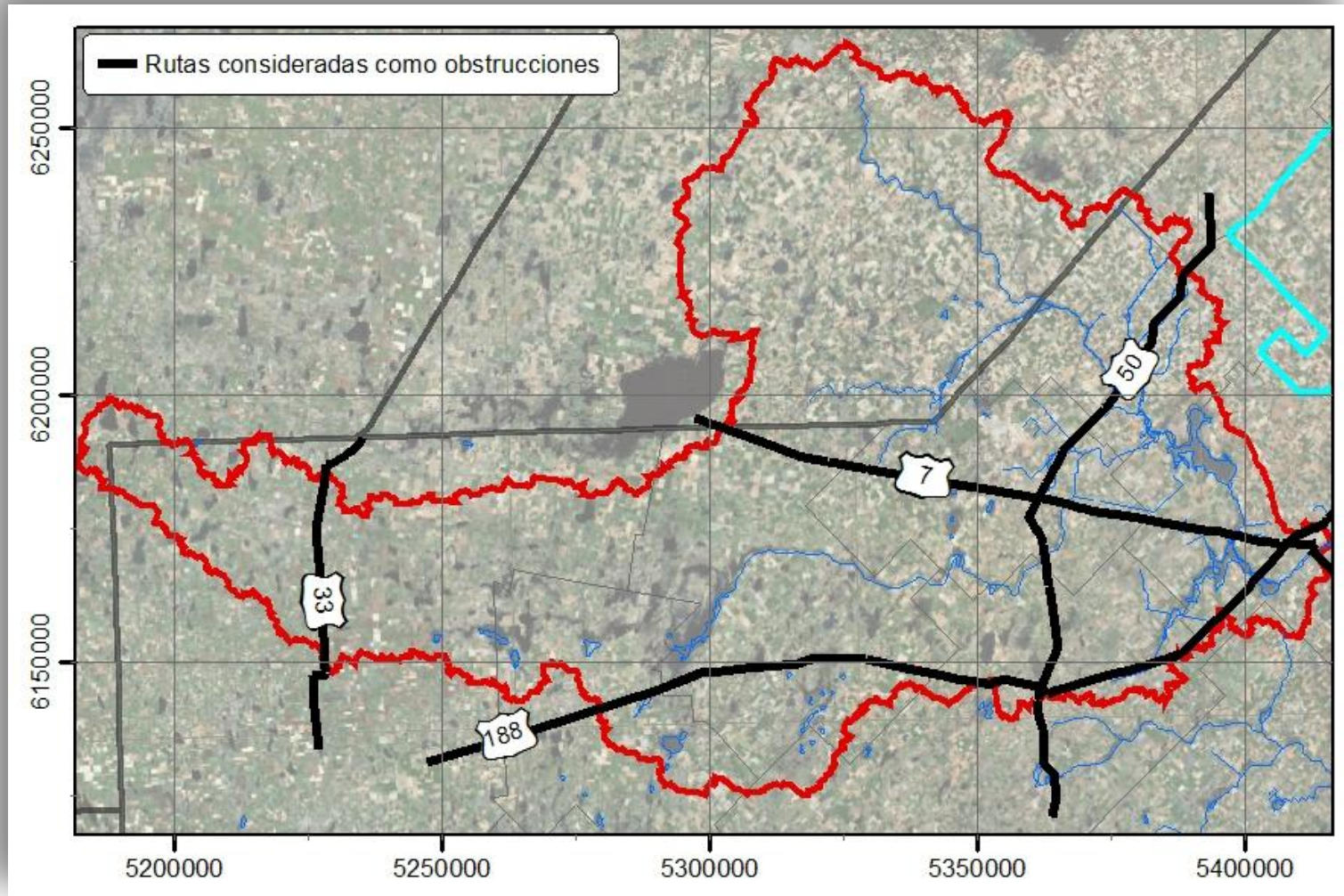
Land Use



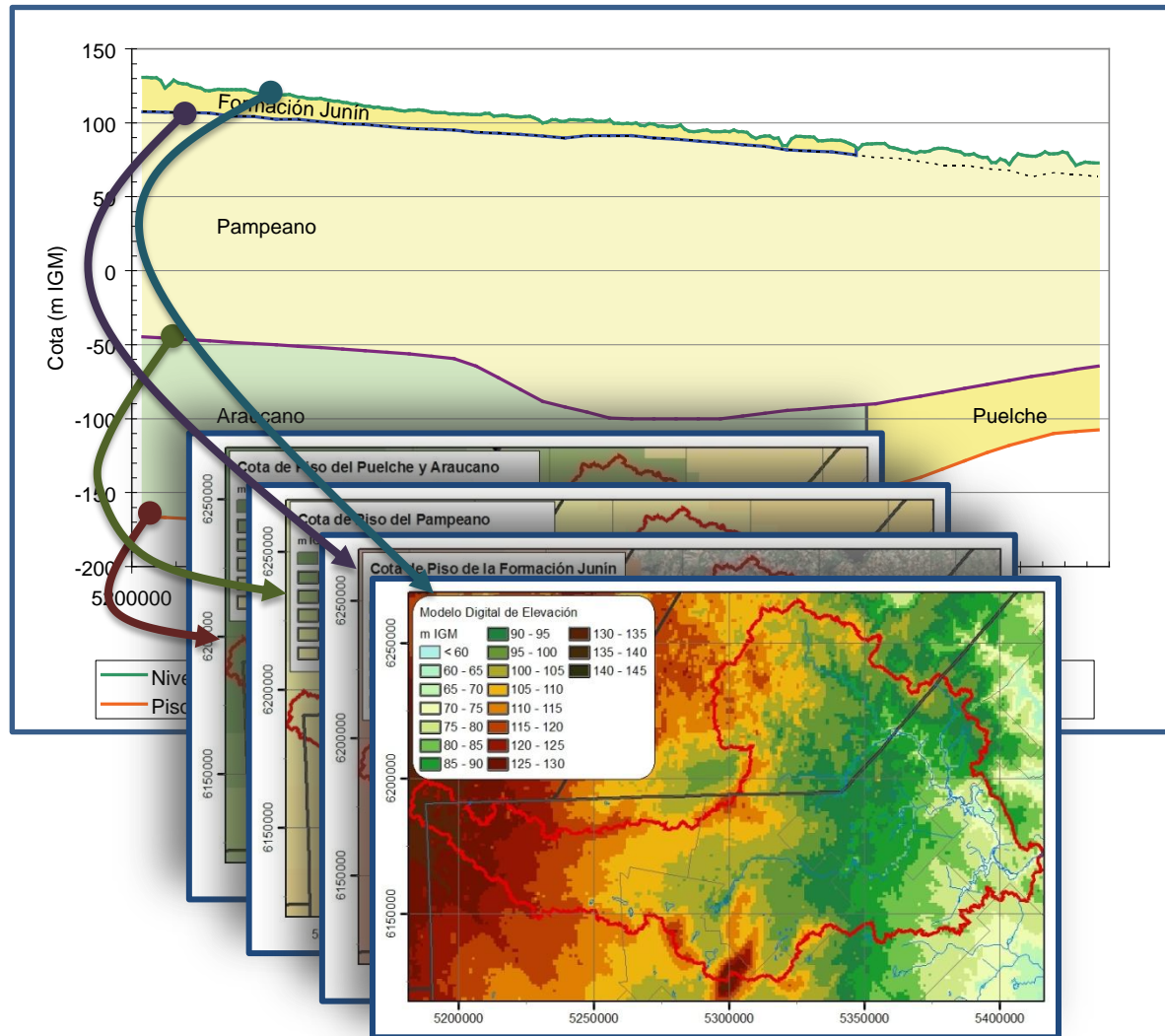
Streams



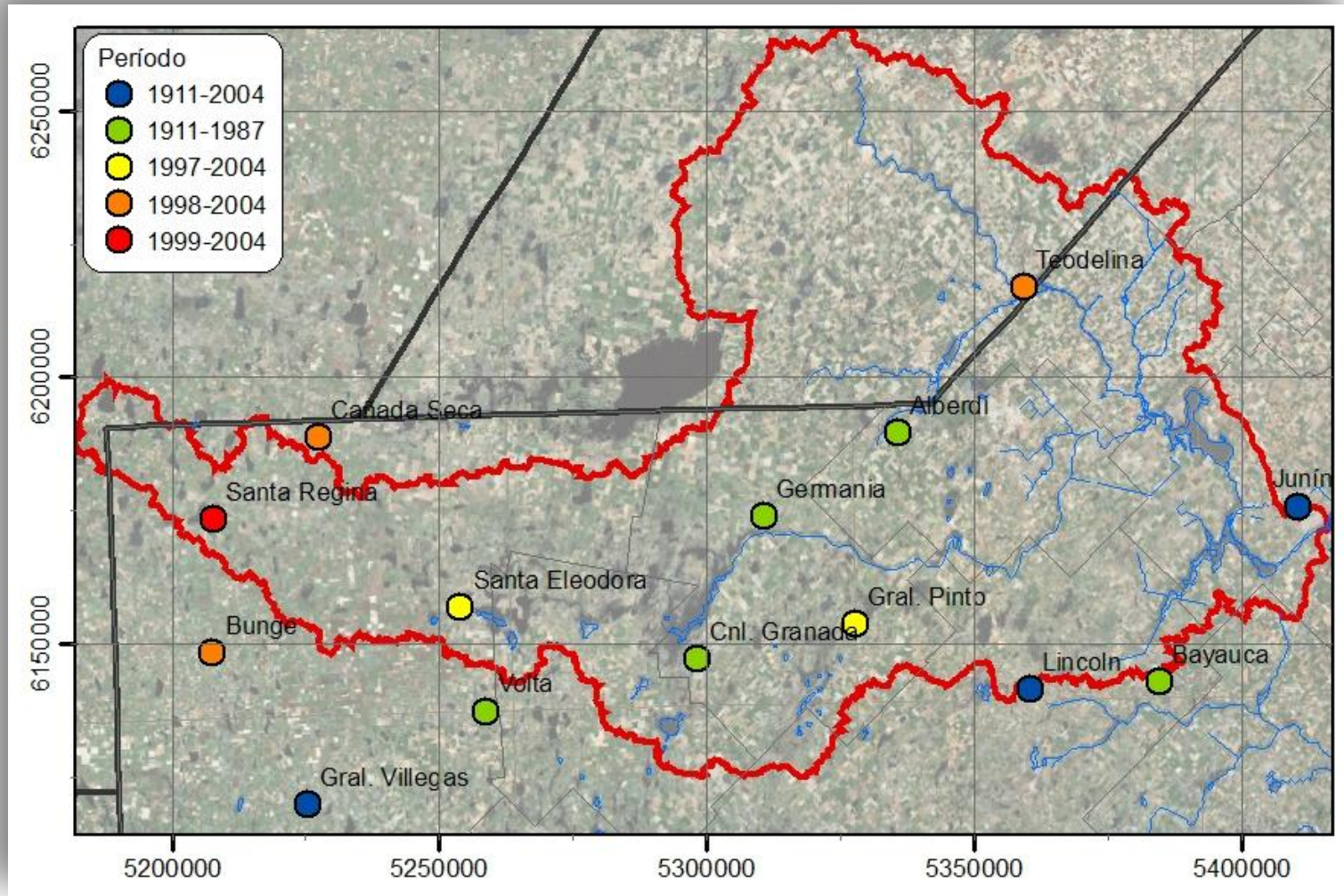
