



Federal University of Pernambuco

Application of SWAT model for streamflow simulation in the Una River Basin, Northeast of Brazil

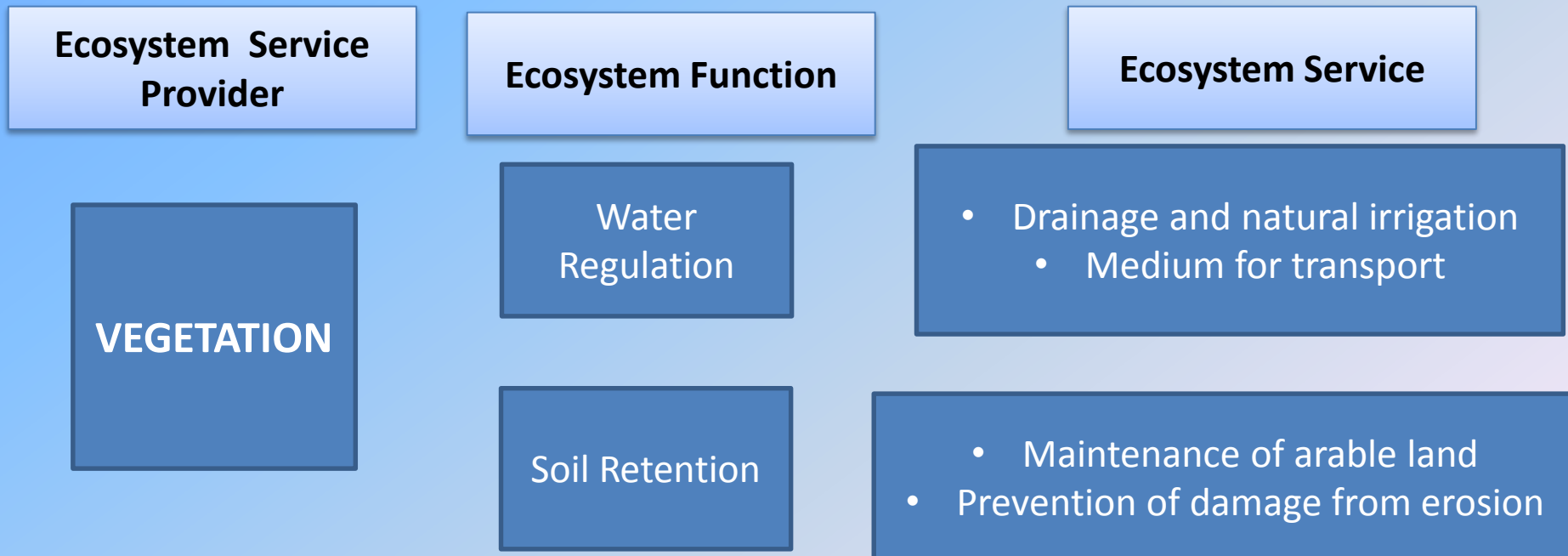
José Guimarães de Carvalho Neto

Adviser: Suzana Montenegro

Co-Adviser: Richarde Marques

Introduction

- SWAT as a tool to indentifiy opportunities of **payments for environmental services (PES)**.
 - Quintero (2009)



Review

- Pernambuco – **ICMS Sócio Ambiental**
 - [Lei Estadual nº 11.899/00](#)
 - ICMS – Tax on the **Circulation of Goods and Supply of Services** Interstate and Intermunicipal Transportation and Communication (*Imposto sobre Operações relativas à Circulação de Mercadorias e sobre Prestações de Serviços de Transporte Interestadual e Intermunicipal e de Comunicação*)
 - 1% for the maintenance and creation of **Conservation Units**
- **Lei Federal nº 9.985/00 - National System of Conservation Units**
(*Sistema Nacional de Unidades de Conservação da Natureza*)
 - Conservation Units: territorial space and its environmental resources, including jurisdictional waters, with significant natural features, legally established by the Government, with conservation objectives and limits set under special administration regime, which guarantees the application of adequate protection.

Review

Permanent Preservation Areas

Some distance from the riverside (depends of the river width)

Wellspring – source of water

Slope bigger than 45°

.....

Objective

- First analysis of input data and capabilities of the SWAT model simulating the River Una Basin.



Brasil

Boa Vista

Belém

Manaus

Rio Branco

Brasília

Campo Grande

Belo Horizonte

São Paulo

Curitiba

Porto Alegre

Fortaleza

Natal

Recife

Salvador

Vitória

Rio de Janeiro

OCEANO ATLÂNTICO

OCEANO PACÍFICO

Study Area

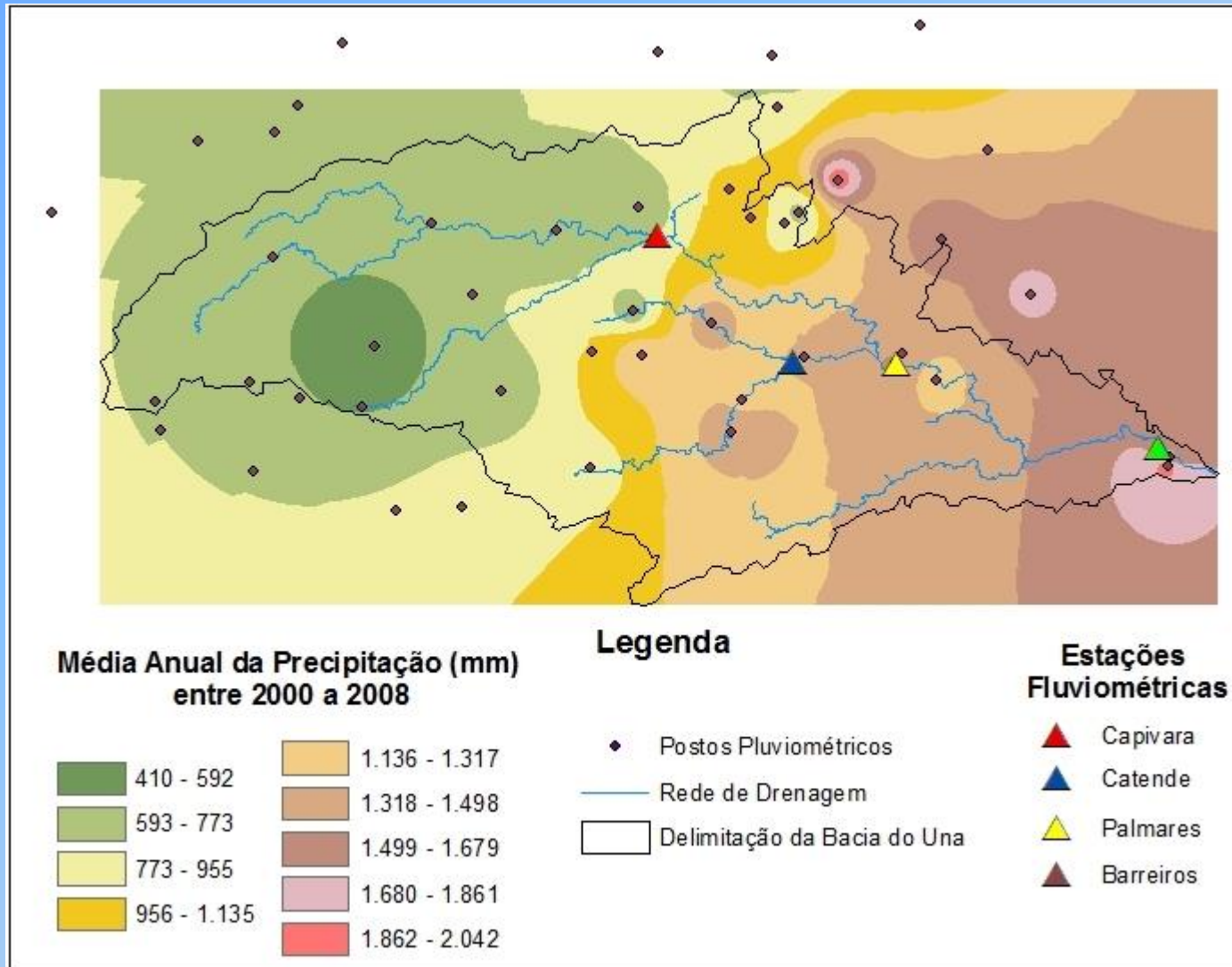
- River Una Basin
 - 6,3 thousand km²
 - 42 county fully or partially inside the basin
 - 19 of them has the city inside the basin
 - 553,3 thousand of people
 - Land Use
 - Sugar Kane industry
 - Historical events of floods
 - 2000, 2004, 2005, 2010 and 2011



