RiverWare User Group Meeting, february 2015

Migration Lerma-2004 model, from Stella to RiverWare

CONAGUA
COMISIÓN NACIONAL DEL AGUA

UNIVERSIDAD AUTÓNOMA DE ZACATECAS
FRANCISCO GARCÍA SALINAS

RiverWare User Group Meeting, february 2015

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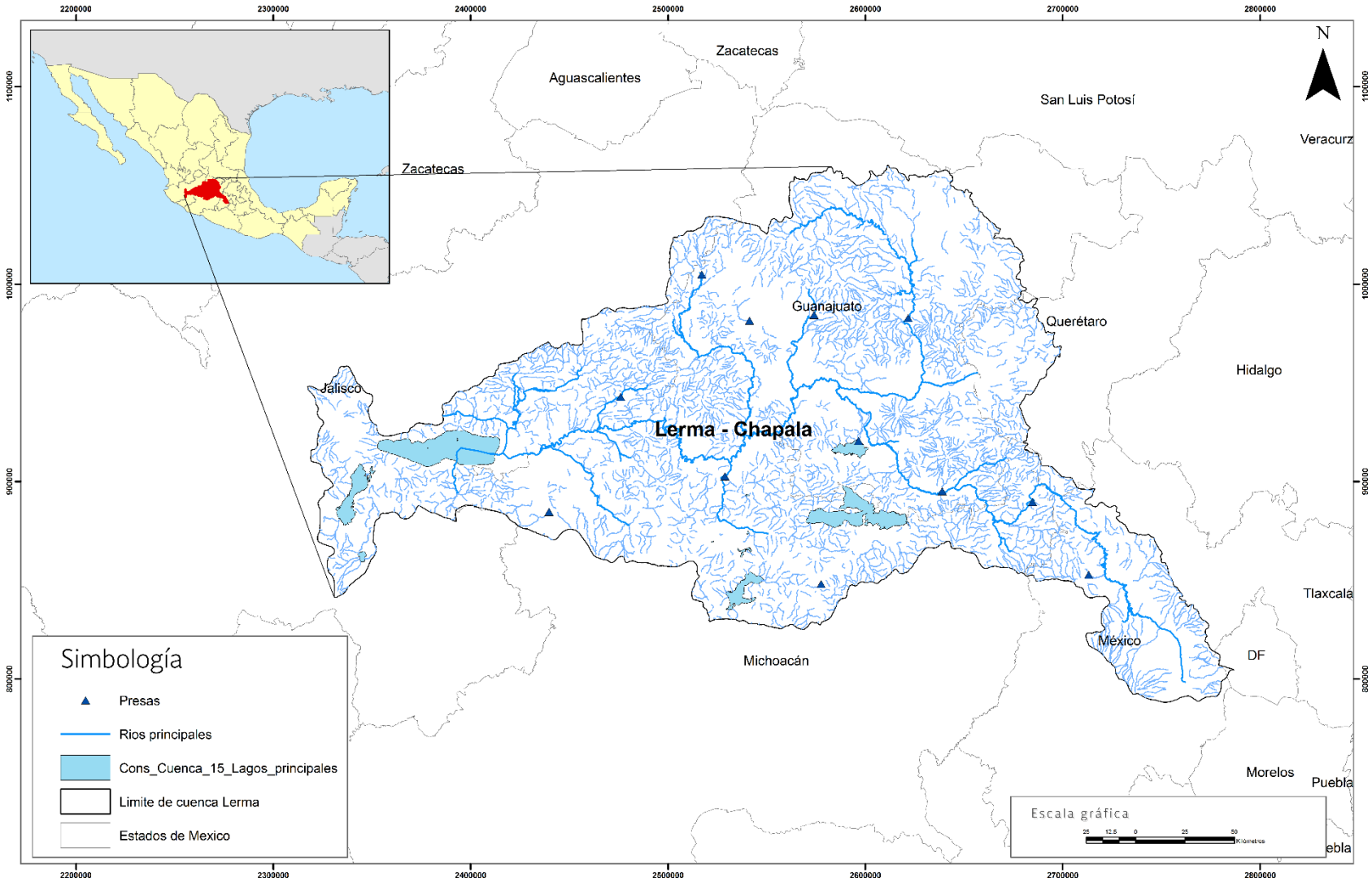
Migration Lerma-2004 model, from Stella to RiverWare

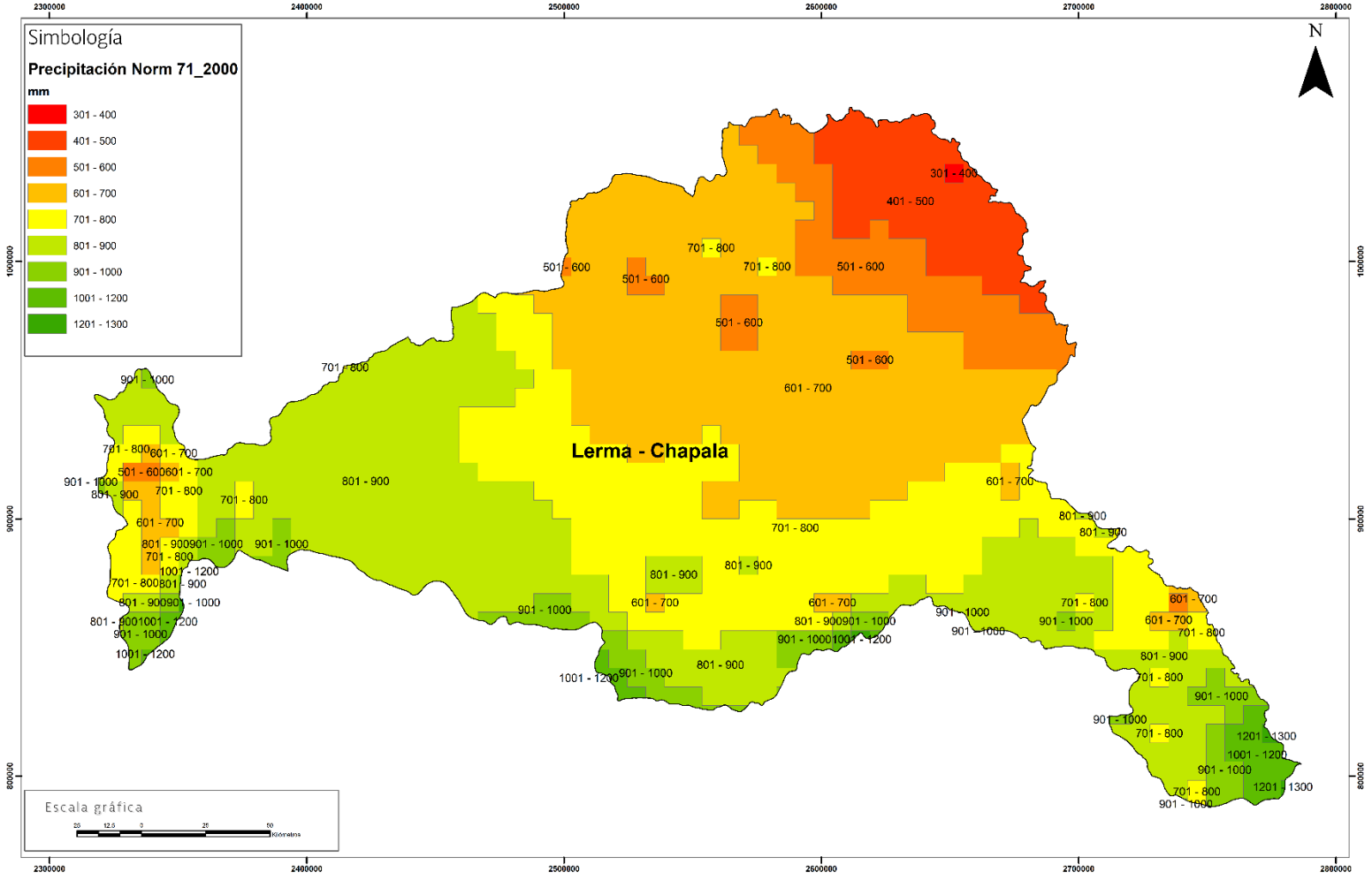
- Objective: To export the information according to the distribution agreement of surface water in the Lerma-Chapala river basin from 2004 Lerma Model developed in Stella Research to RiverWare.

- The Lerma - Chapala river basin is located in the central part of Mexico.