Surface Flow Obstructions



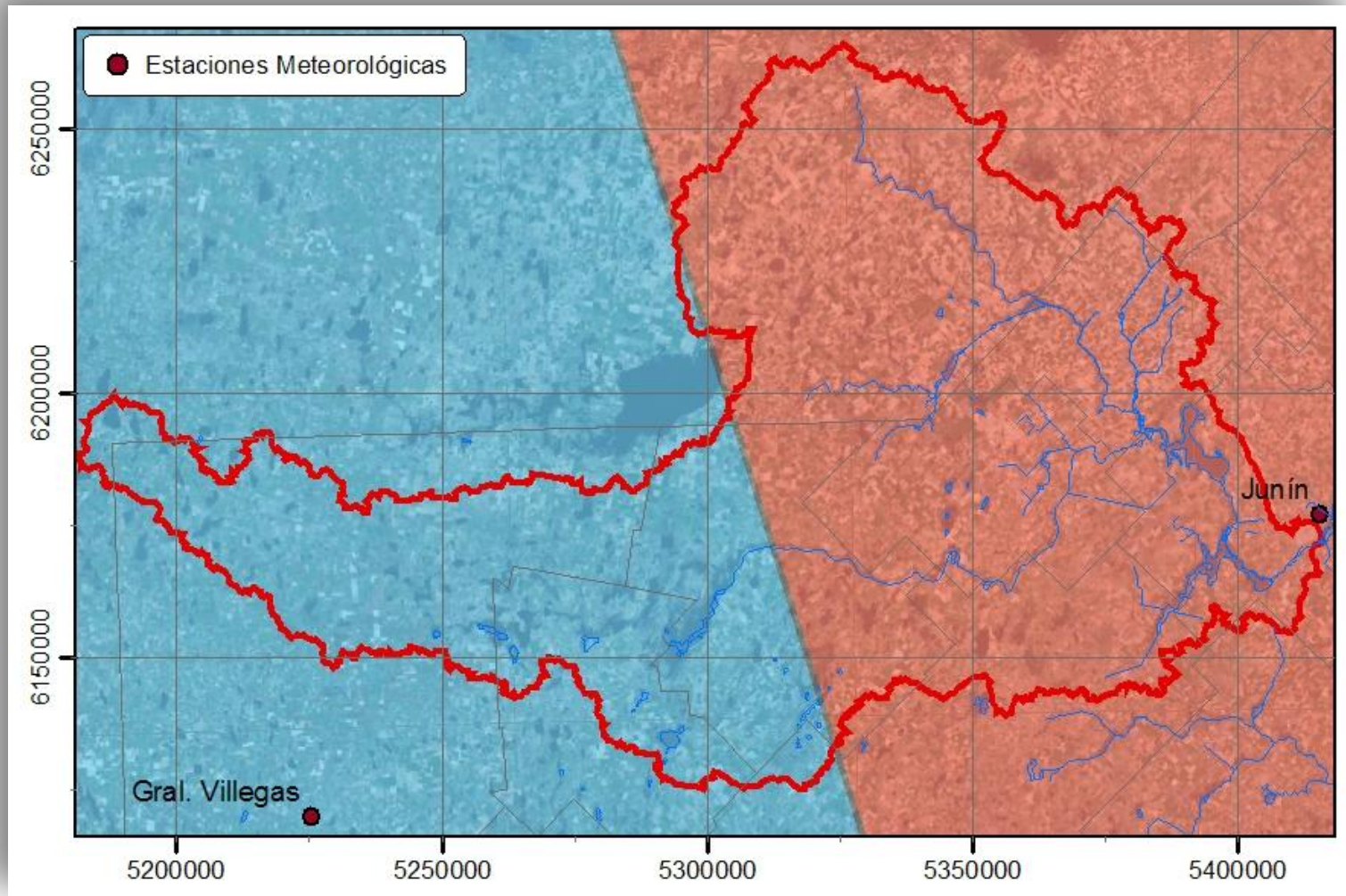
Hydrogeologic Formations



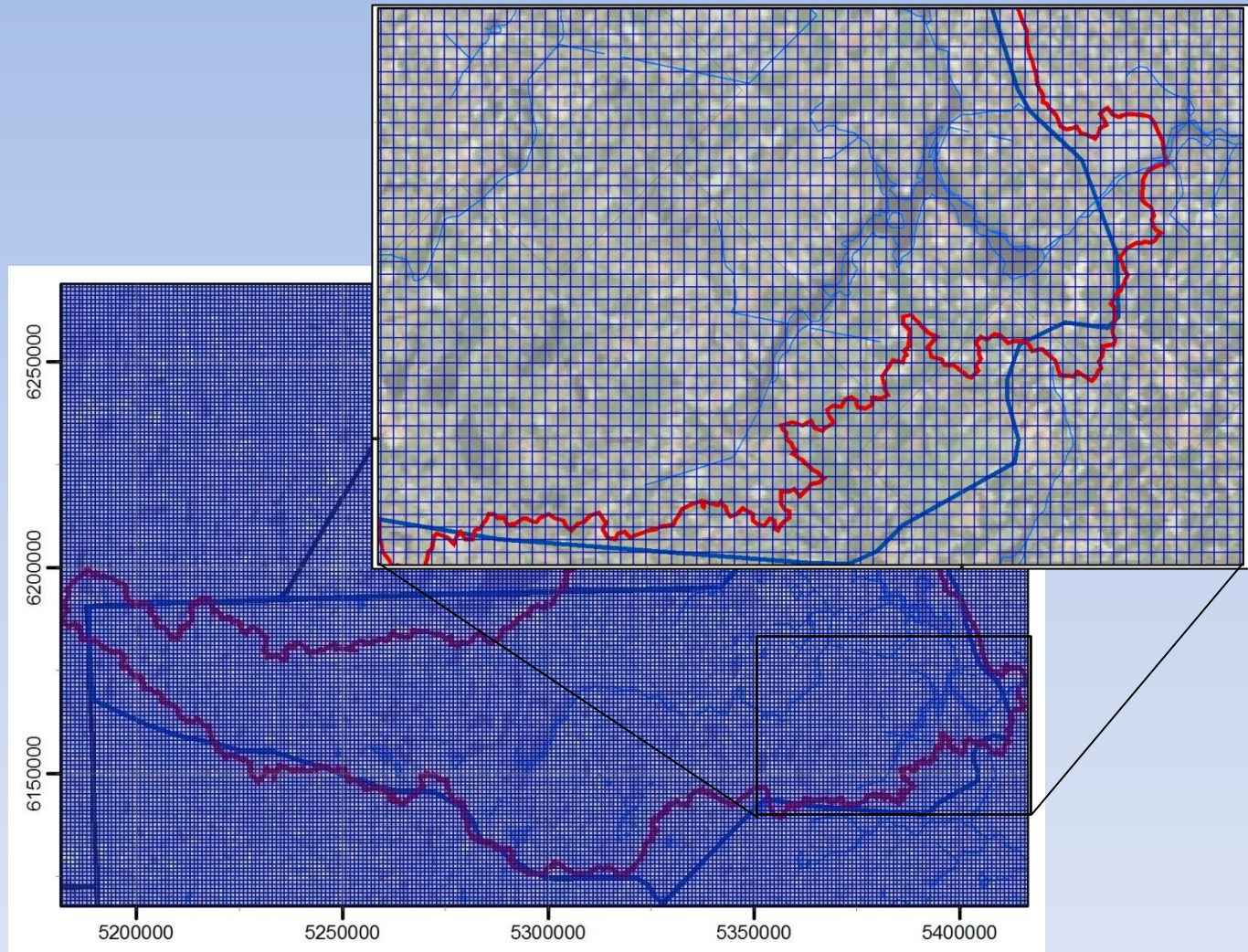