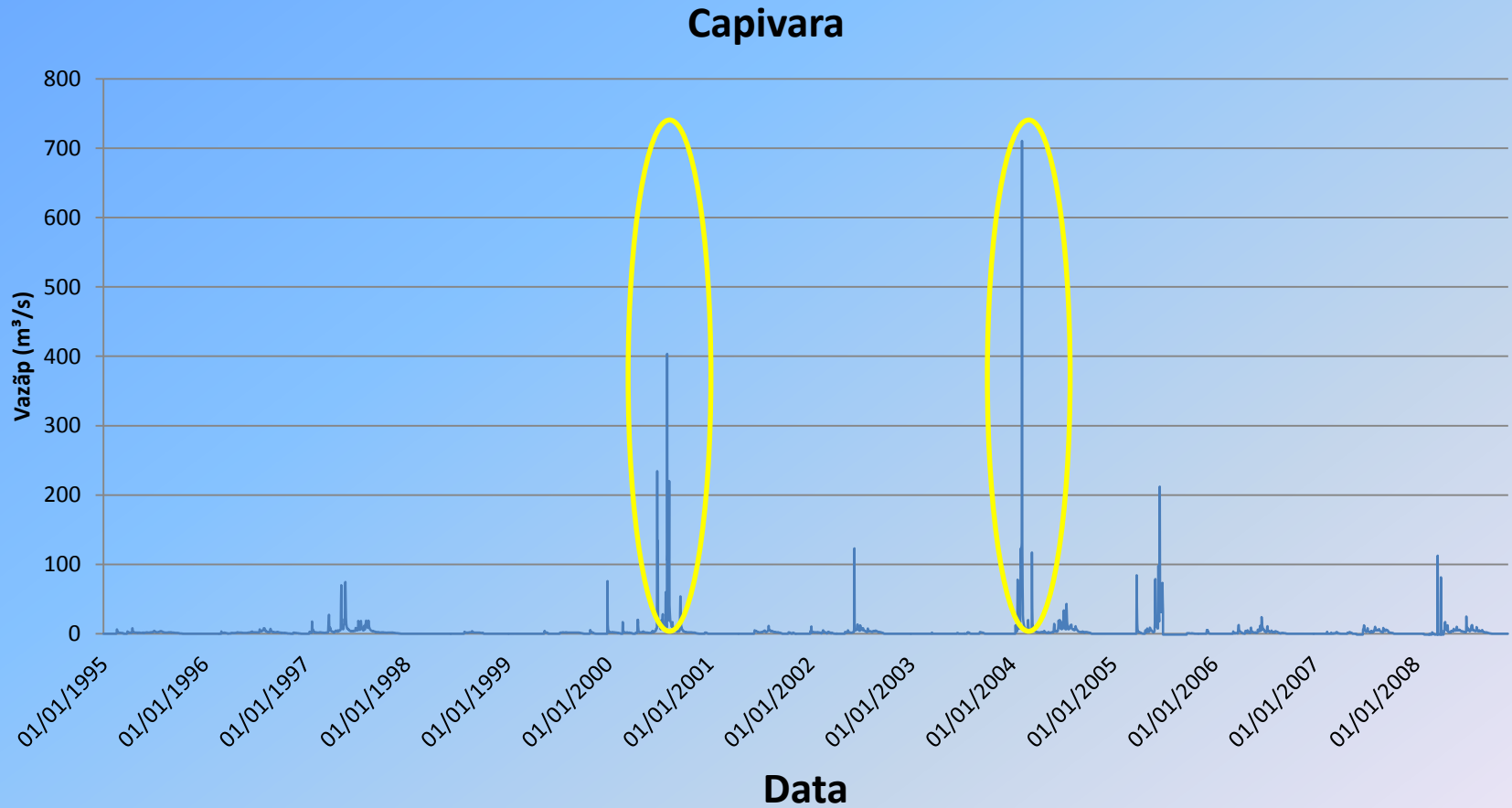
2010



Average Annual Rainfall between 2000 to 2008

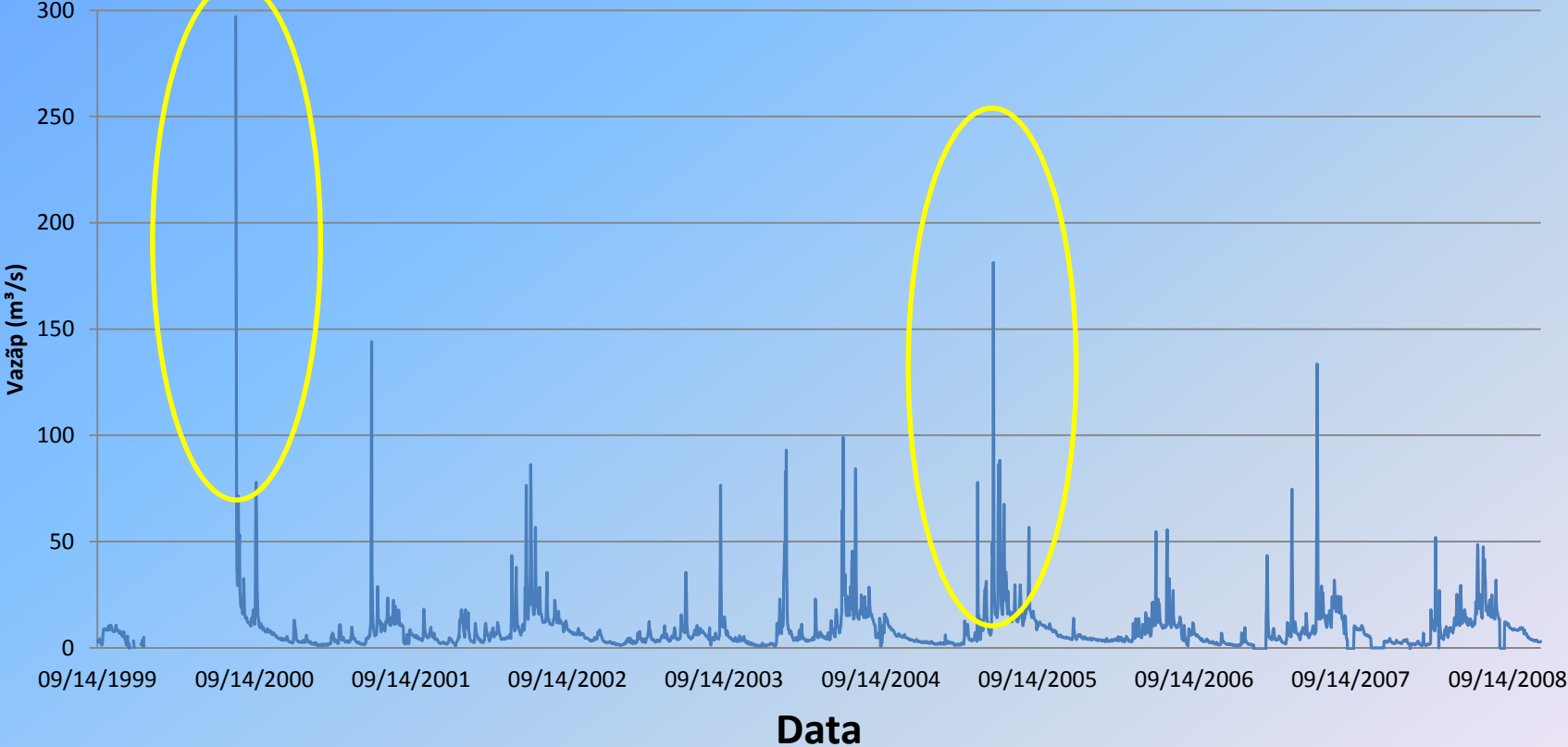