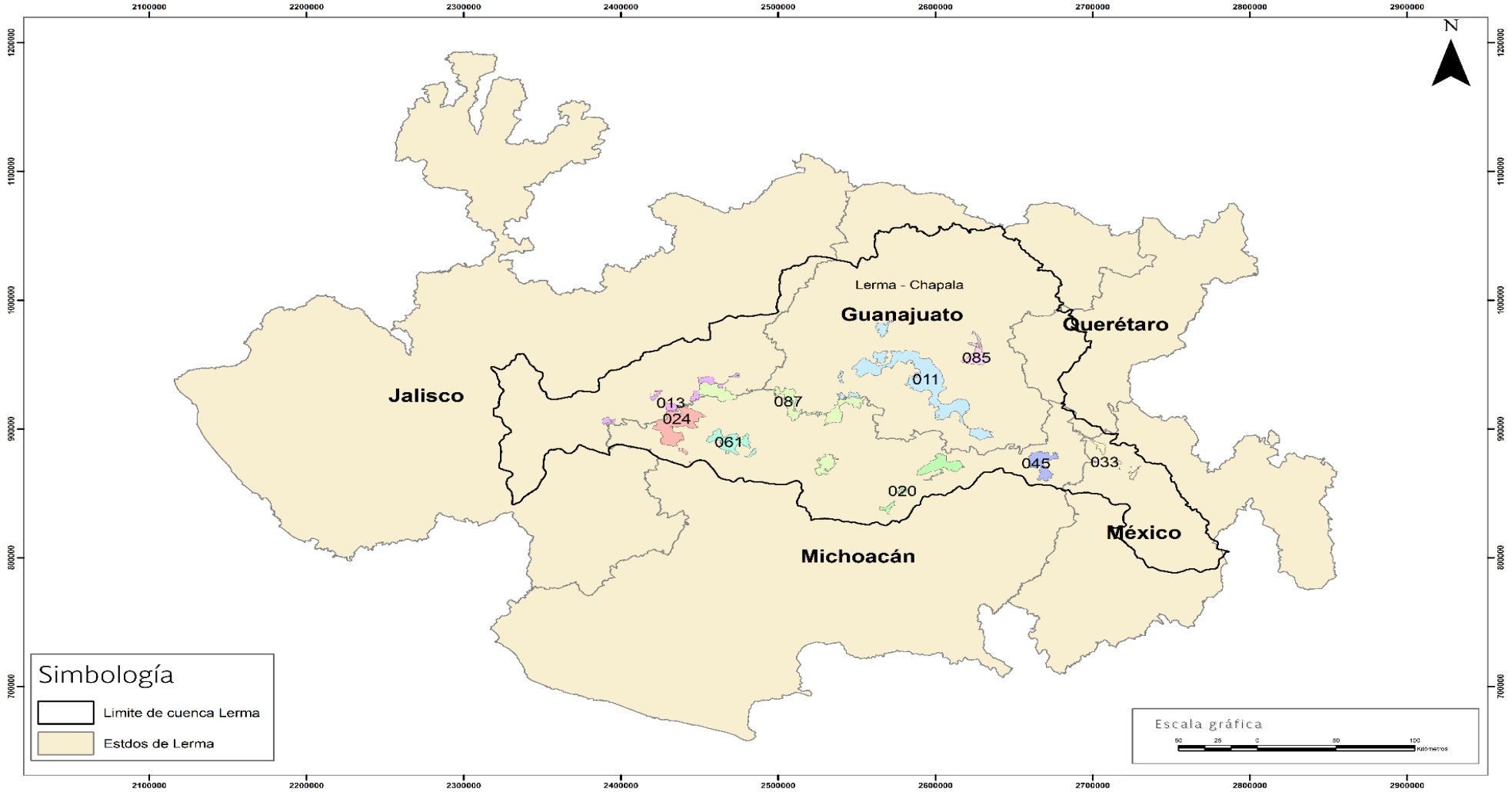
- area of 53,591.3 km^2, representing 2.73% of the national territory.
- Lerma River is about 705 km length, with an annual runoff of 4908 Hm^3.



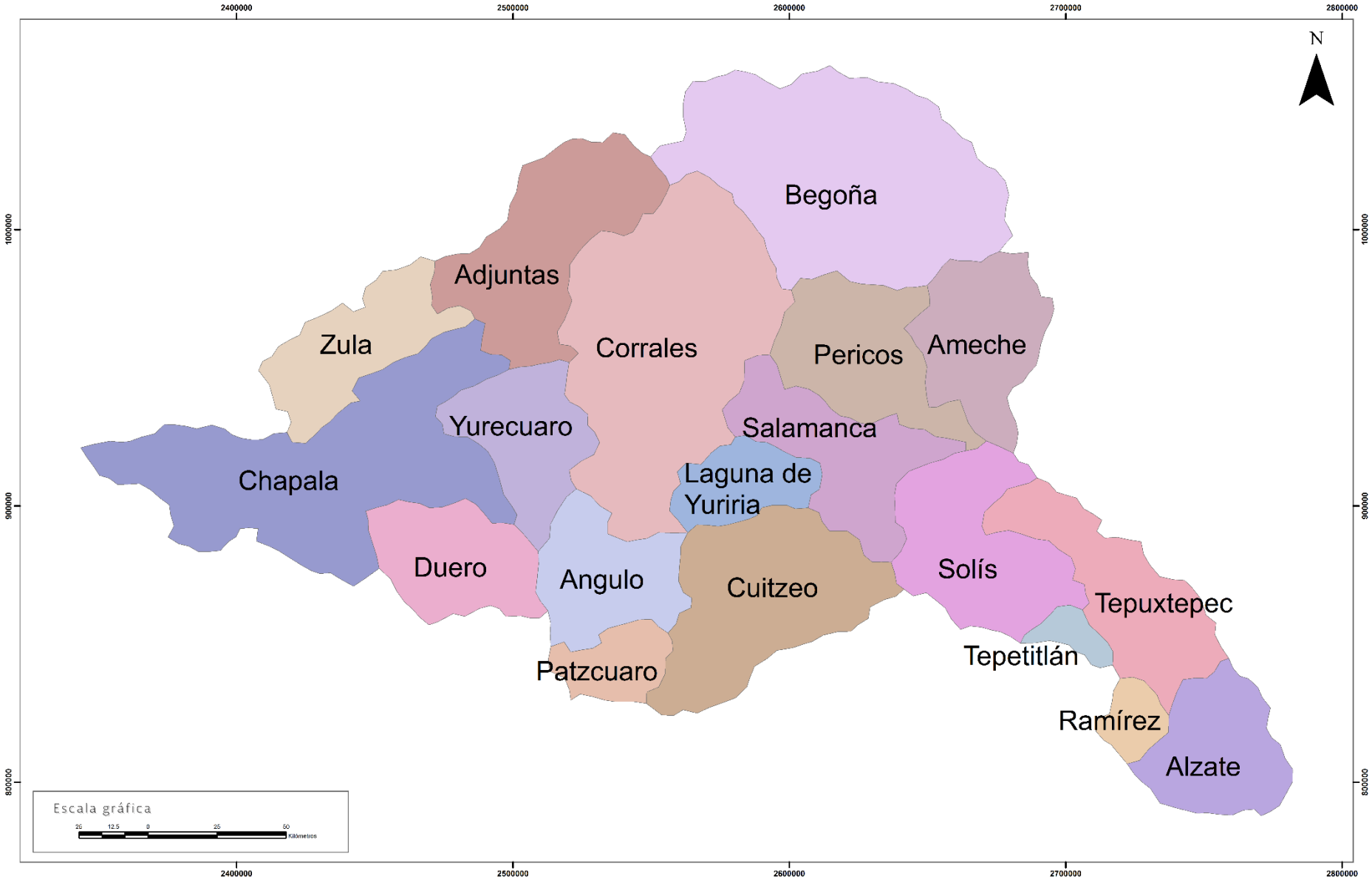
- The basin is a region with relatively little rain, mostly (79%) was concentrated in just four months and is distributed unevenly in the territory.



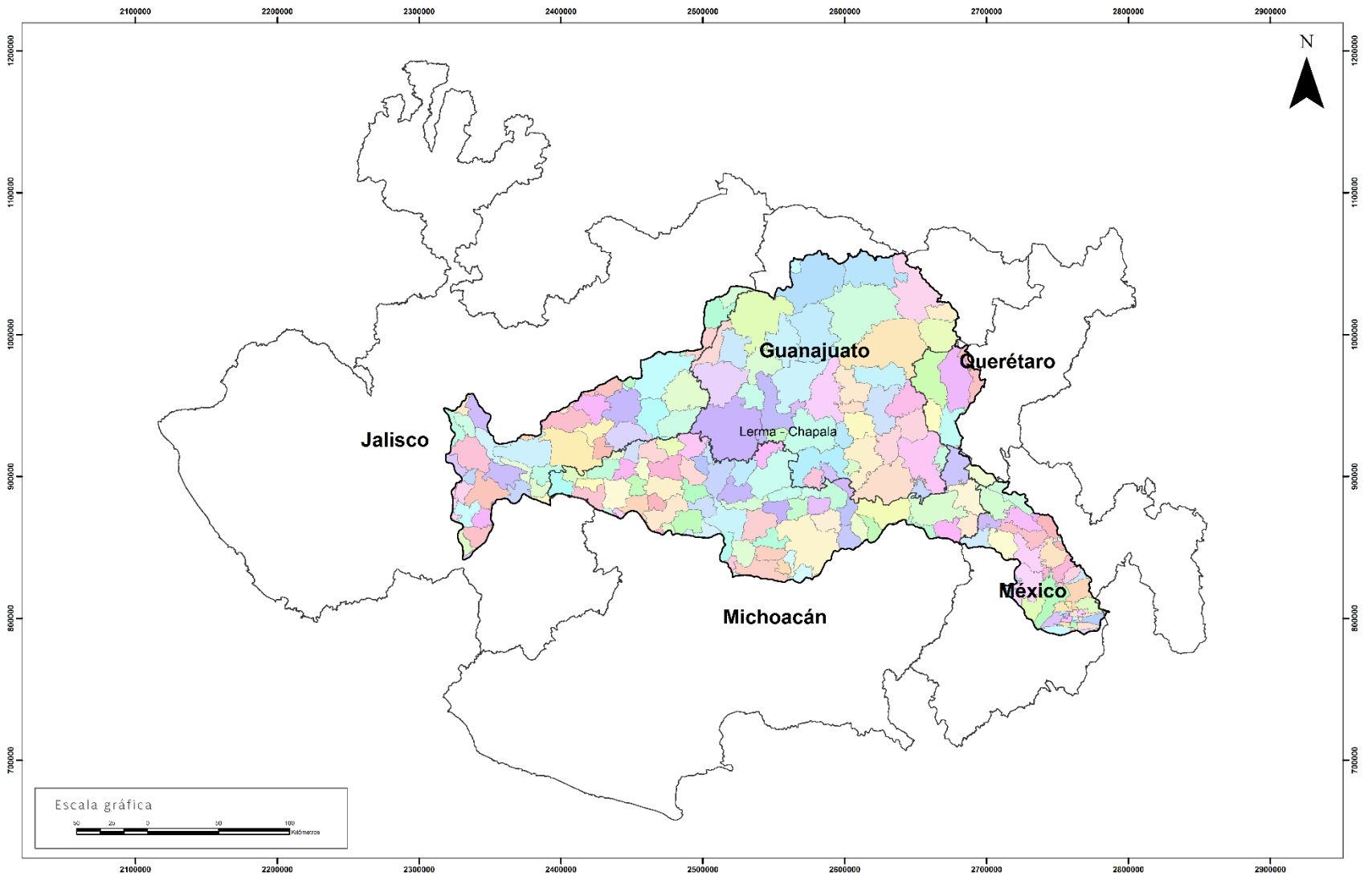
- This basin covers territories of five states in the following proportions to the total basin area: Guanajuato (43.8%); Michoacán (30.3%); Jalisco (13.4%); State of Mexico (9.8%) and Querétaro (2.8%).
- The agricultural sector is very important, the Lerma basin has eight irrigation districts : DR33, DR 45,DR 11, DR 85,DR 13,DR 24, DR 61, DR 87.