Rainfall Stations



Climatic Stations



Horizontal discretization

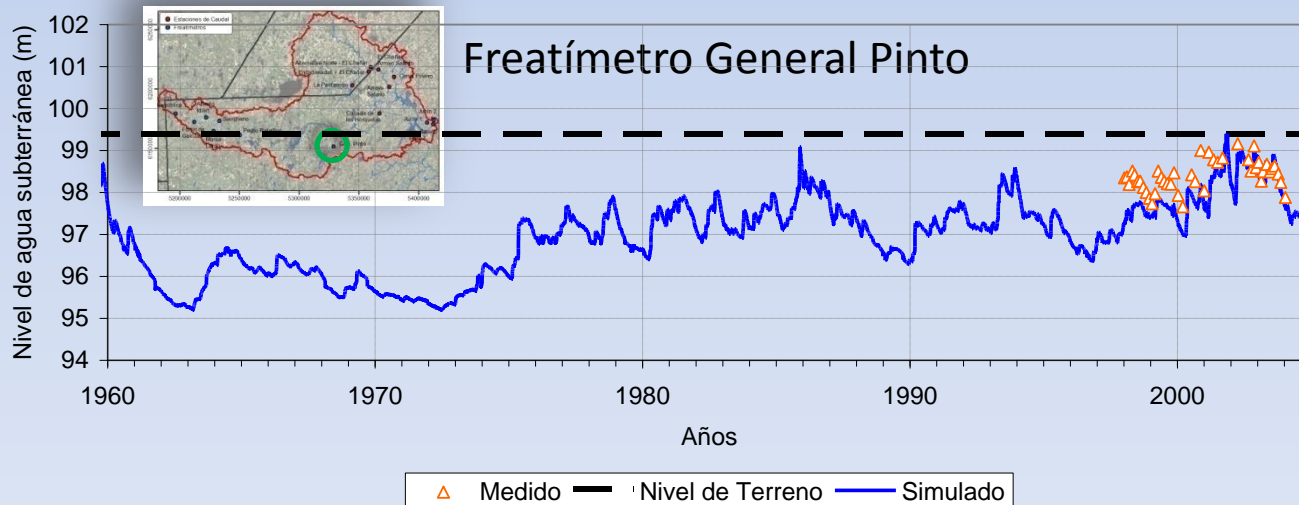
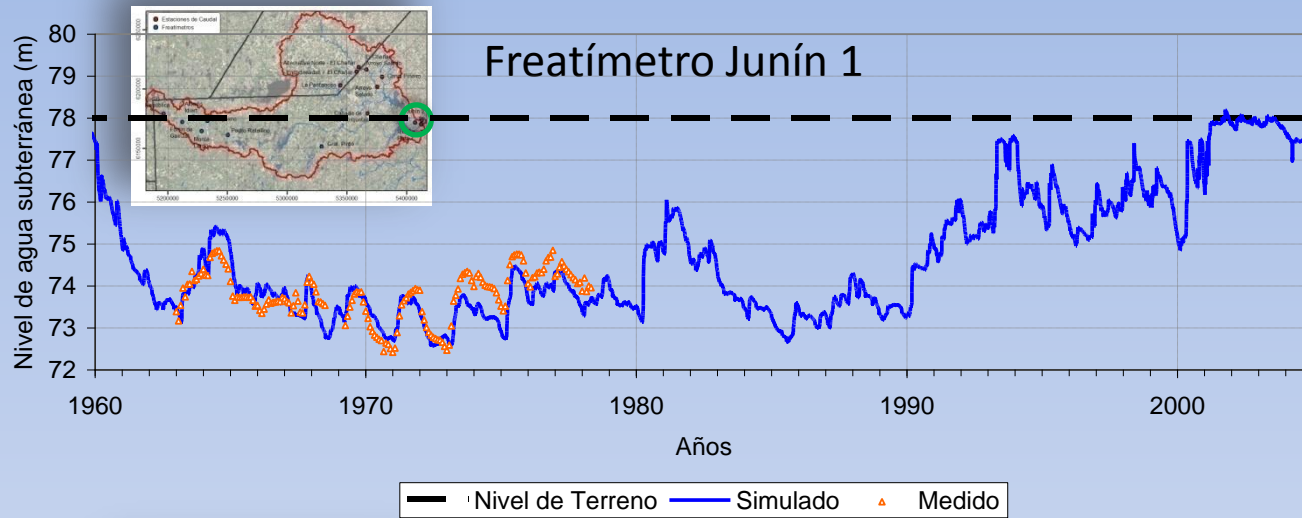