StreamFlow - Capivara

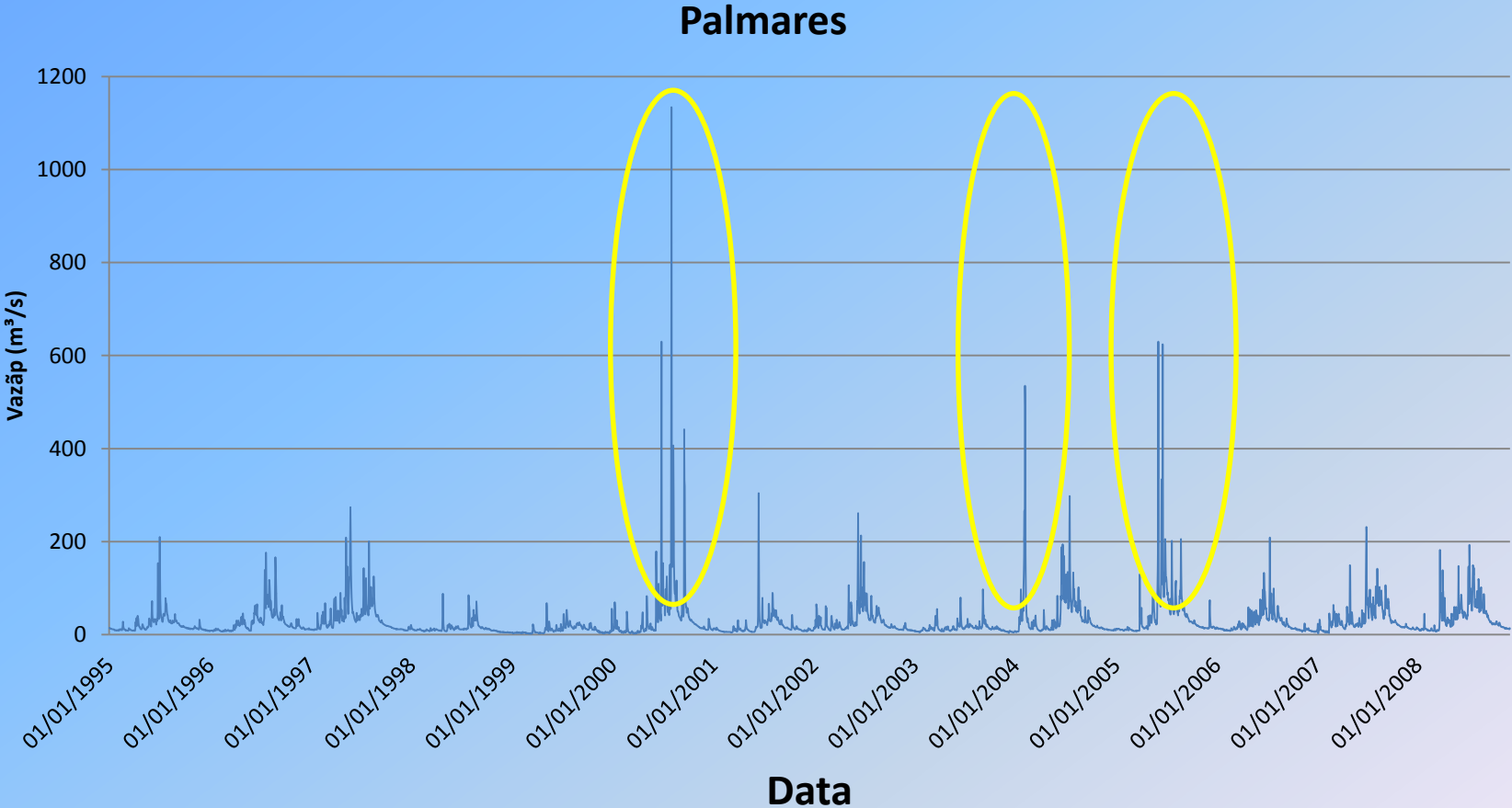


StreamFlow - Catende

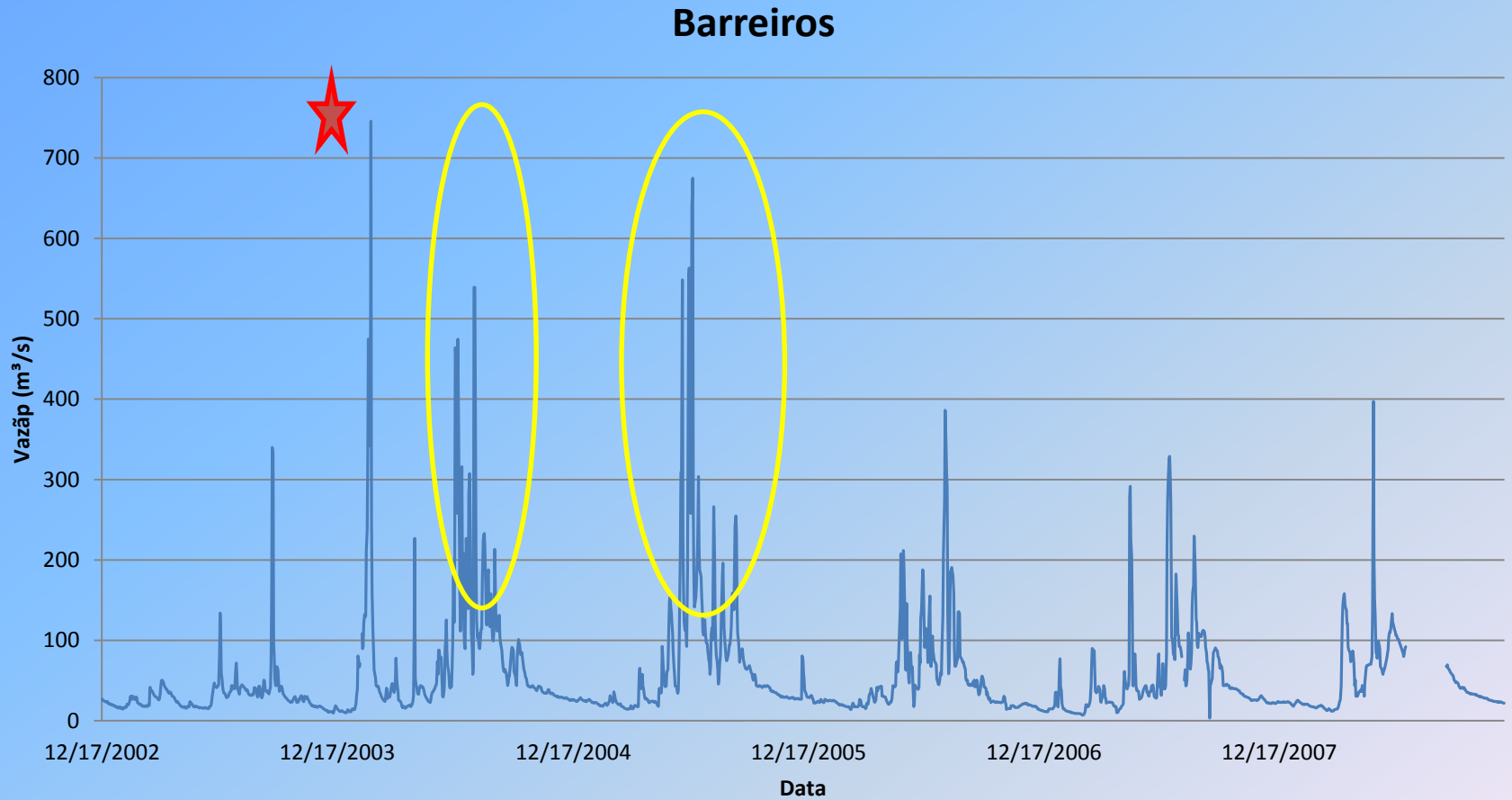