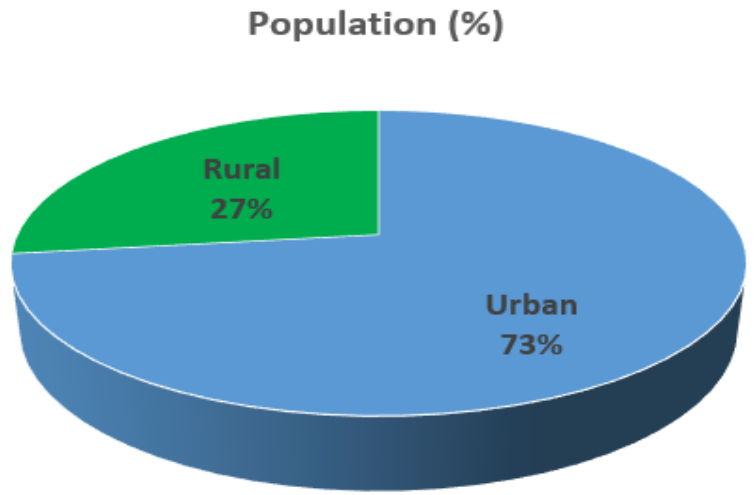
Lerma Chapala Basin is composed of 17 subbasins



- The basin has considerable economic importance. It occupies only 2.9% of Mexico's total landmass, but live more than 12 million people, and its economic activities account for 11.5% of national GDP.



- 215 municipalities.
- 12 million people.



Integrated management of water resources

- By late 1988 low water levels prevailed in Chapala lake with increased water pollution and low fish production. Guadalajara city was suffering water scarcity
- On April 13, 1989 the **federal government and the five state governments** in the river basin **signed an historic agreement with four main objectives:**

➢ ***Water distribution among users via a new water allocation policy – a new water deal for the basin.***

➢ ***Water quality improvement by treating municipal and industrial raw effluents***

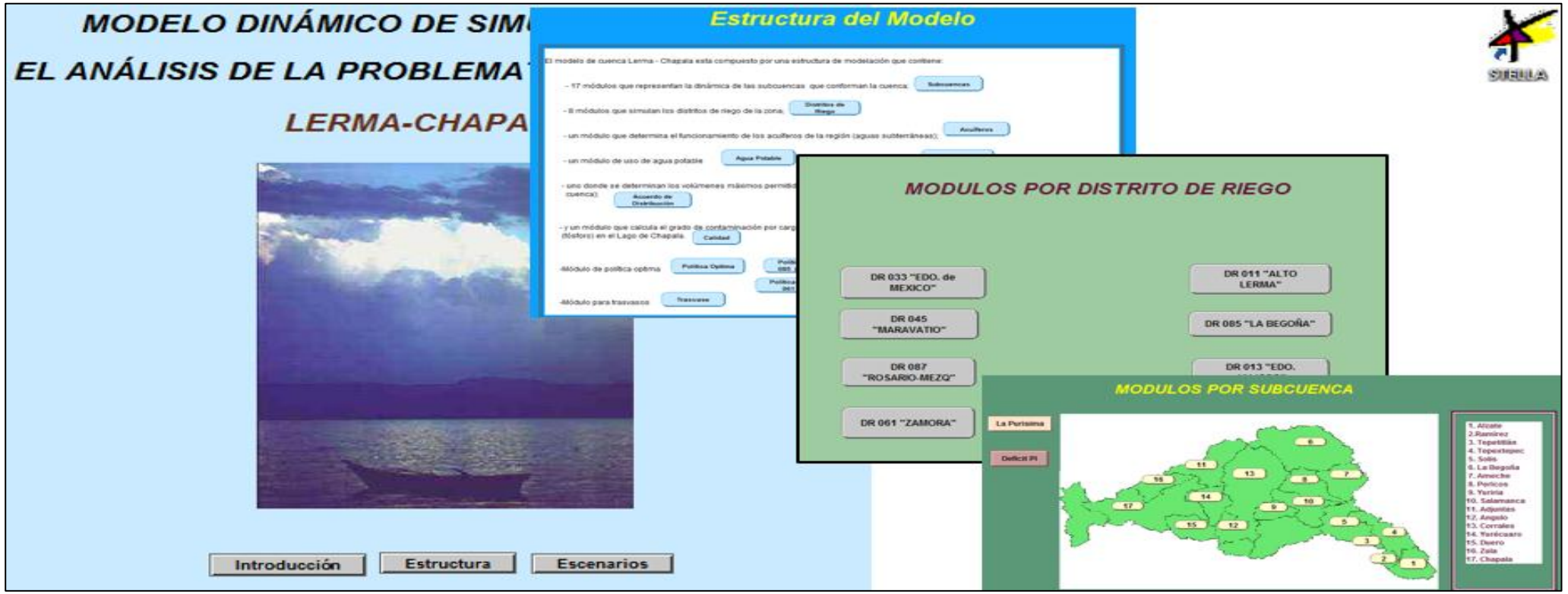
➢ ***Increasing water-use efficiency***

➢ ***Protecting and conserving the river basin system.***

Water allocation

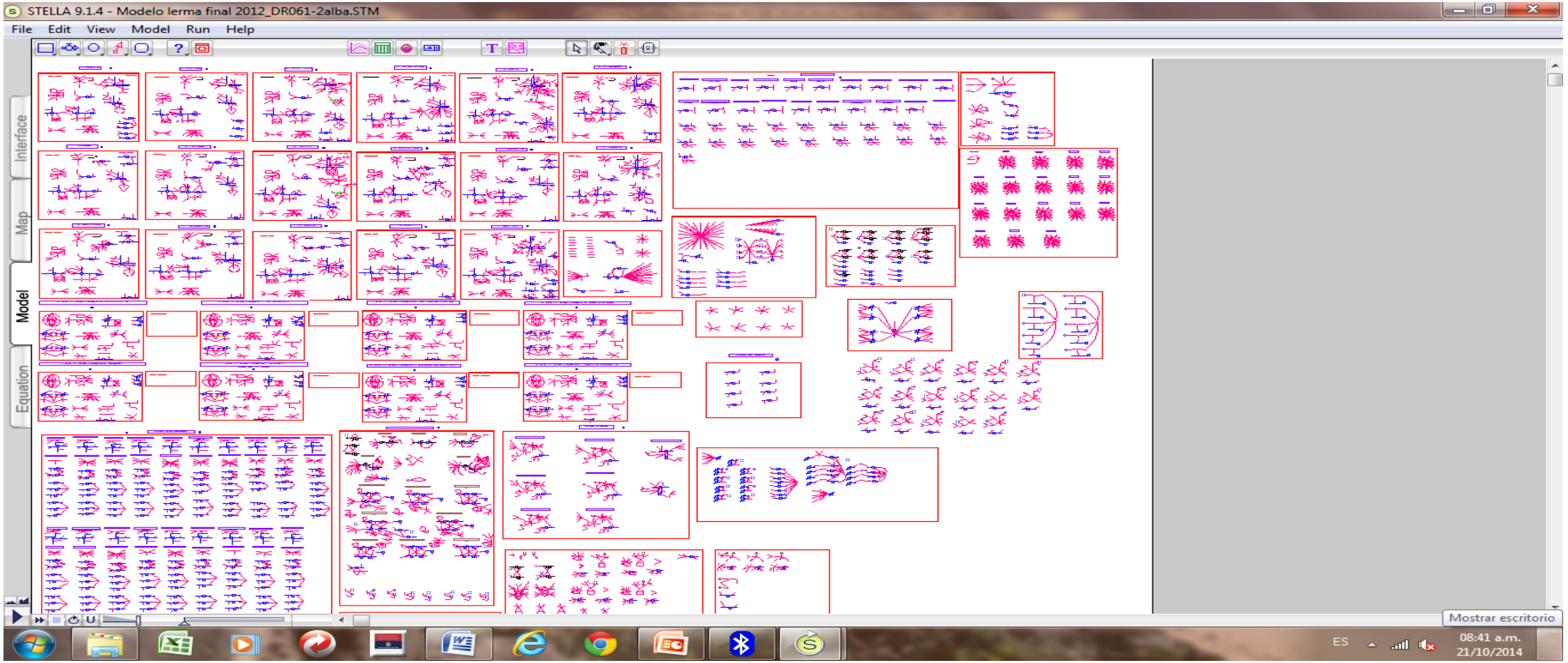
- On September 1, 1989 a Consultative Council was integrated to follow up and evaluate goals and tasks
- **Since 1991 a surface water distribution agreement has been in force.** It established clear mathematical **rules for annual water distribution and reservoir operation, in accordance with users.**
- **A specific date to allocate surface water was agreed: November 1st of each year,** a moment in time that roughly coincides with the end of the rainy season.
- Between 2002 and 2004 a new surface water allocation agreement was negotiated to allocate surface water between users and to protect the lake. One of the tools used by the technical working group is the Lerma 2004 model developed in Stella Research