1,000 m x 1,000 m → 14,000 grid cells

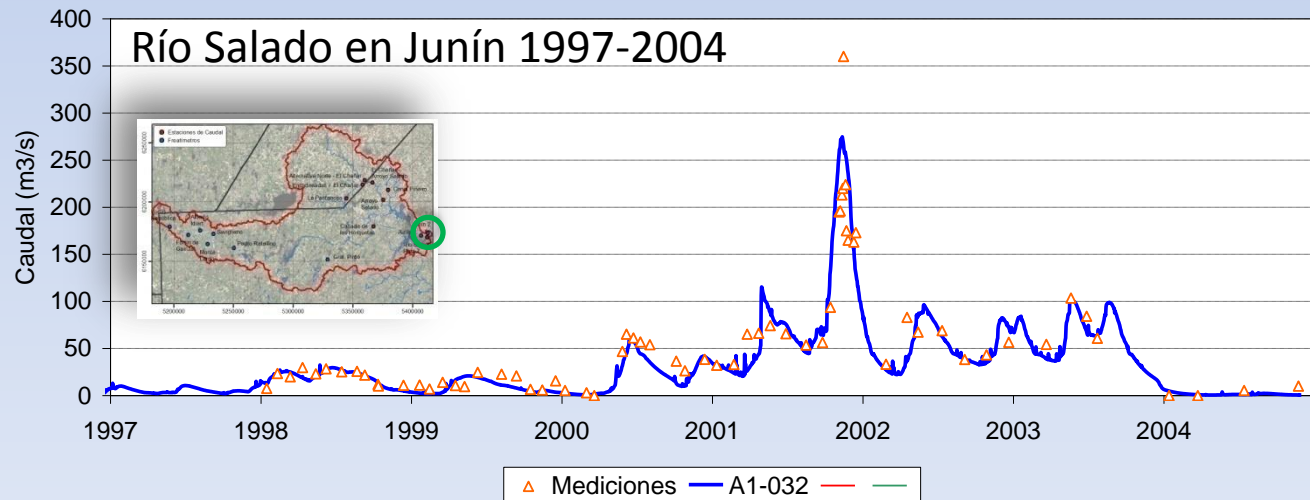
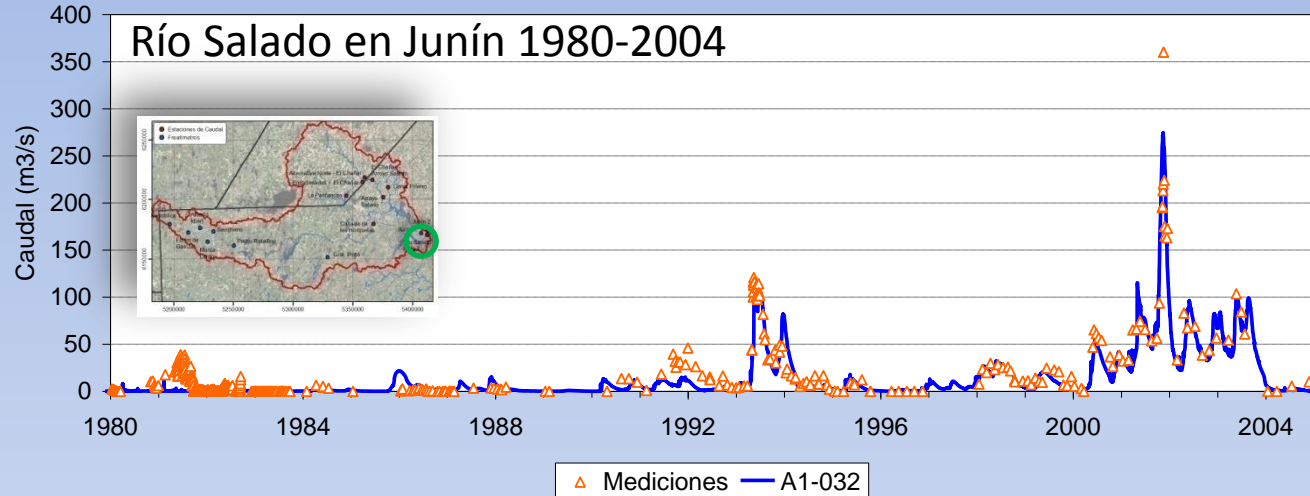
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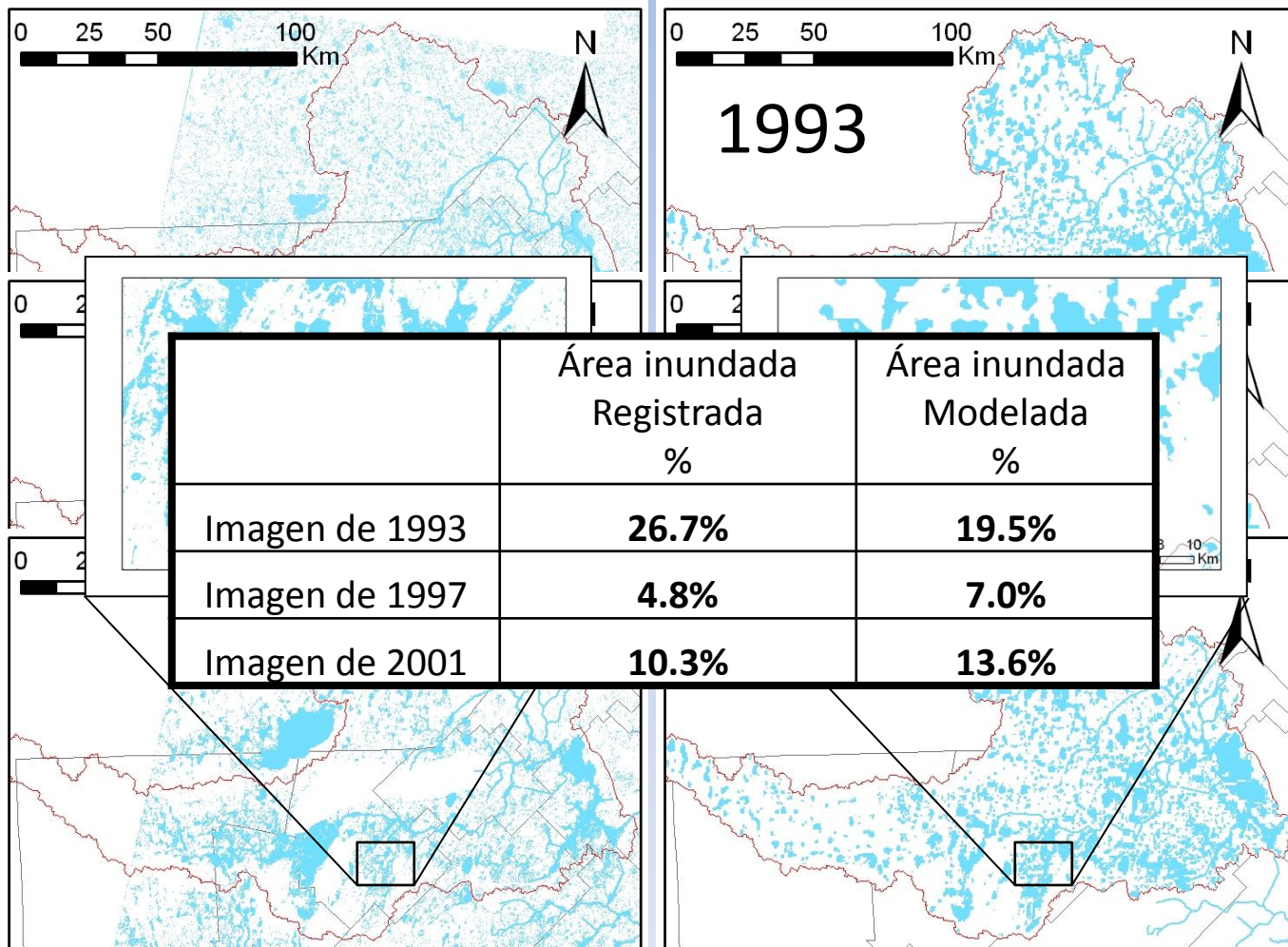
Phreatic levels