Catende



StreamFlow - Palmares

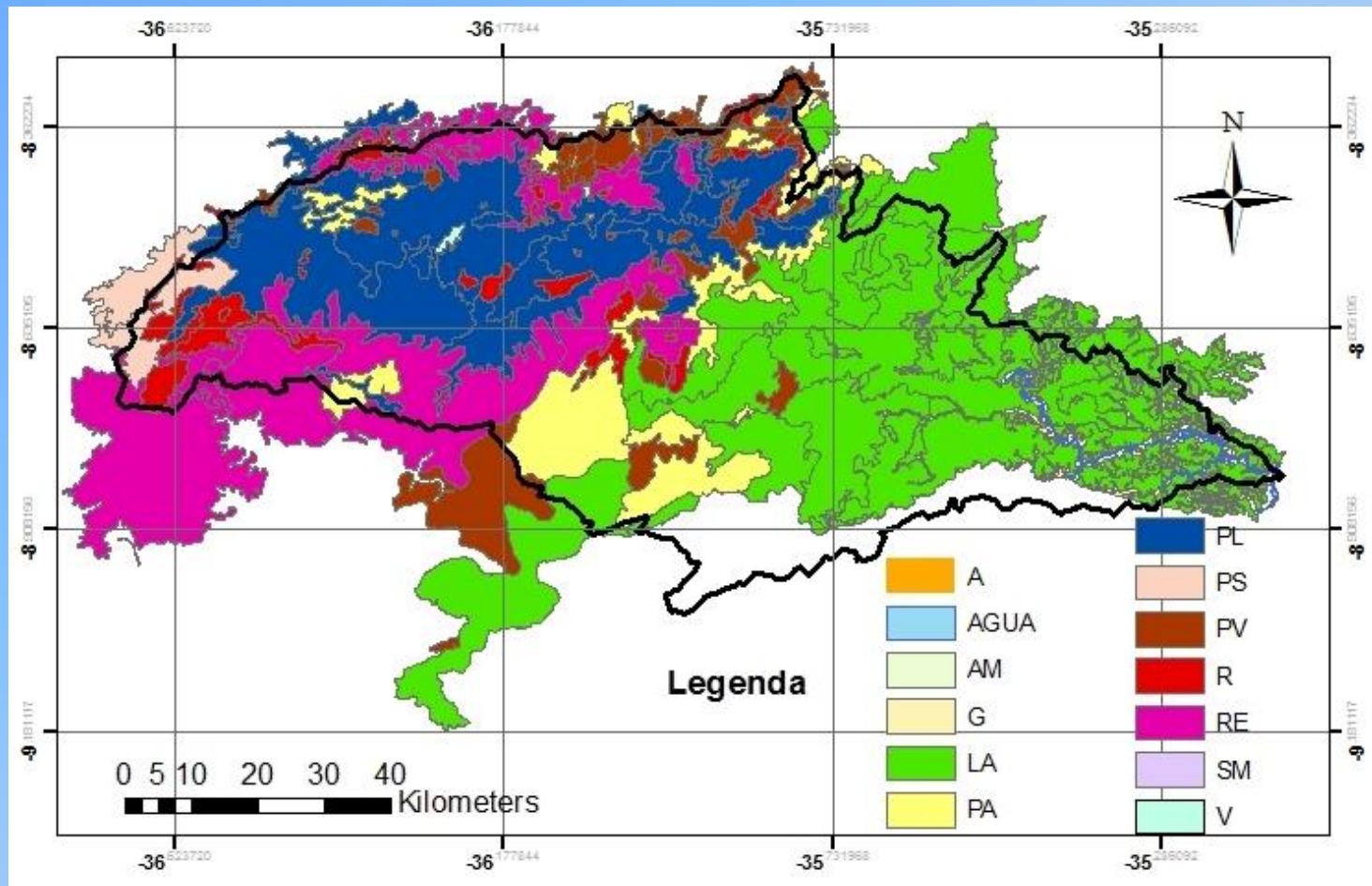


StreamFlow - Barreiros

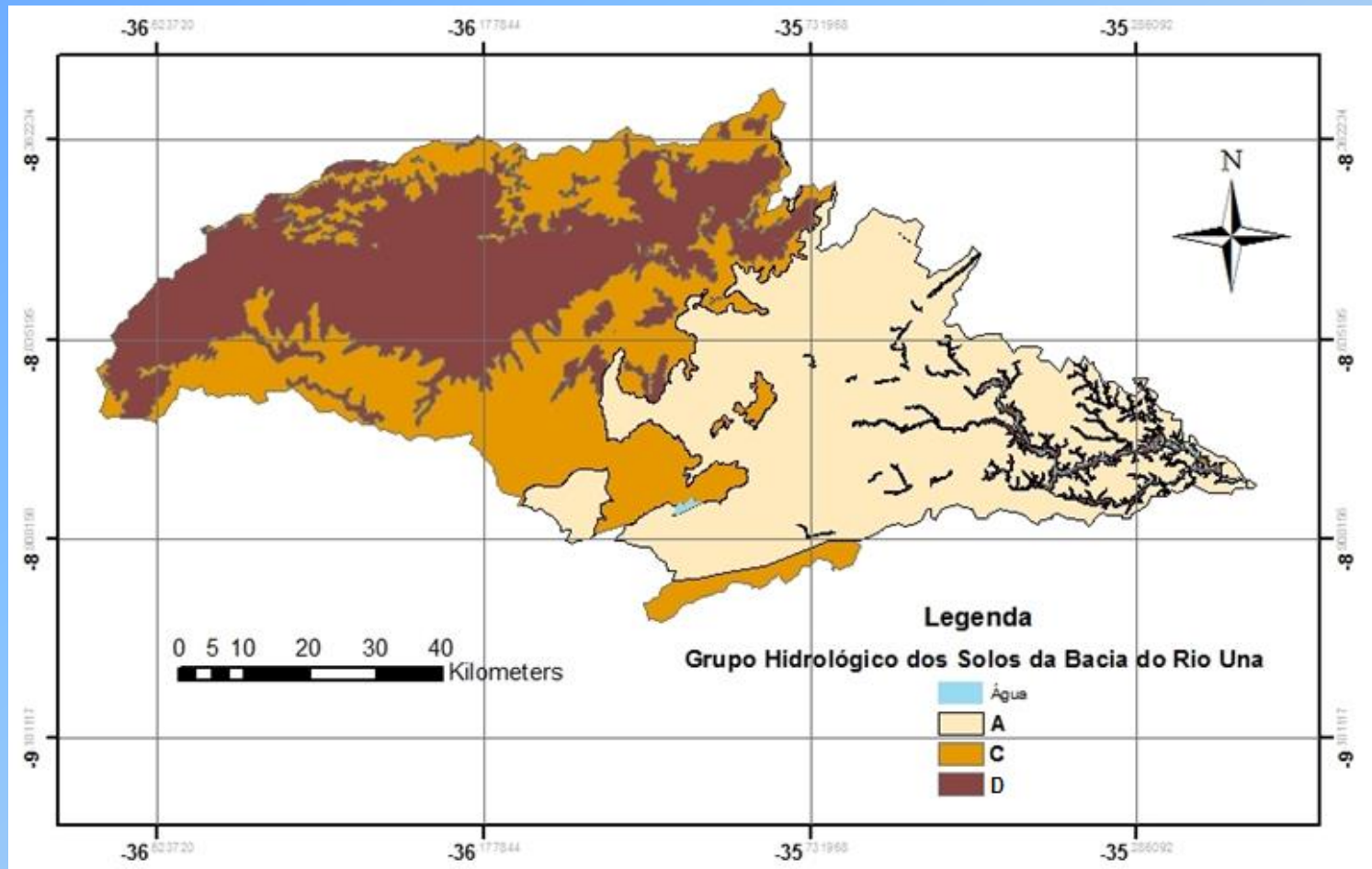