Lerma Chapala model

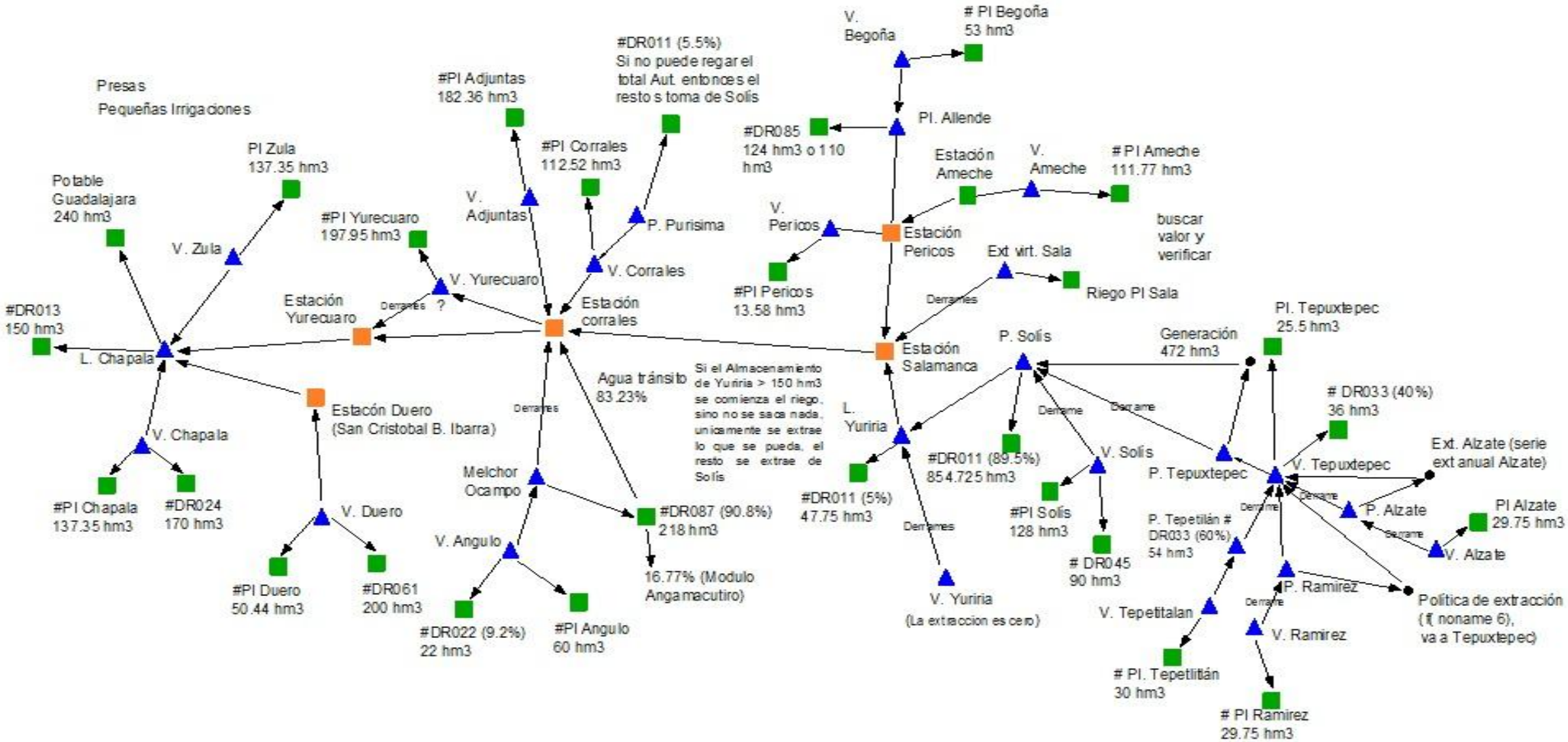


- Version 2004 model has as time unit the day and runs on agricultural cycles, starting on 1 November of each year and ending on October 31 of the following, and considers a horizon with a maximum of 52 years.

2004 Lerma Model



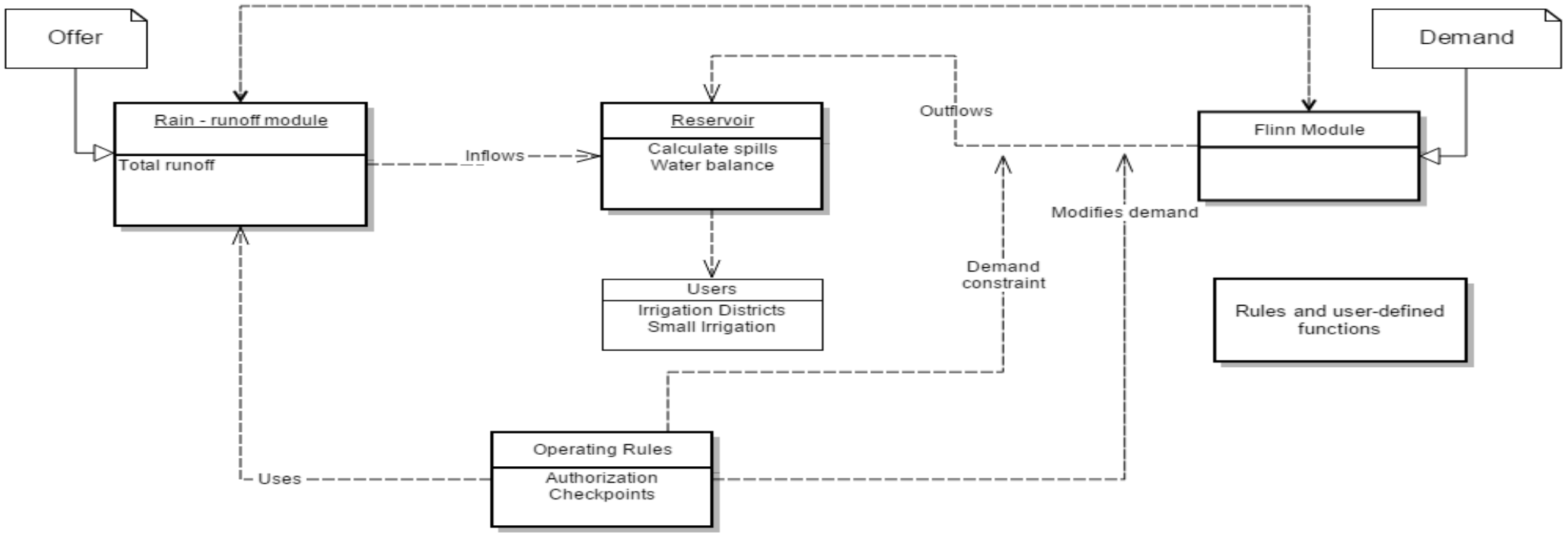
The Lerma 2004 model can be represented as follows:



2004 Lerma Chapala model

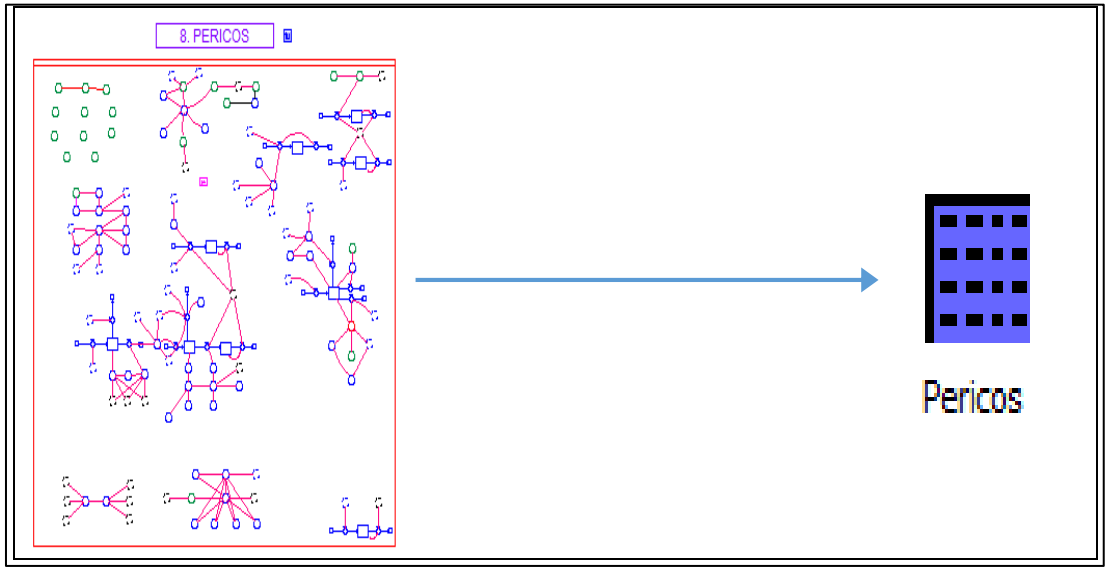
- Uses the **Soil Conservation Service** (SCS) curve number (CN) **method** to determine runoff
- Uses the simulation model FLINN to determine crop water requirement
- The operating rules of the 2004 agreement