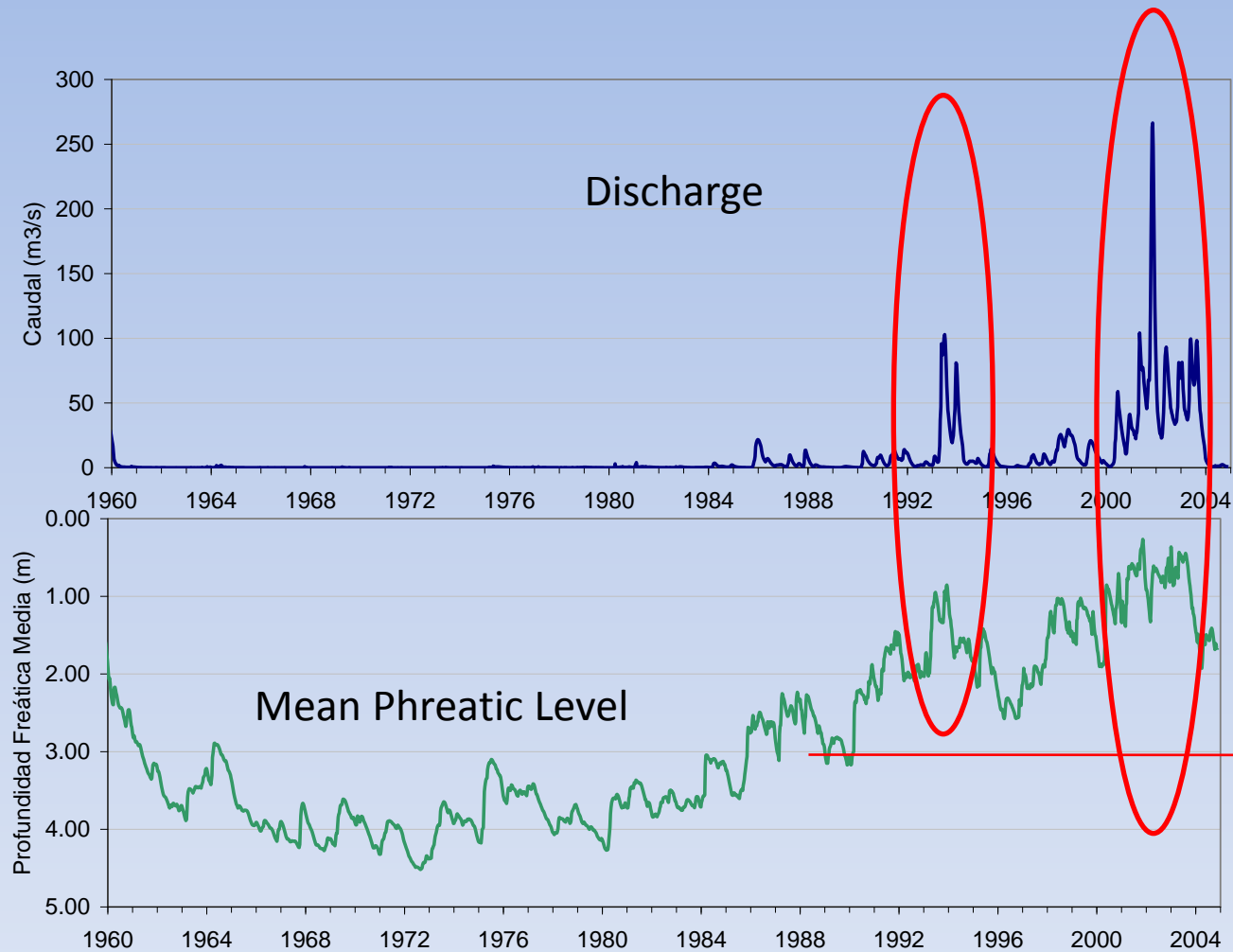
Discharge



Flooded Area

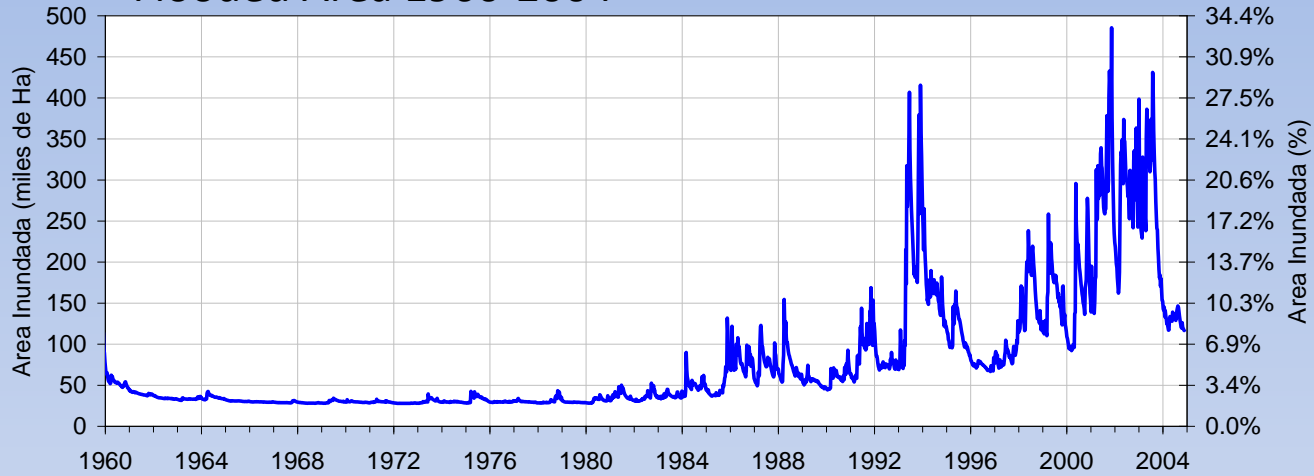


Relation discharge/phreatic level



Flooded Area

Flooded Area 1960-2004



Flooded Area 1991-2004



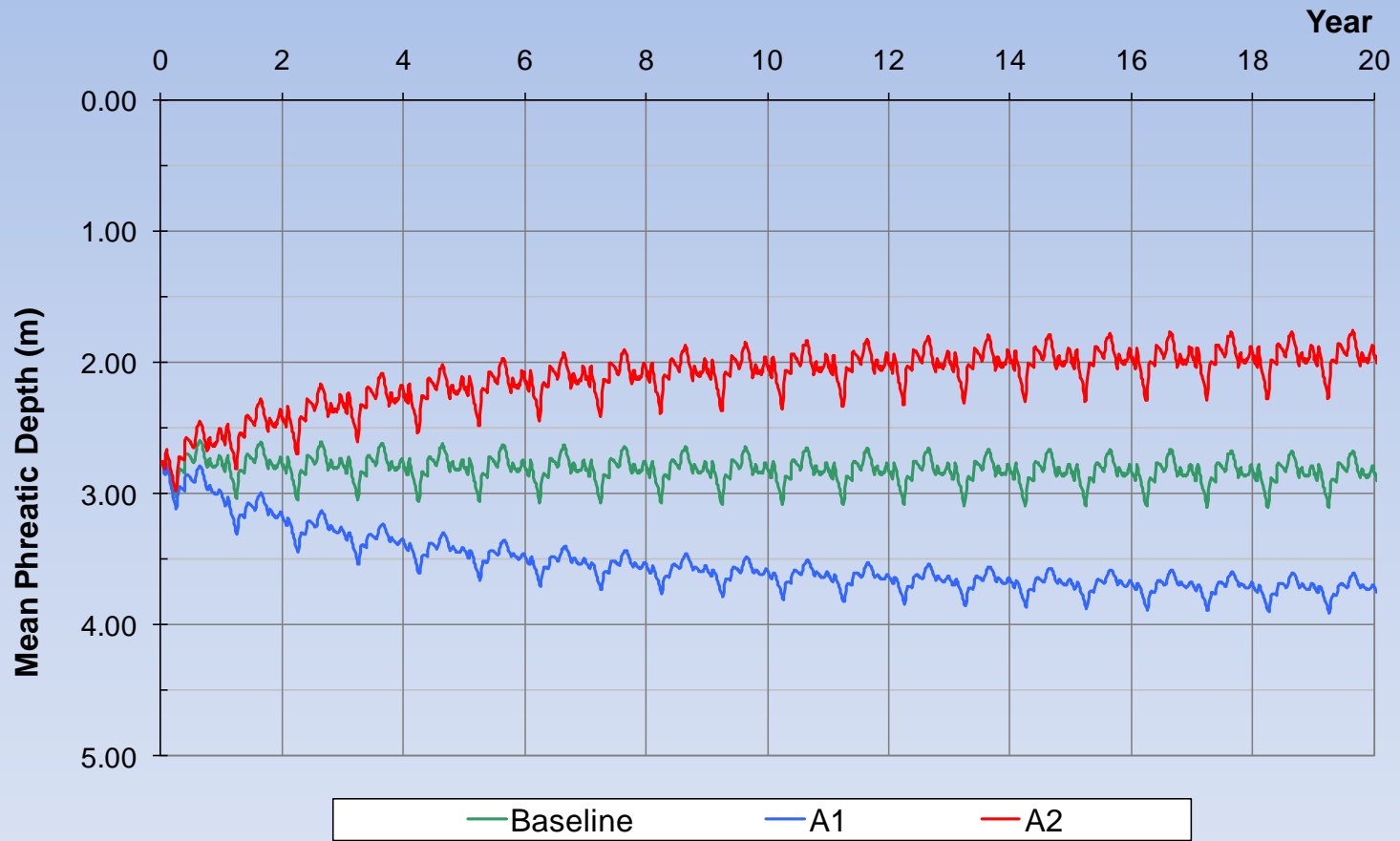