Input Data

Soil

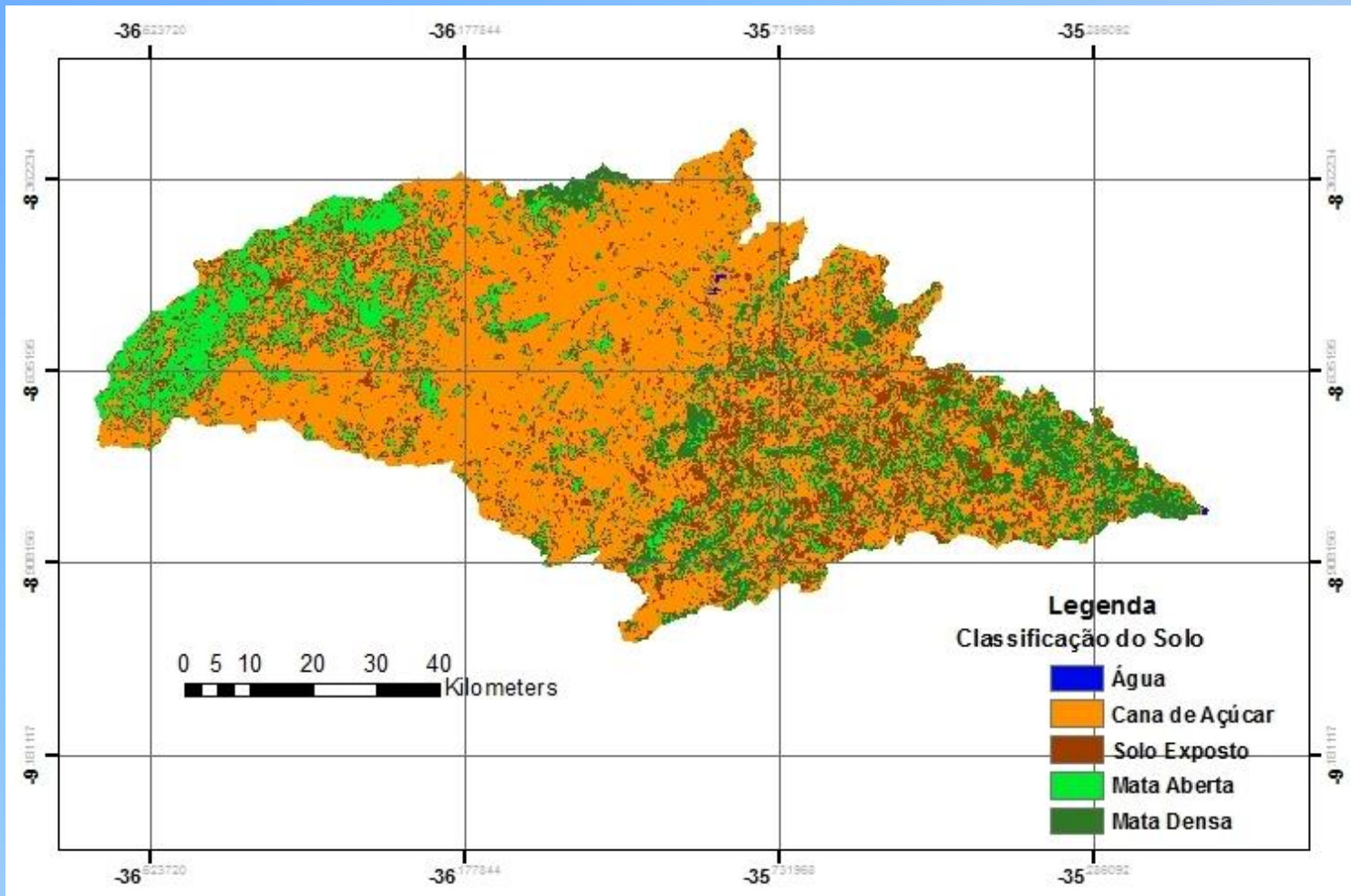


Soil Map

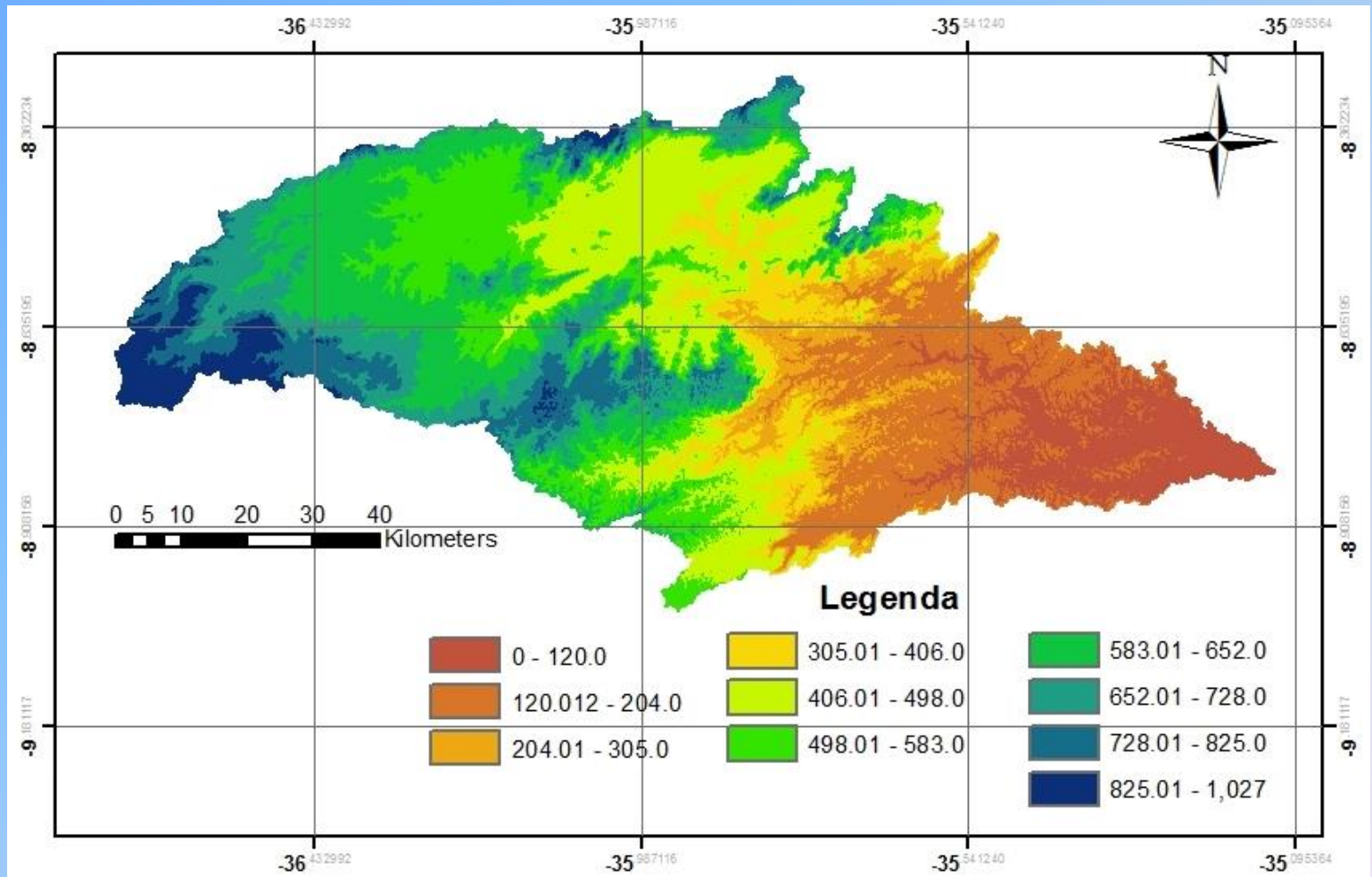


Sartori, 2005.