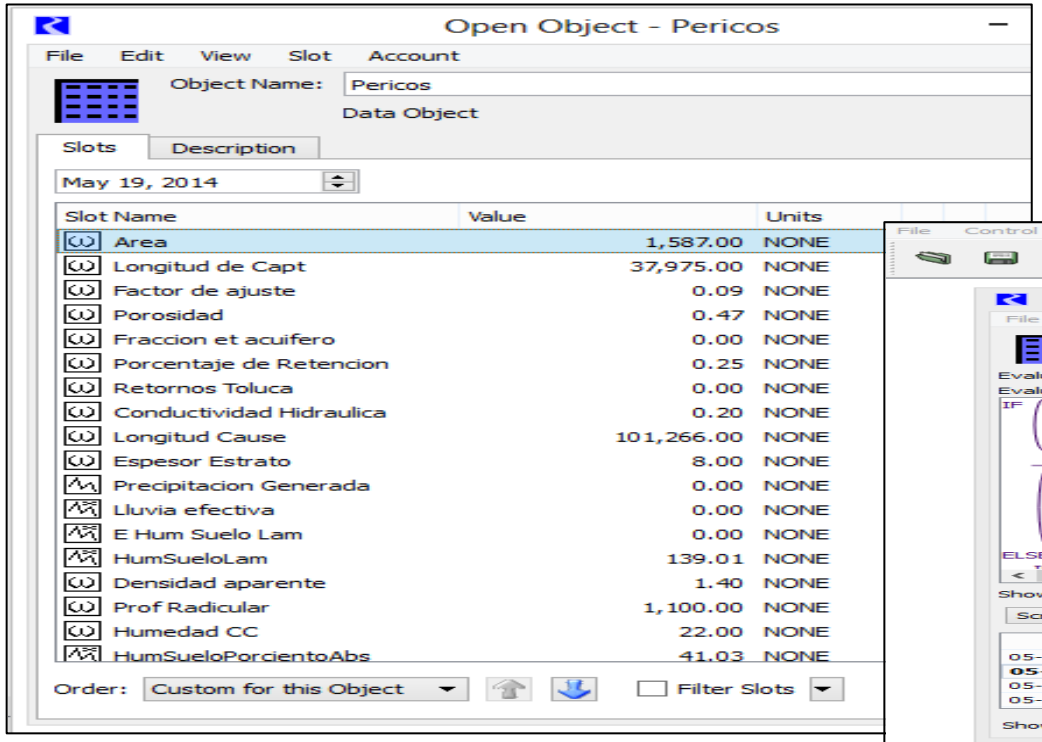
General structure of the model in RiverWare

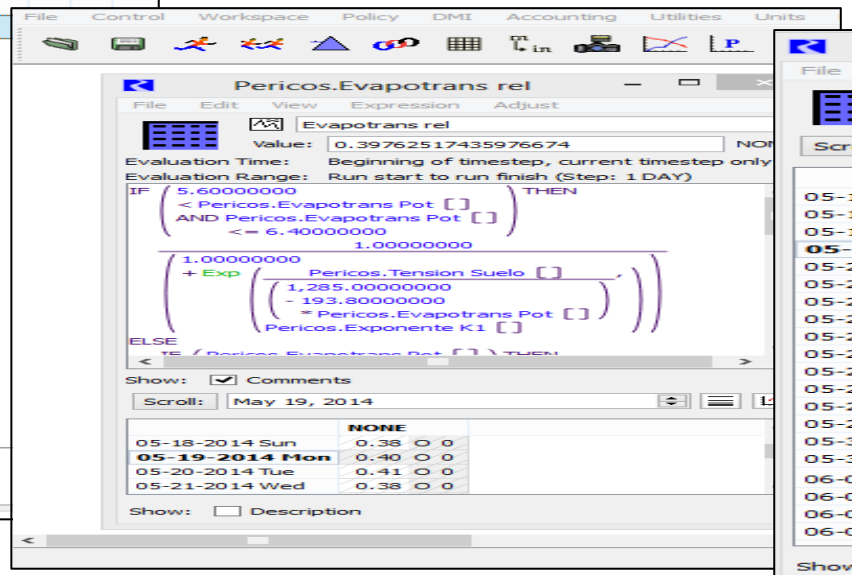


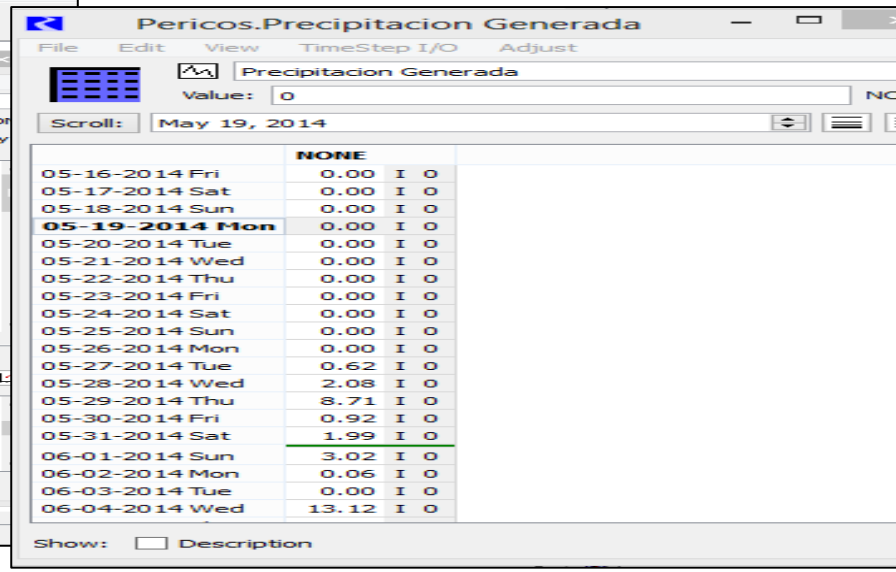
17 Sub-basins

- Each sub-basin in Stella was represented at River Ware through a data object.
- Each Data Object contains 62 slots between: (3)series, (40) series with expression and (19) scalar slot, corresponding to the variable type that uses the 2004 model. The objective of these data object is to determine the runoff