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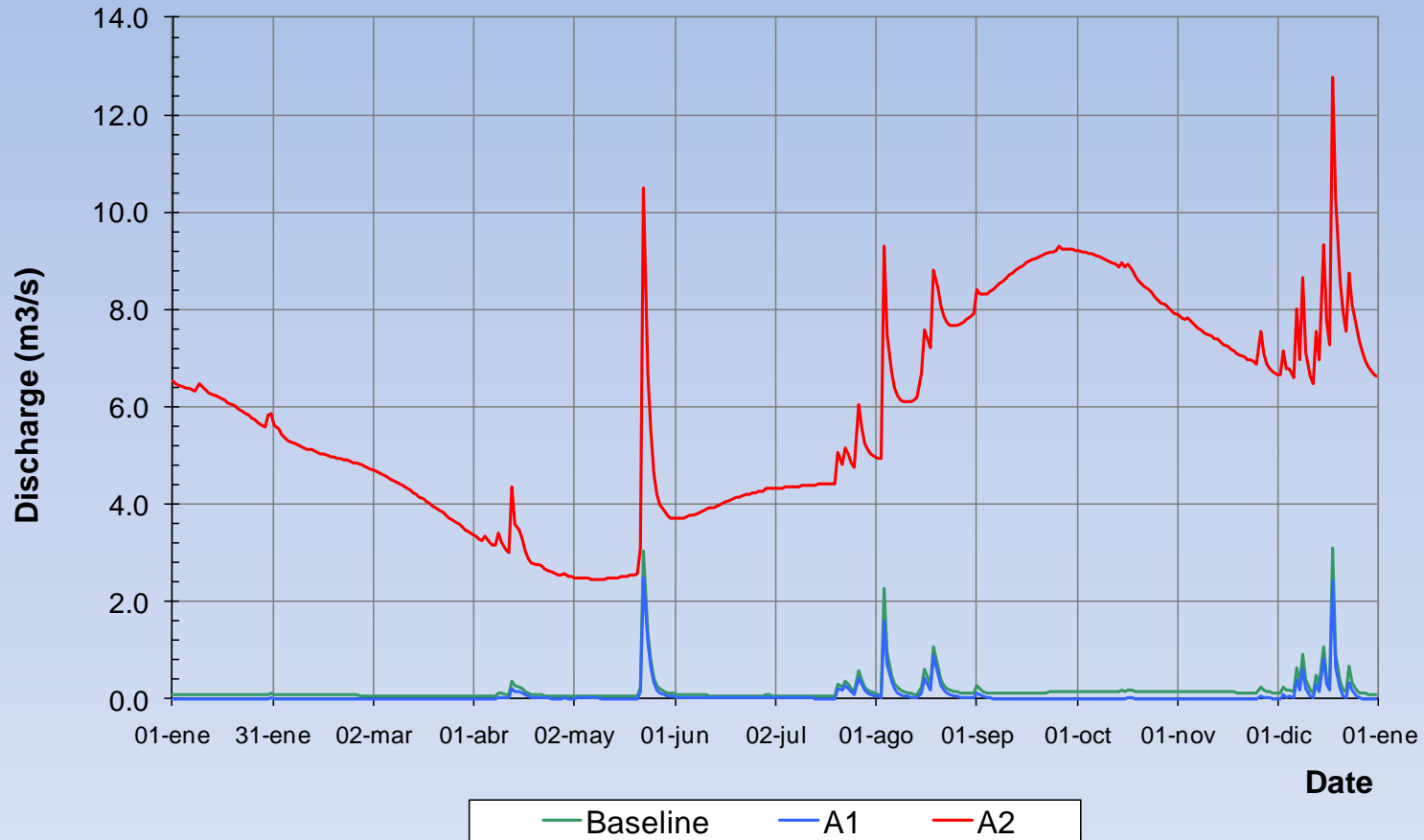
Scenarios of Rainfall Change

- *Scenario A1*: reversion to rainfall conditions back in about three decades
- *Scenario A2*: 30 years projection of yearly mean rainfall increase trend (3 mm/year) during the last decades of the XXth century