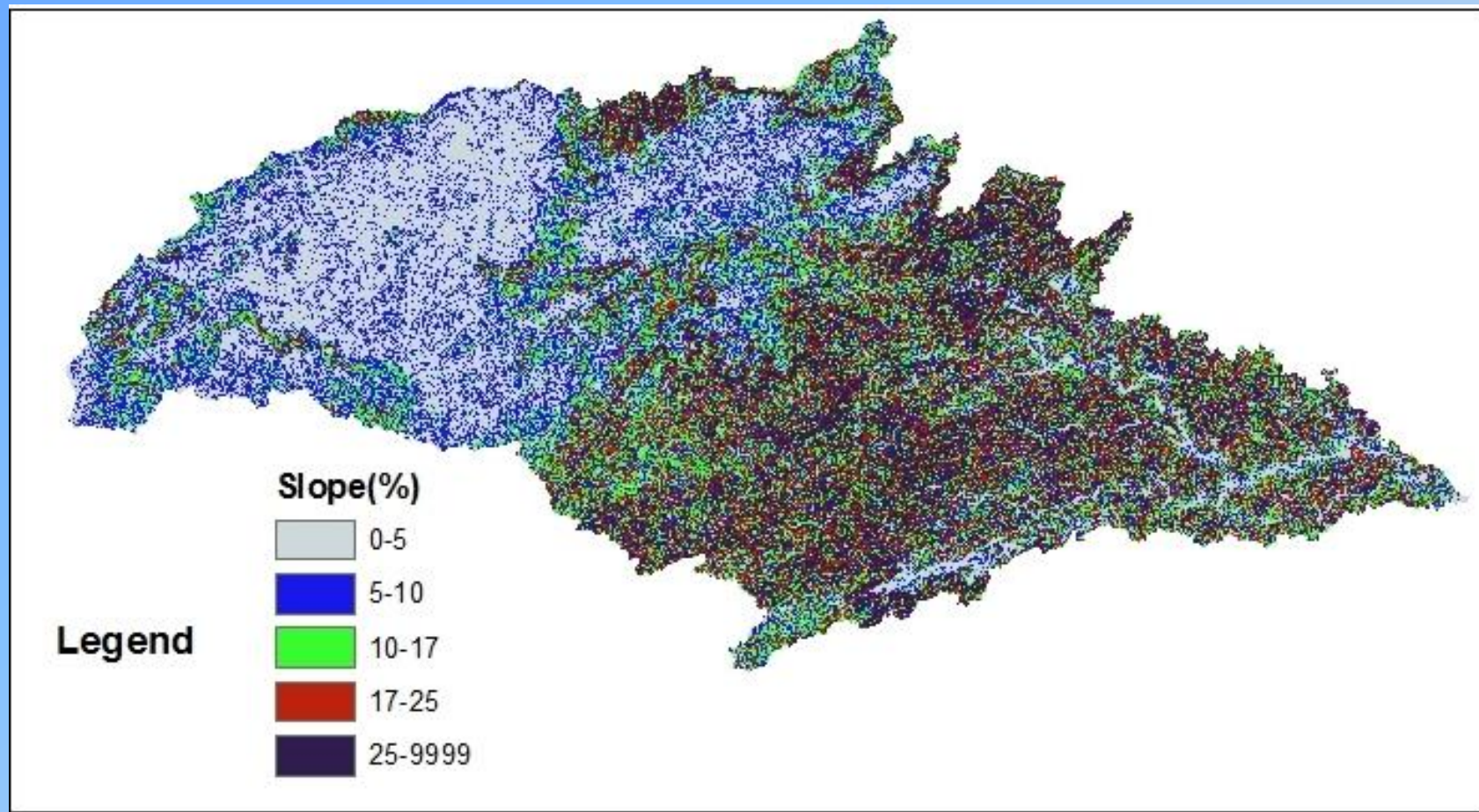
Land Use Map



Digital Elevation Model



Slope



Watershed Delineation

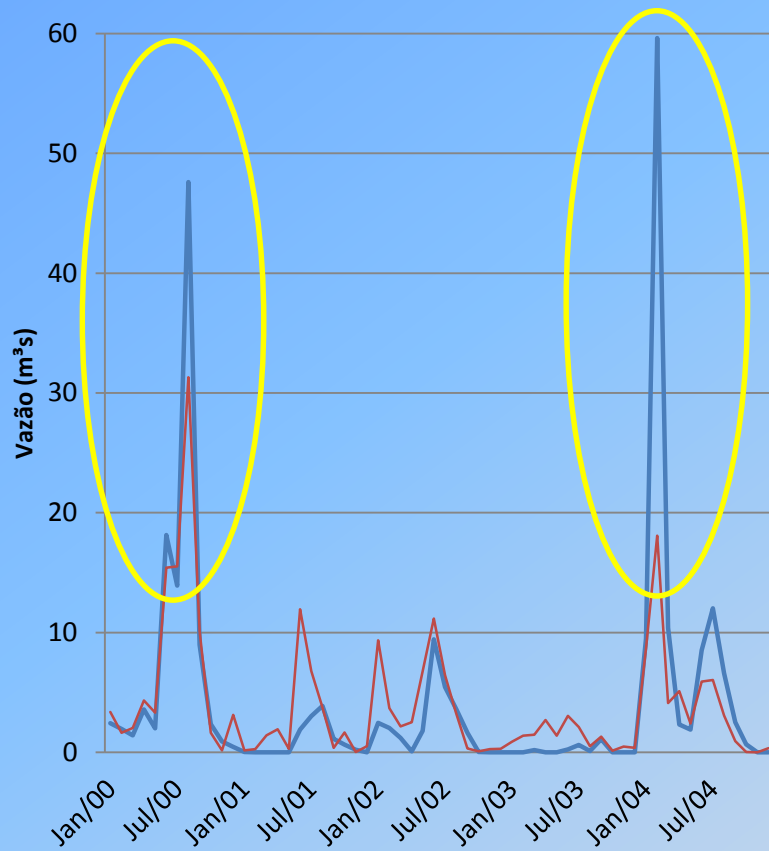


Methodology

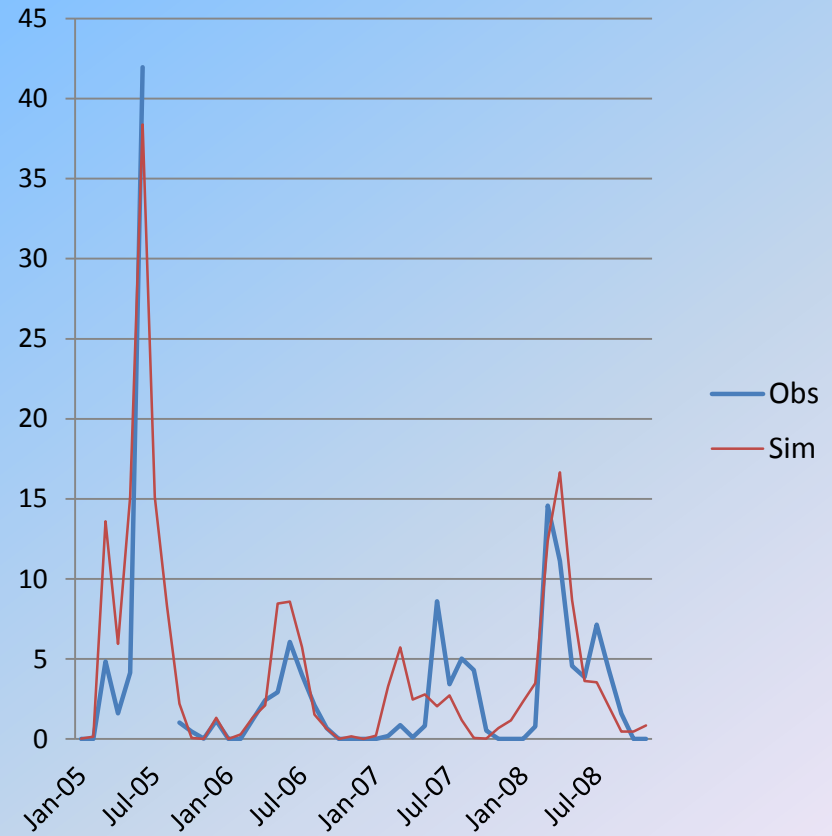
- Only streamflow analysis
 - Monthly simulation
- Calibration (year)
 - 2000 to 2004
 - 97 to 99 as warm up period
- Validation (year)
 - 2005 to 2008
- Land Use
 - Sugar kane
 - Open Forest – Range Brush
 - Dense Forest – Forest Deciduos
 - Onion as Bare Soil
 - Water
- Soil