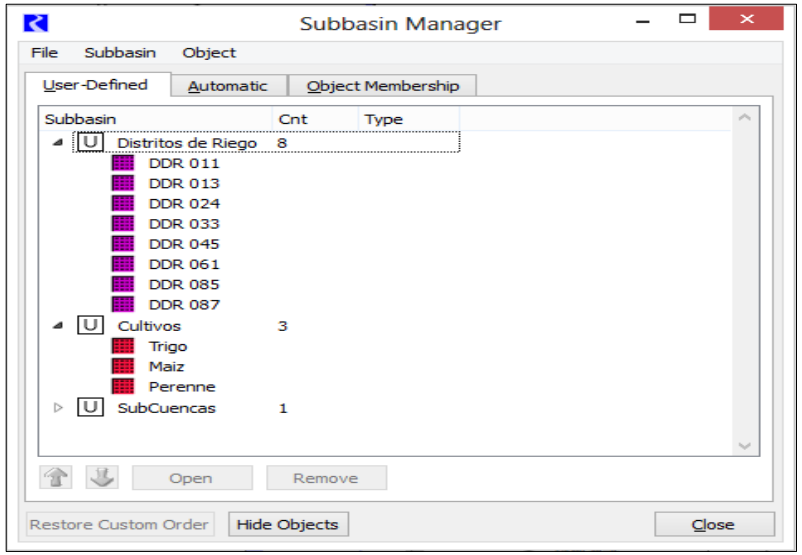


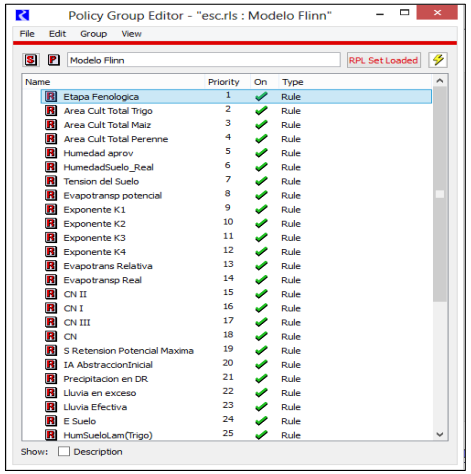


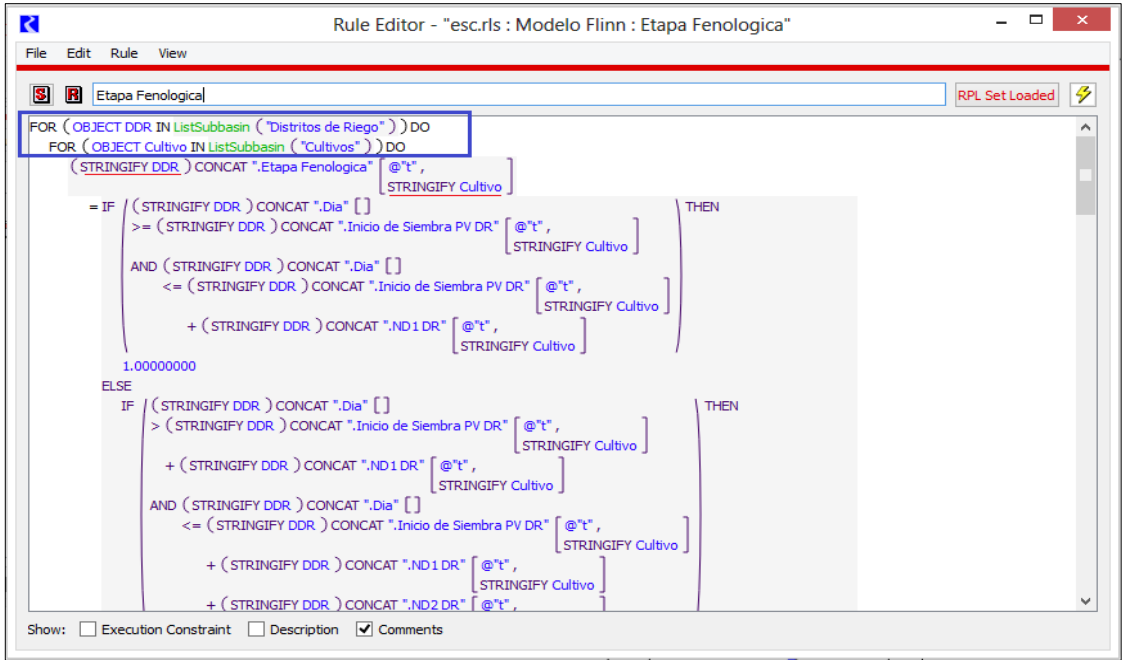


Flinn module

- 8 Data objects
- 38 rules, one for each Add AggSeries slot in data objects
- We use the sub-basin manager to create 2 lists of objects: one for irrigation districts (8) and other for crops (3).
- Each slot solves for these two lists in the same step time







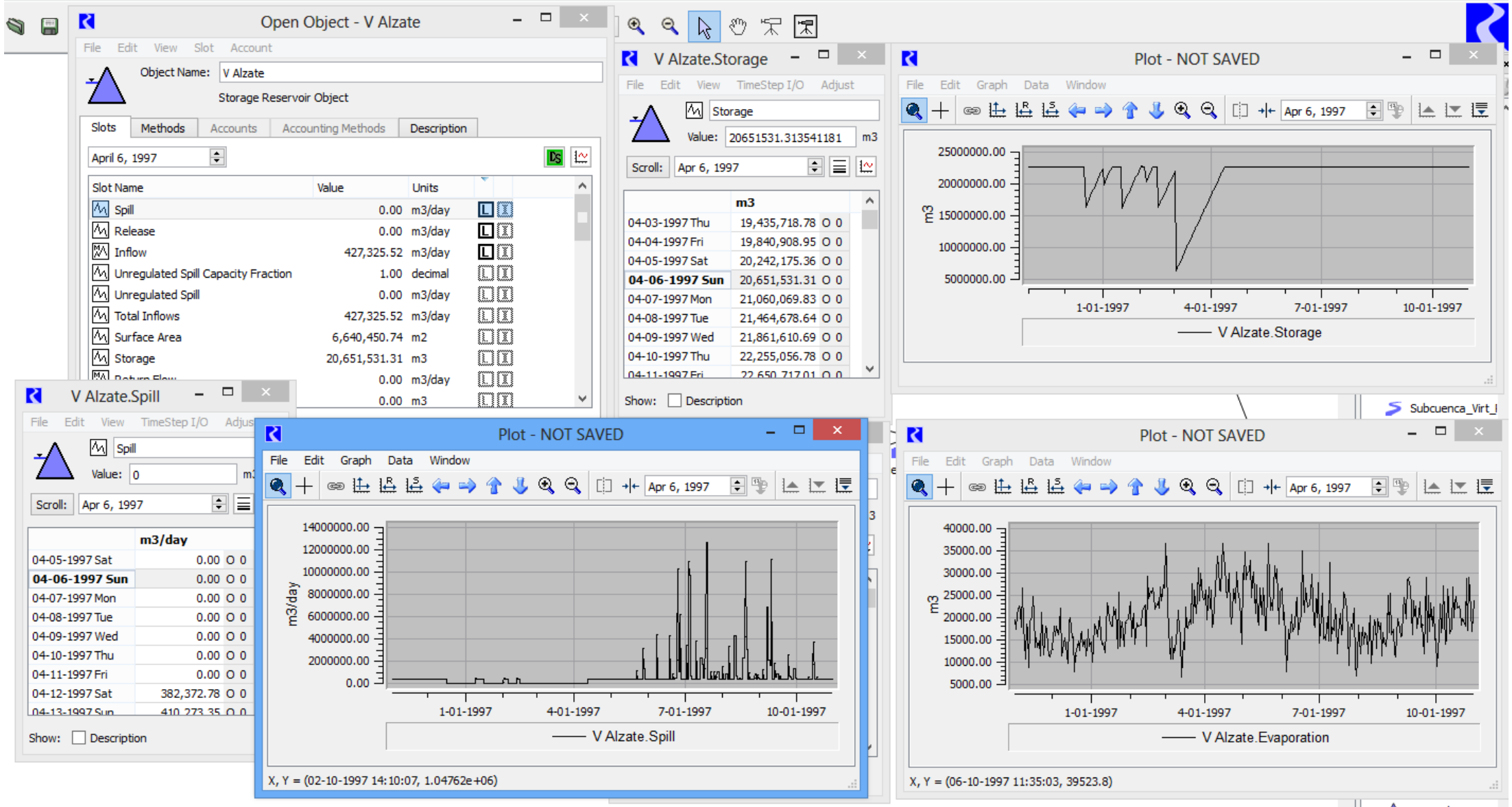
Operating rules

- There are six checkpoints to determine the authorized water amount in the current year according to the 2004 agreement.

Fuente de abastecimiento	Escurrimiento antecedente considerado de las subcuencas
Tepetitlán	Tepetitlán
Tepuxtepec	Alzate, I. Ramírez, Tepetitlán y Tepuxtepec
Solís	Alzate, I. Ramírez, Tepetitlán, Tepuxtepec y Solís
Ignacio Allende	Begoña
Melchor Ocampo	Angulo
Chapala	Alzate, I. Ramírez, Tepetitlán, Tepuxtepec, Solís, Begoña, Ameche, Pericos, Yuriria, Salamanca, Corrales, Adjuntas, Yurécuaro, Angulo, Duero, Zula y Chapala.

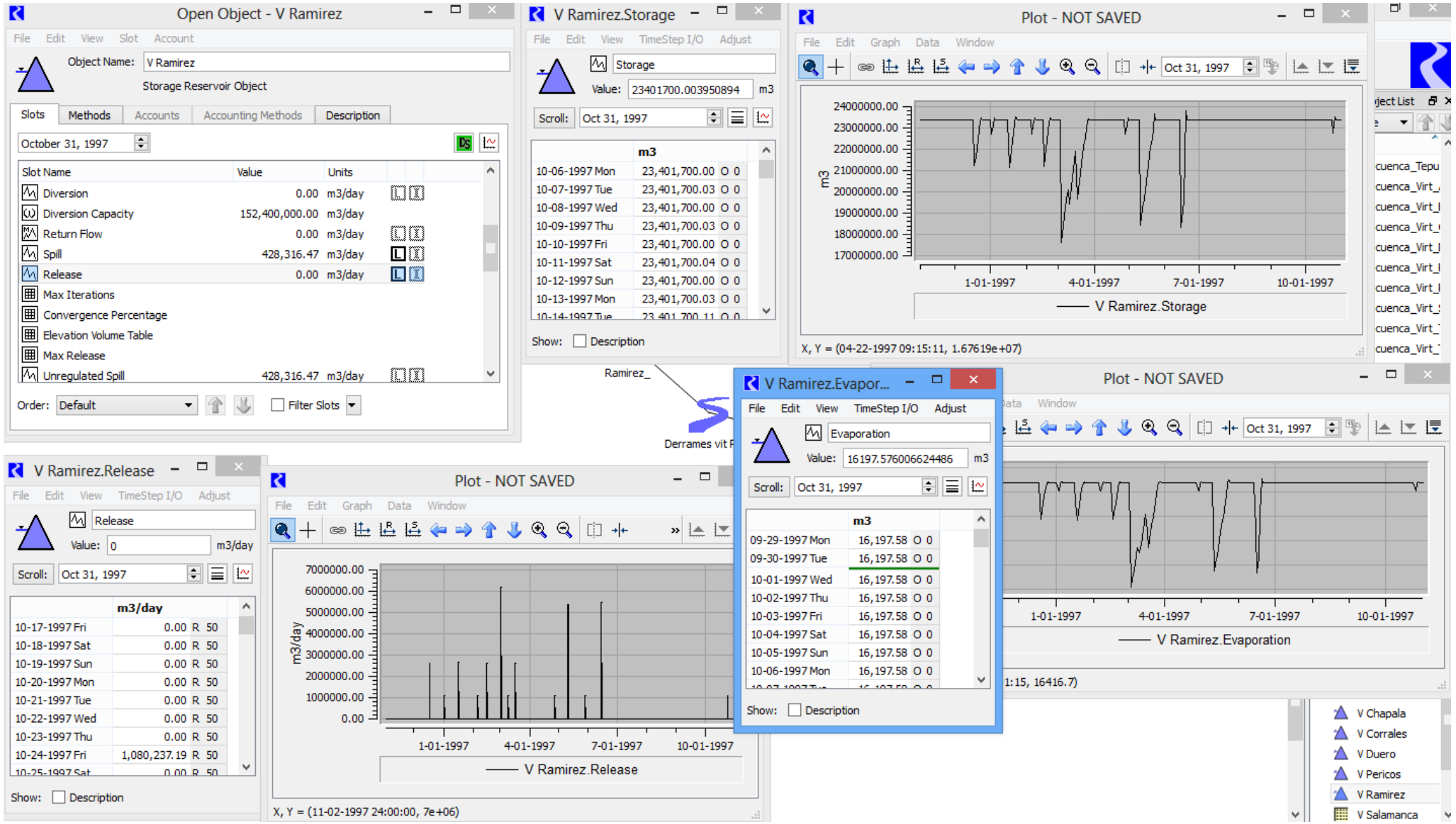
Results

- Alzate.