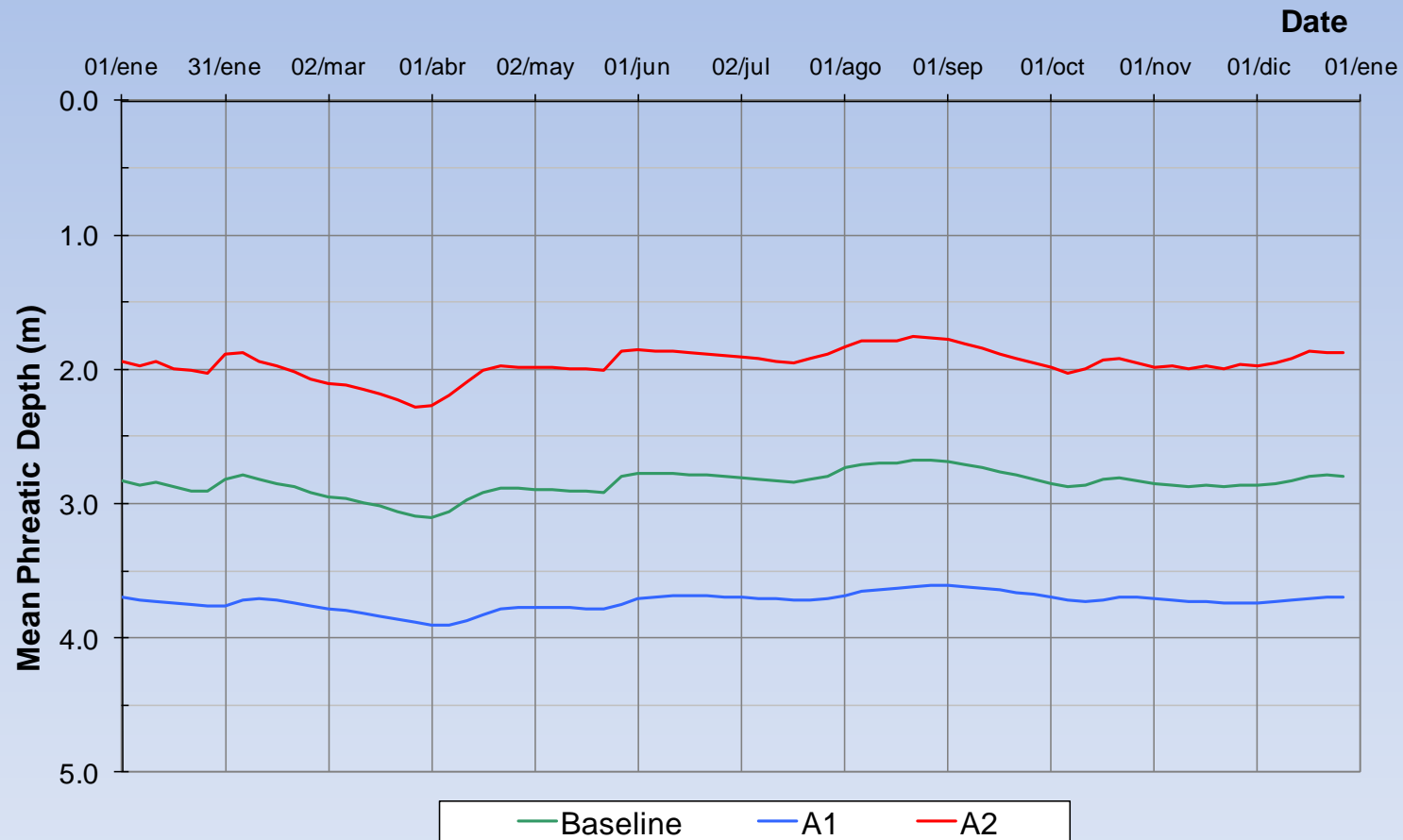
Scenarios of Rainfall Change



Scenarios of Rainfall Change



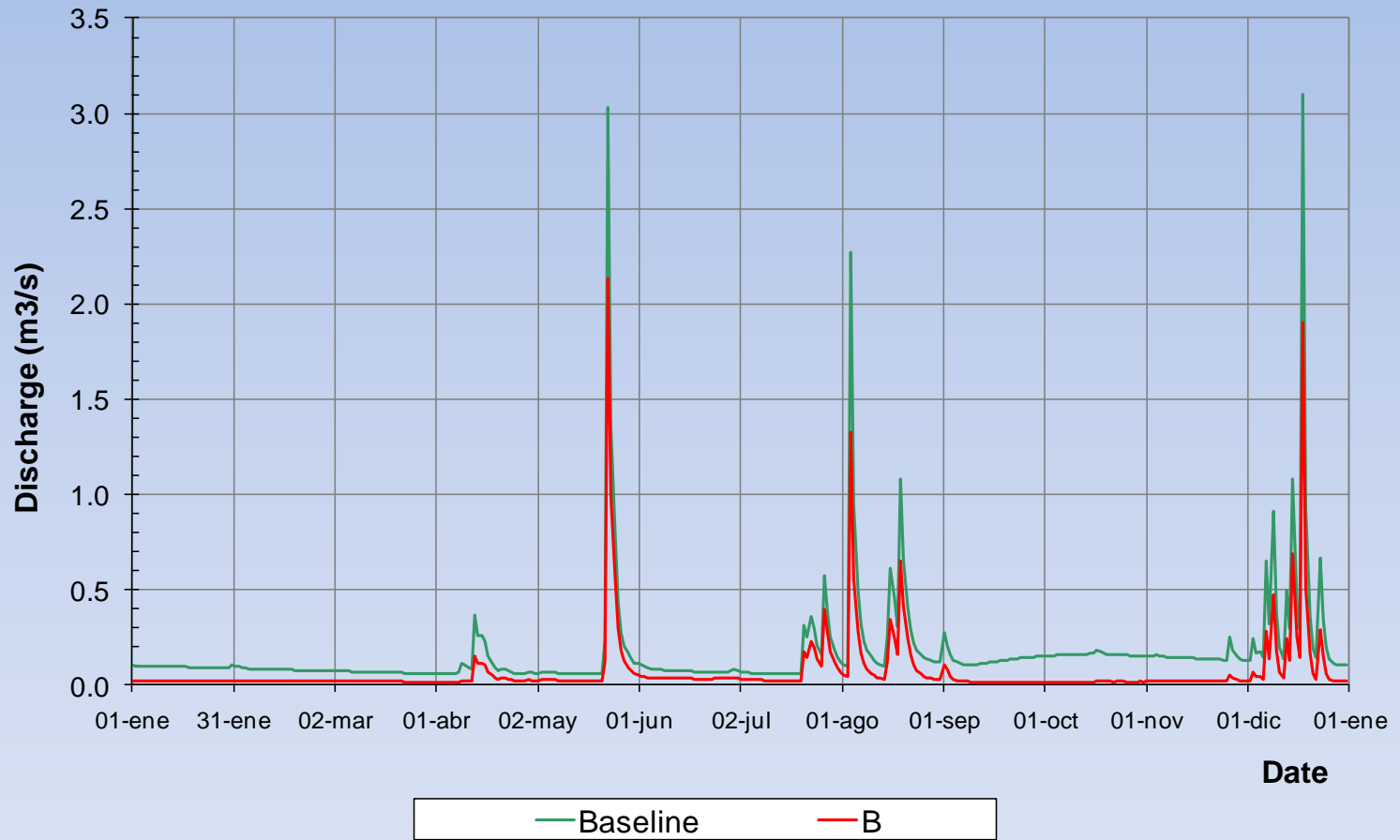
Scenarios of Rainfall Change



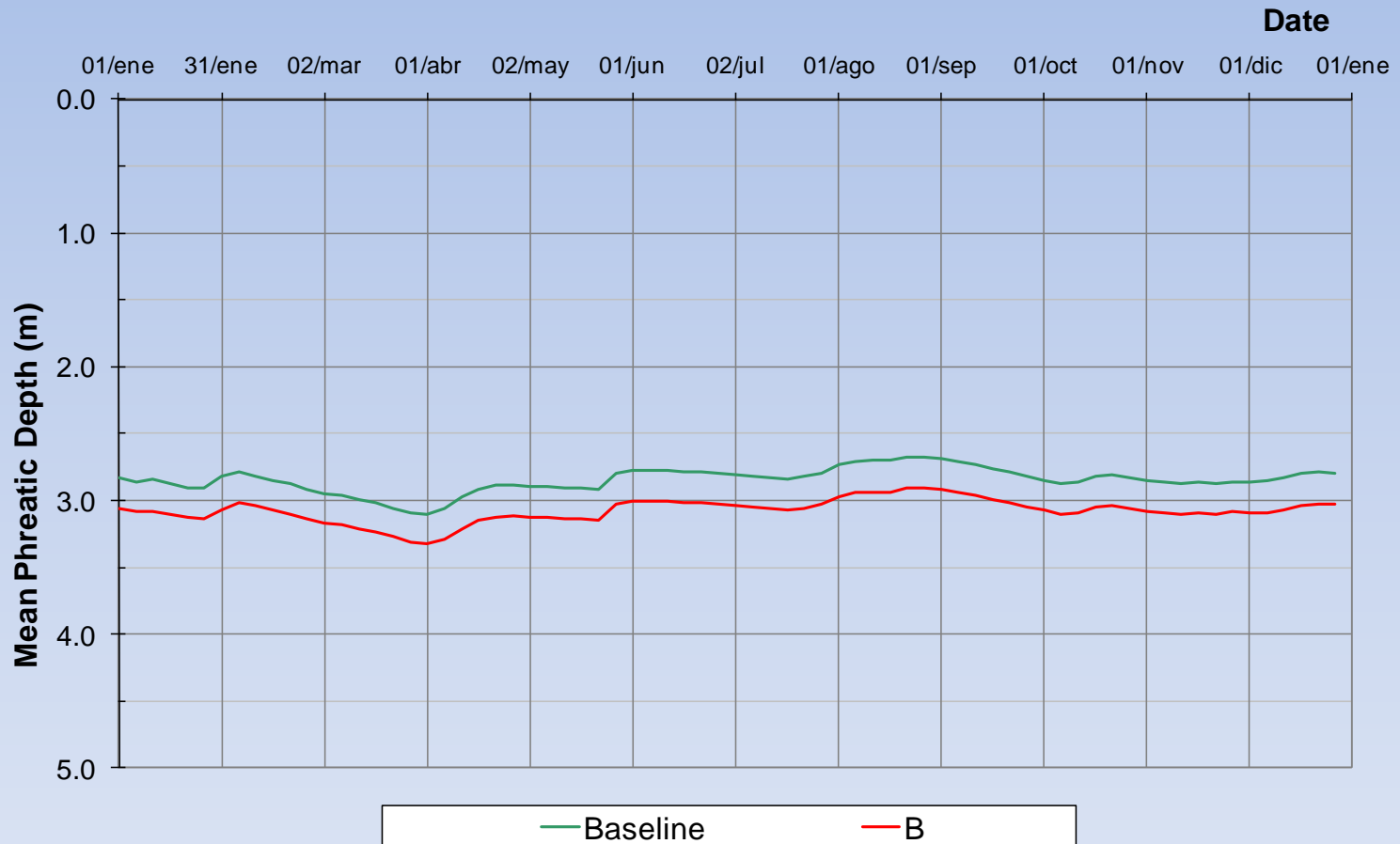
Scenario of Temperature Increase

- *Scenario B*: 30 years projection, with a yearly mean temperature increase of 0.011°C , which leads to an increase in potential evapotranspiration