 - Sartori (2005)
 - Levantamento Exploratório e Reconhecimento de Solos de Pernambuco (1973)
 - Exploratory Survey and Recognition of Pernambuco's Soil
- SWAT-CUP
 - Parameters
 - r_CN2.mgt
 - v_ALPHA_BF.gw
 - v_GW_DELAY.gw
 - v_GWQMN.gw
 - r_SOL_AWC().sol
 - r_SOL_K().sol
 - 120 turns

Results - Capivara

Capivara - Calibration



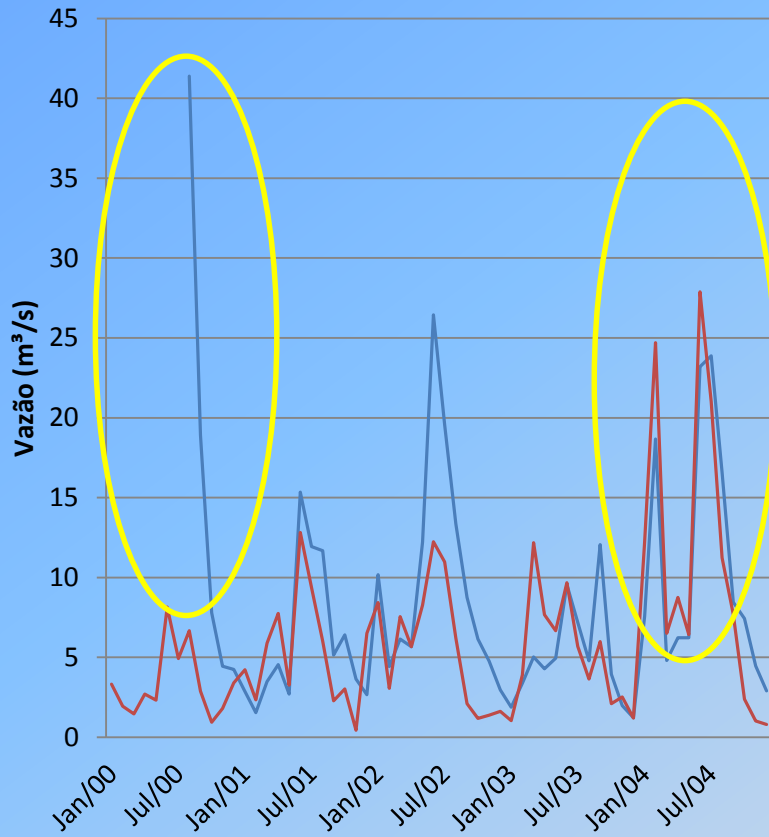
Capivara - Validation



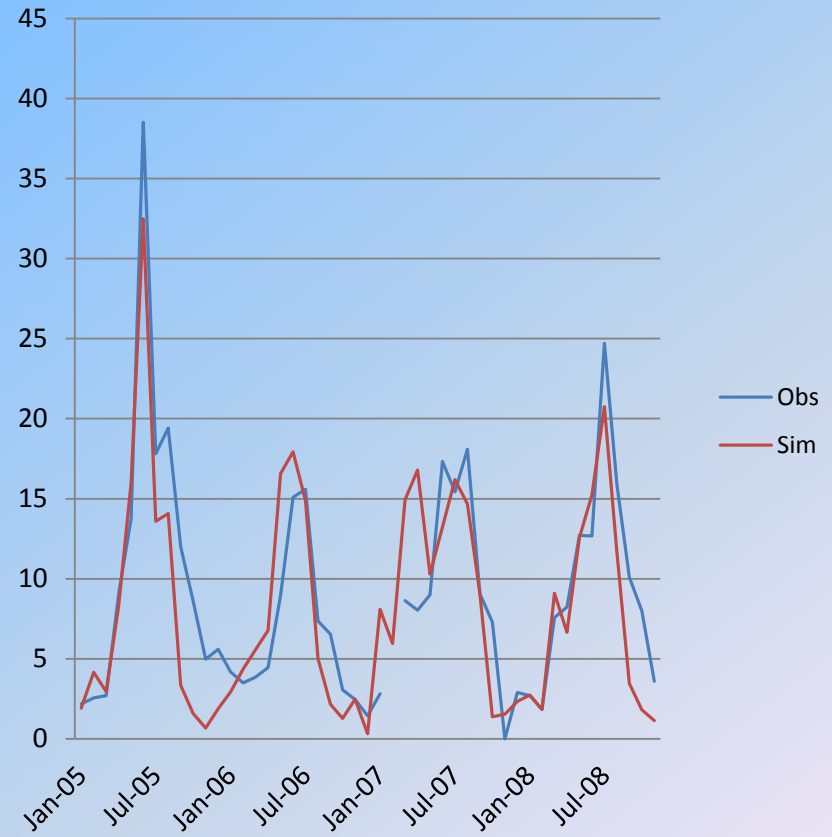
	Calibration	Validation
R ²	0.689	0.787
Nash	0.607	0.613