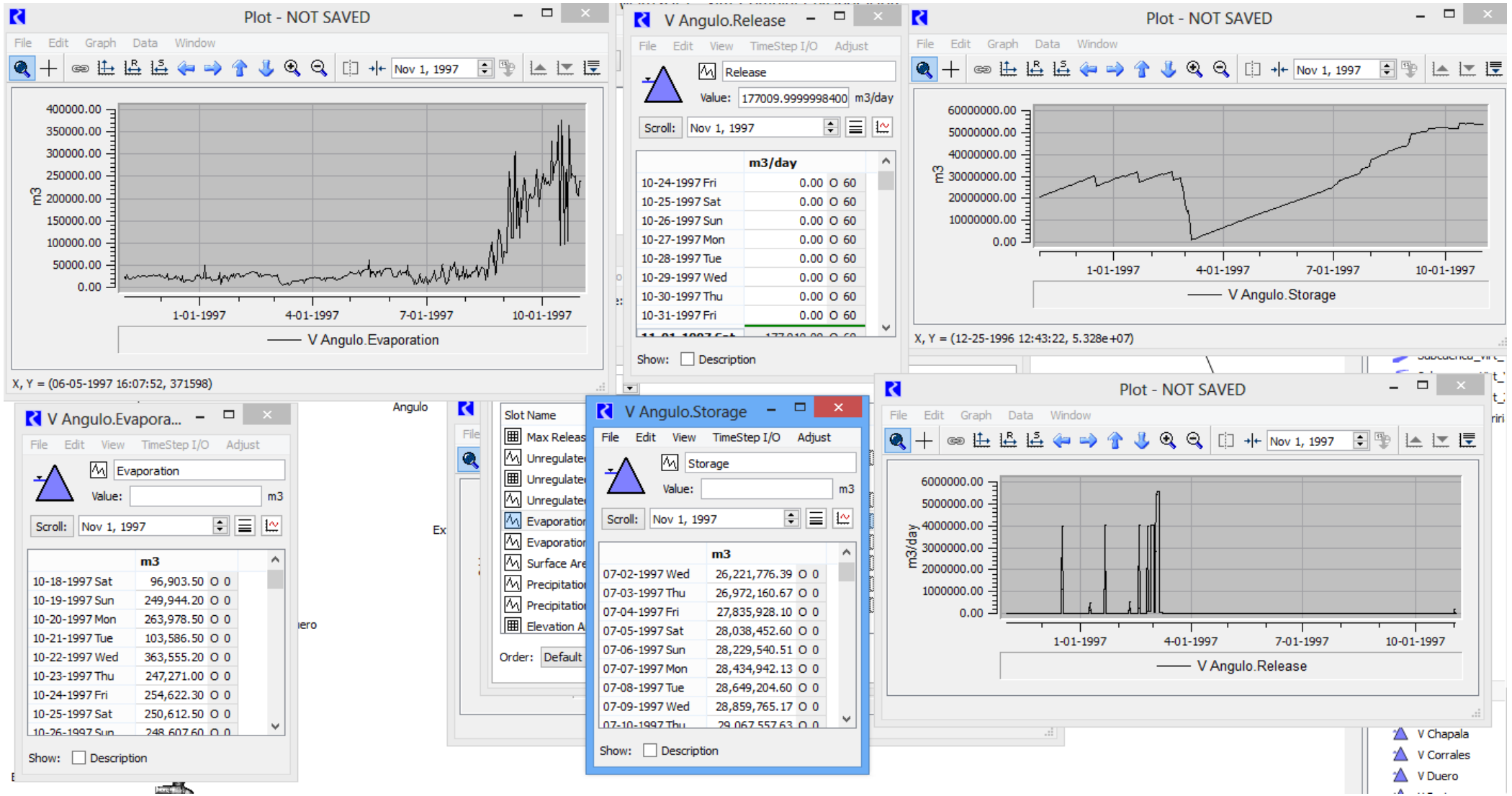
Results

- Ramírez

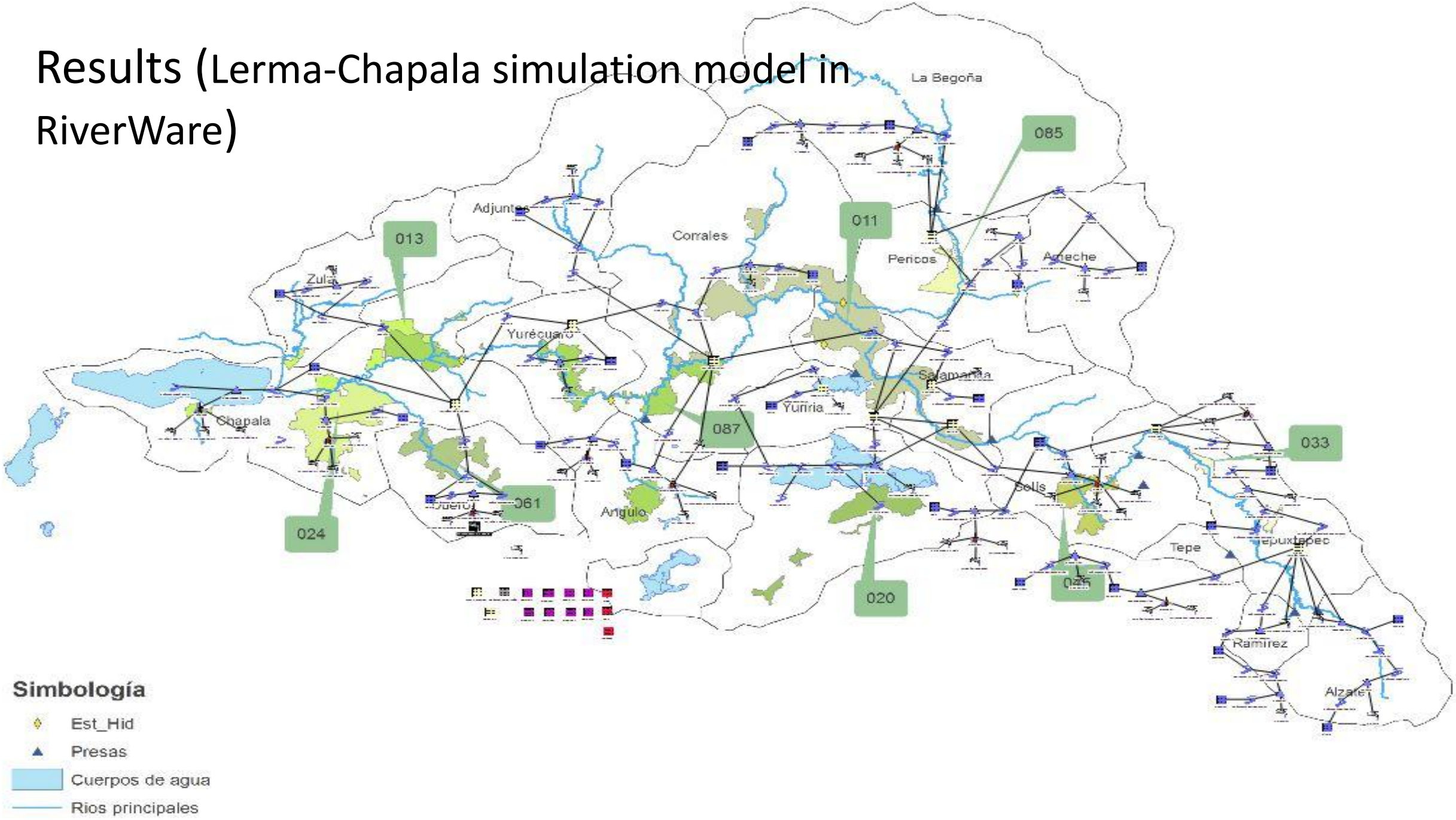


Results

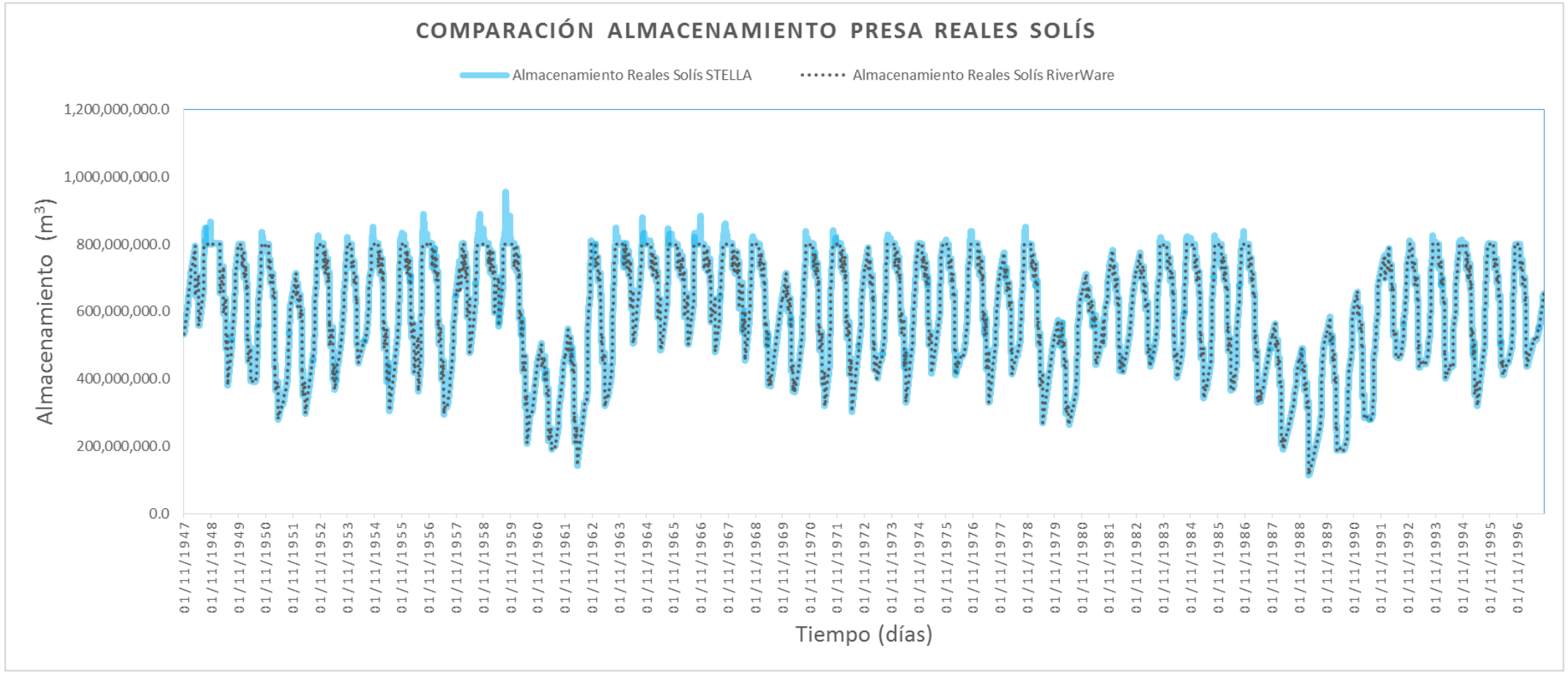
- Angulo



Results (Lerma-Chapala simulation model in RiverWare)