Scenario of Temperature Increase



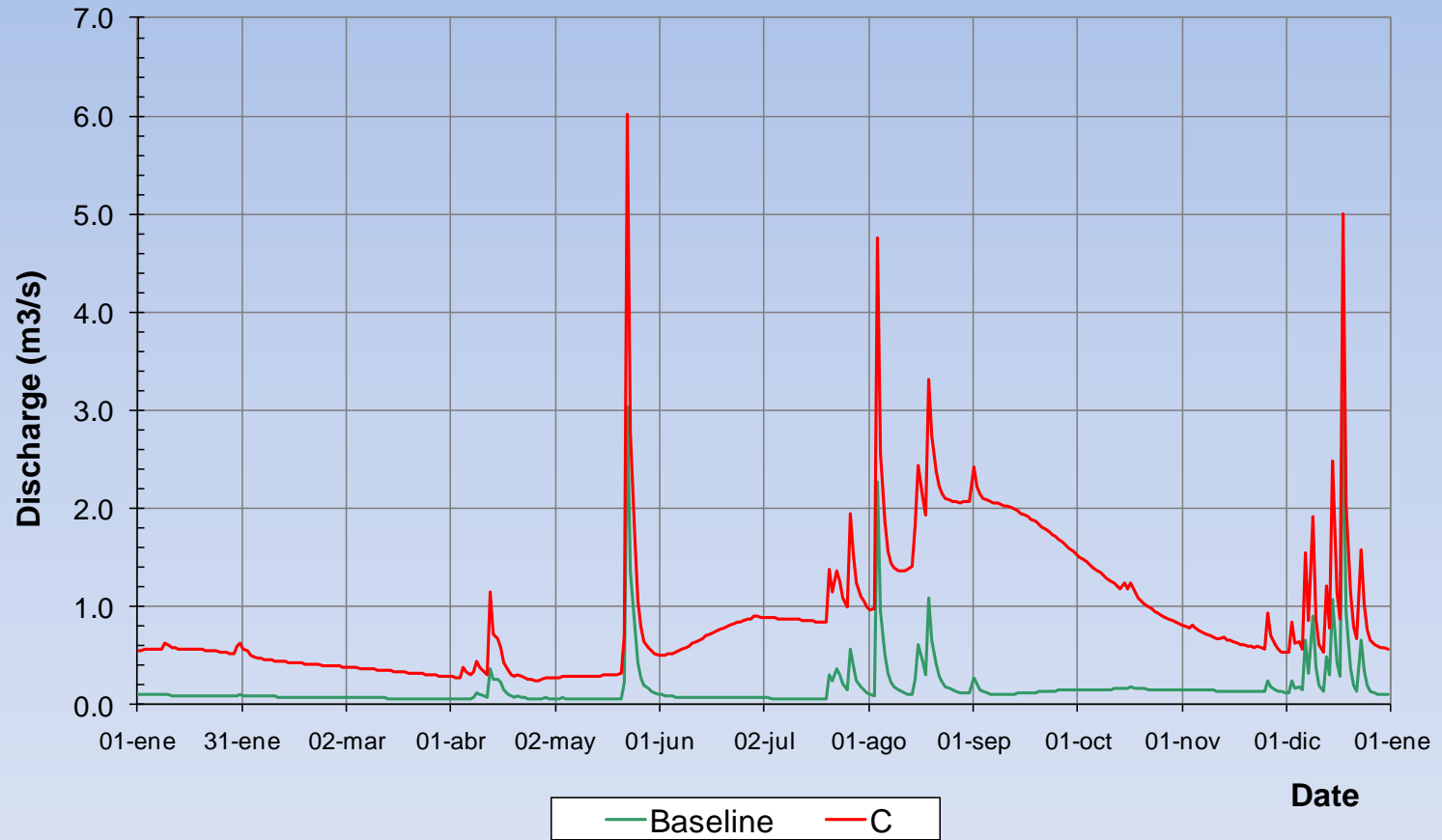
Scenario of Temperature Increase



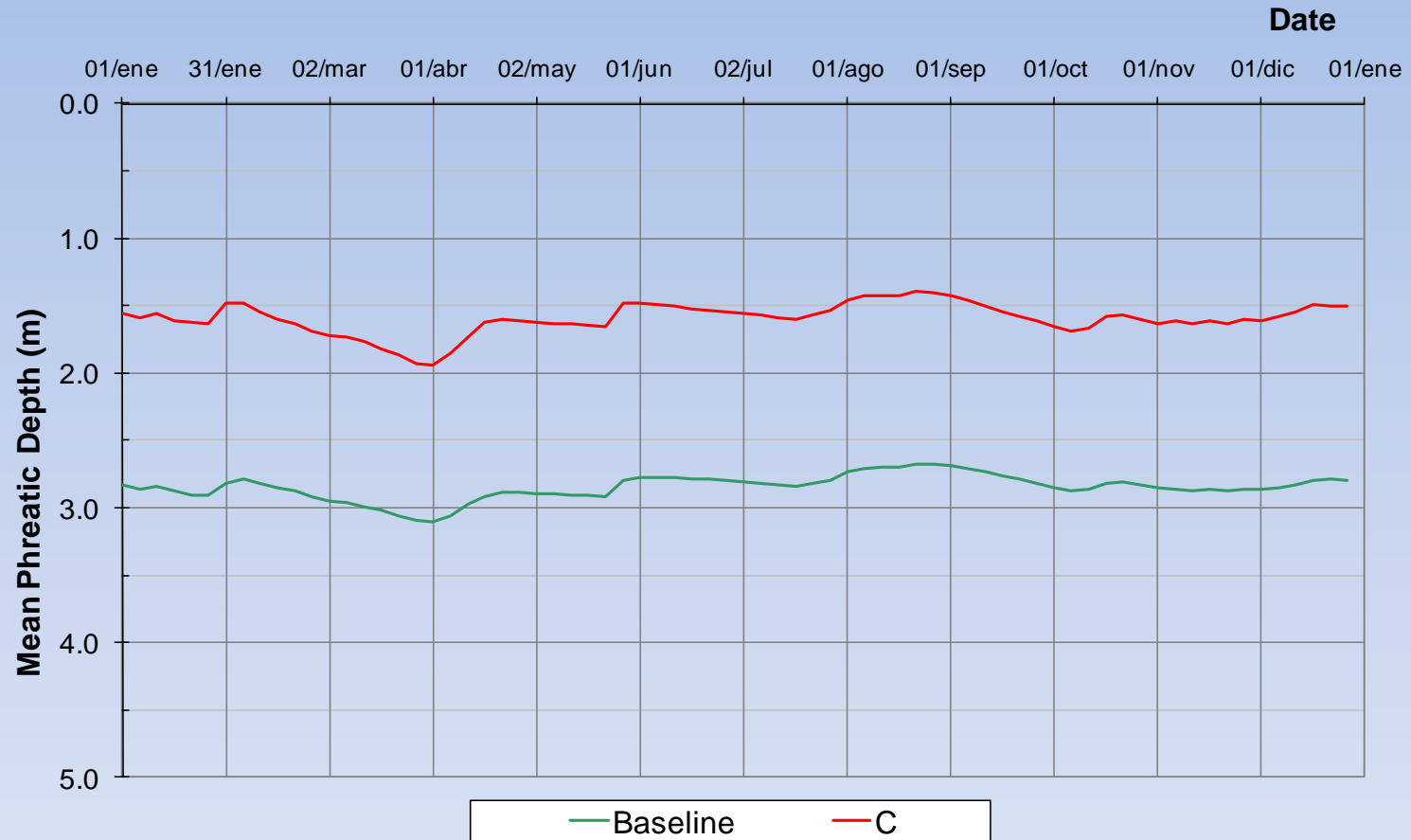
Scenario of Agriculturization

- *Scenario C*: complete agriculturization of the basin with soybean, which reflects in an increase of the amplitude of oscillation of infiltration through changes in LAI and RDF

Scenario of Agriculturization



Scenario of Agriculturization



PRESENTATION

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CONCLUSIONS (1/2)

- *Plausible projected changes in climate and land use over a planning horizon:* significant effects on hydrologic response of very mild slope basin
- *Increase in mean precipitation and agriculturization:* increase in flood risk, decrease in drought risk
- *Increase in temperature:* decrease in flood risk, increase in drought risk
- *Decrease in mean precipitation:* flood risk unchanged, increase in drought risk

CONCLUSIONS (2/2)

- *Methodology to quantify risk changes:* valuable input for sustainable agricultural management planning
- *Time lag* (of about a decade) for system response can be determined, and should be taken into account
- *Combined scenarios* should also be studied

<http://laboratorios.fi.uba.ar/Imm>

Thank you...