Results (Comparison of storage in both models)



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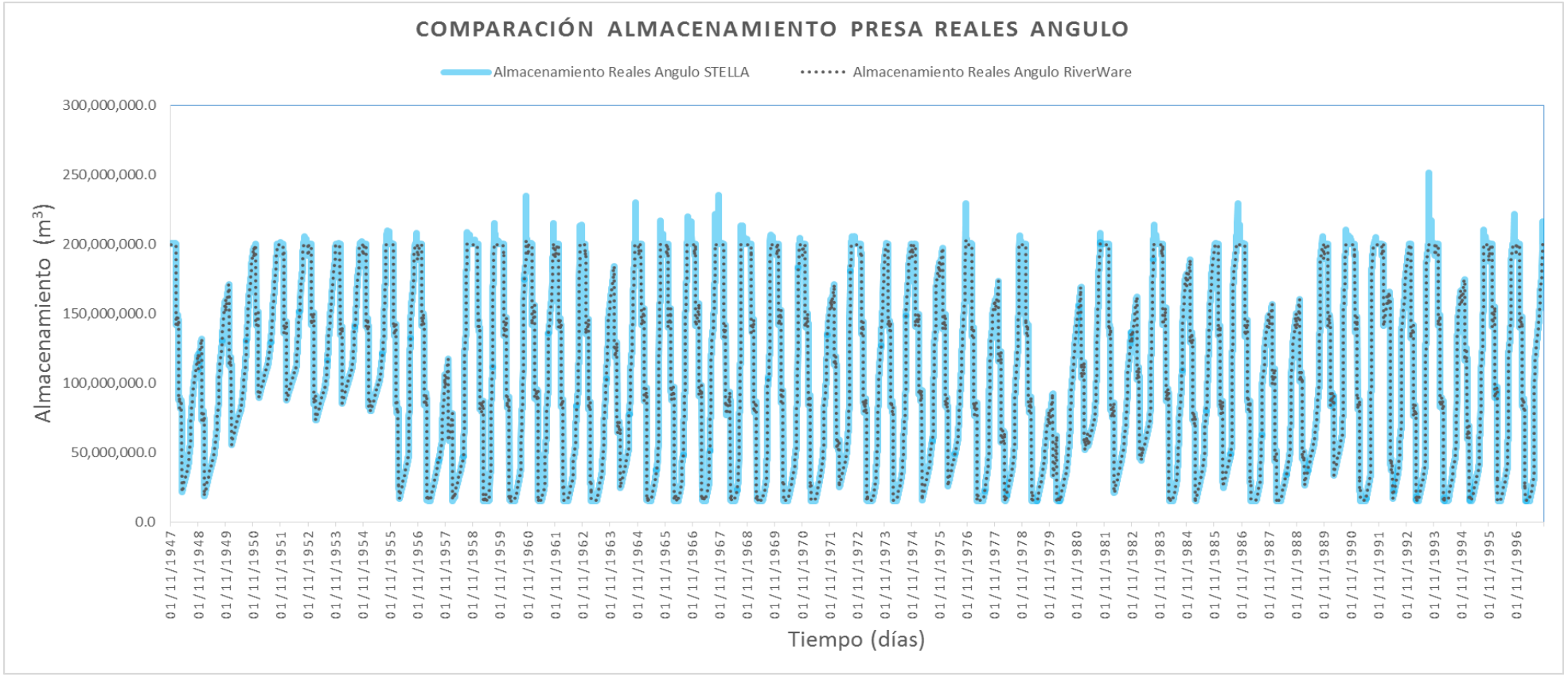

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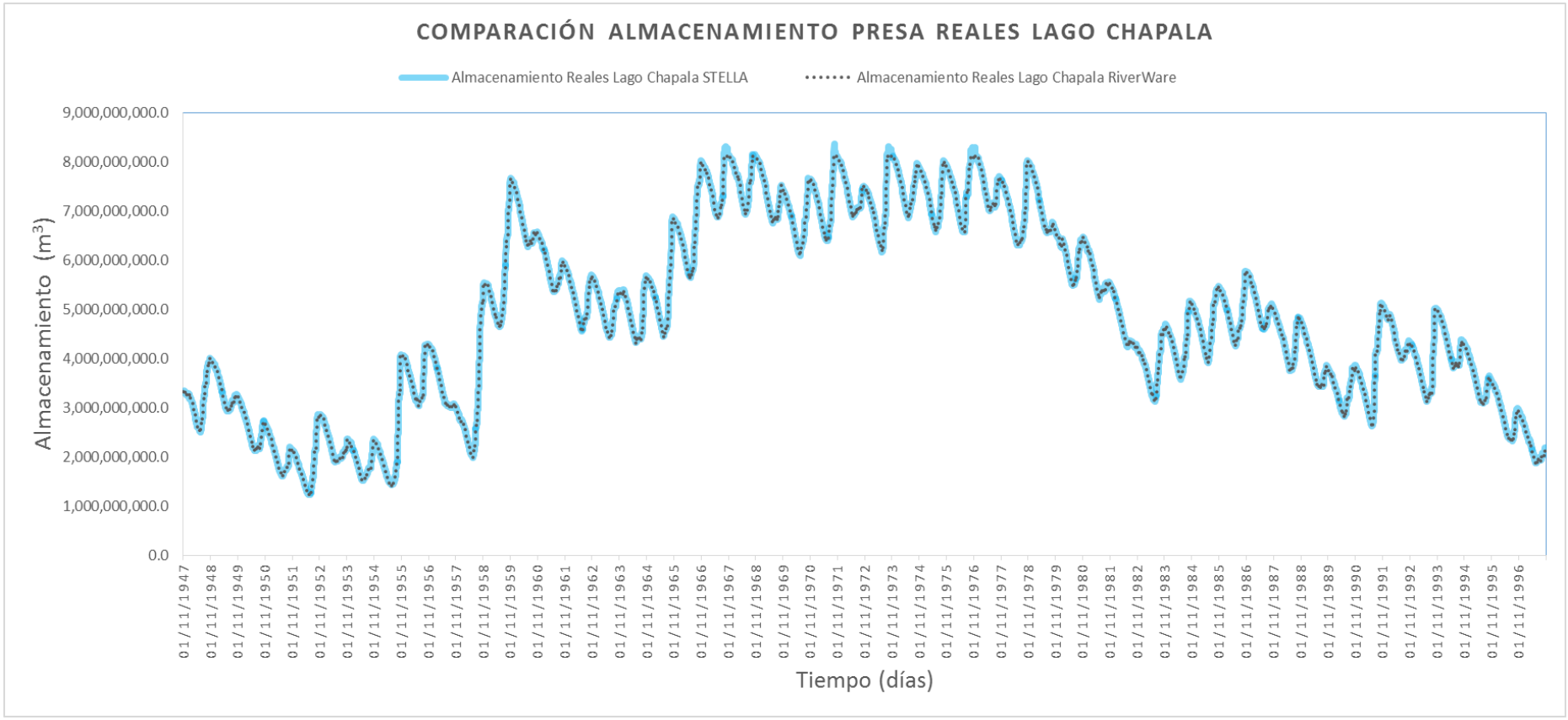


Thanks,
Questions?