Results - Catende

Catende - Calibration



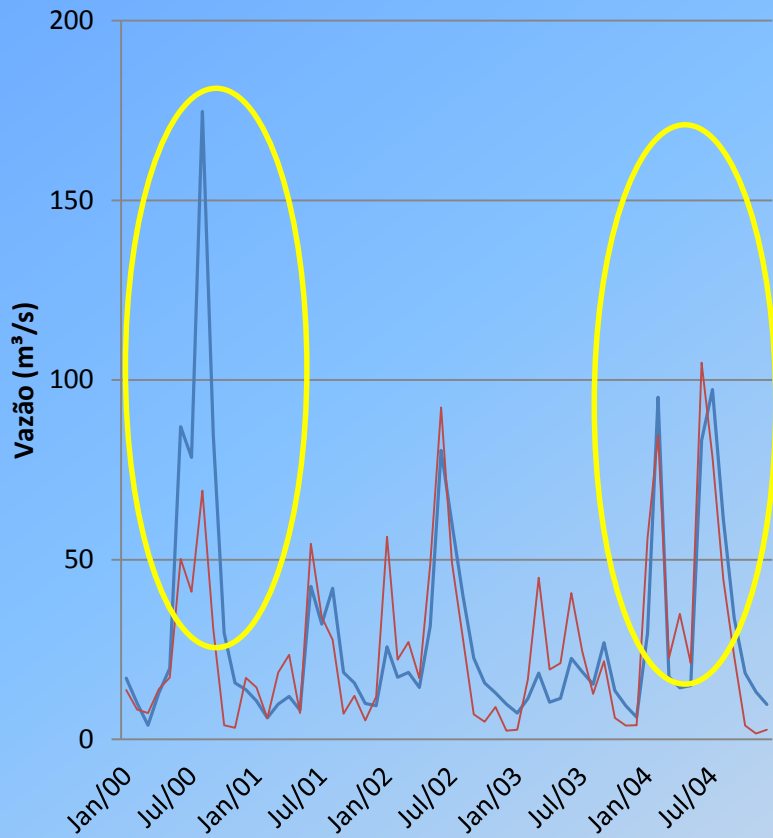
Catende - Validation



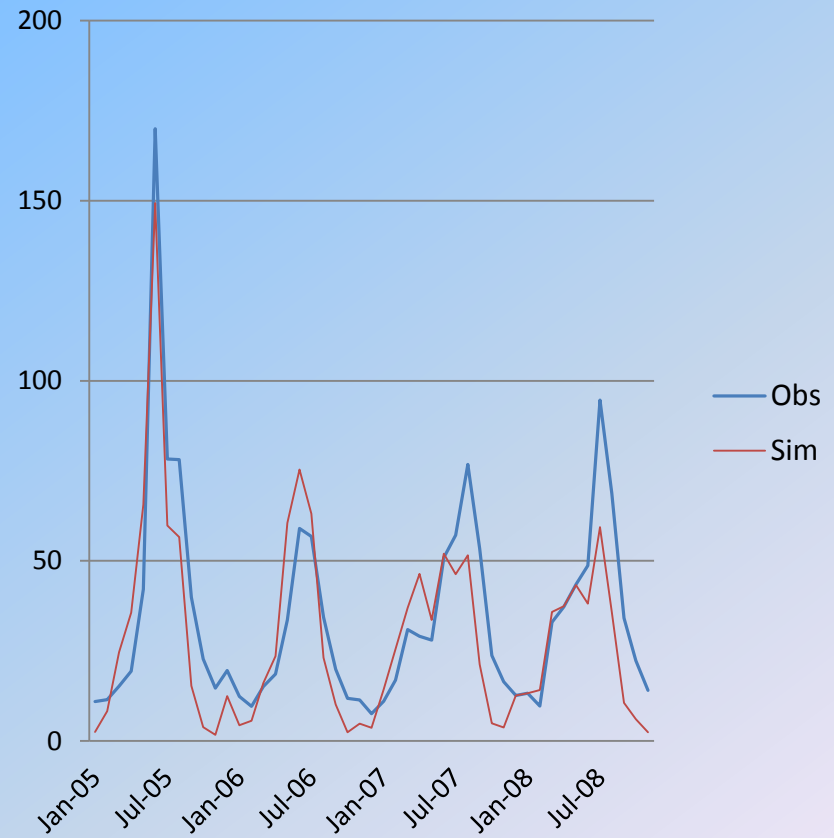
	Calibration	Validation
R ²	0.344	0.734
Nash	0.231	0.695

Results - Palmares

Palmares - Calibration



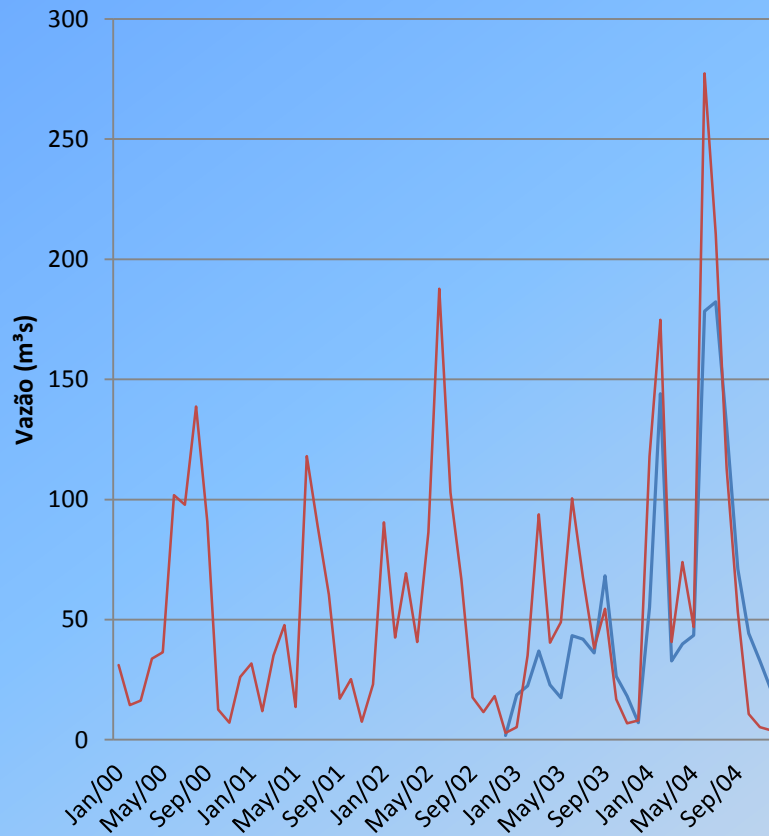
Palmares - Validation



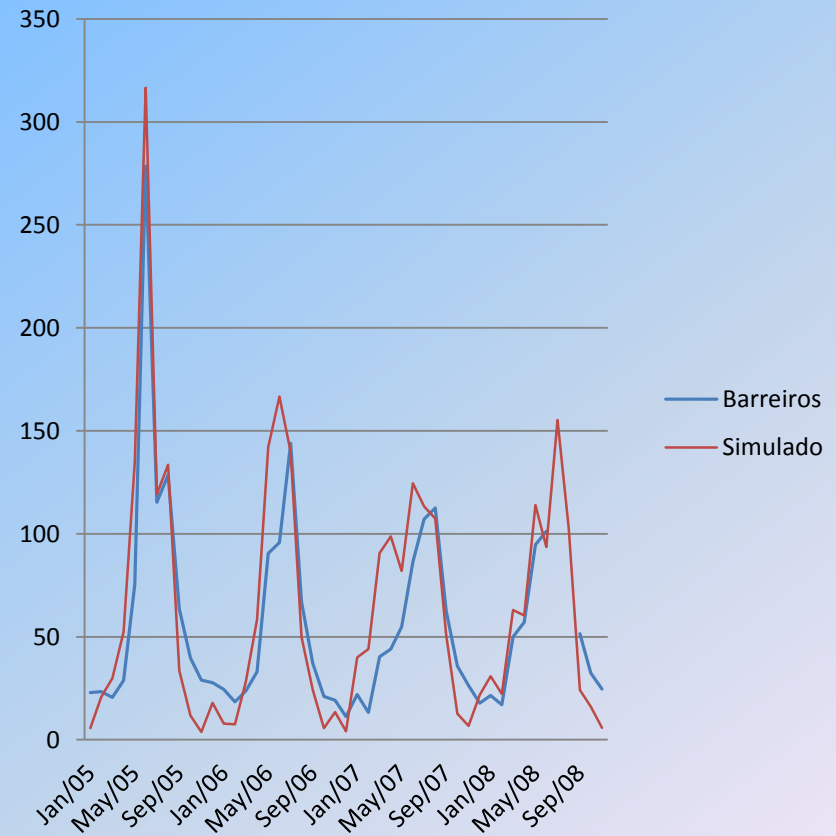
	Calibration	Validation
R ²	0.582	0.769
Nash	0.569	0.730

Results - Barreiros

Barreiros - Calibration



Barreiros - Validation

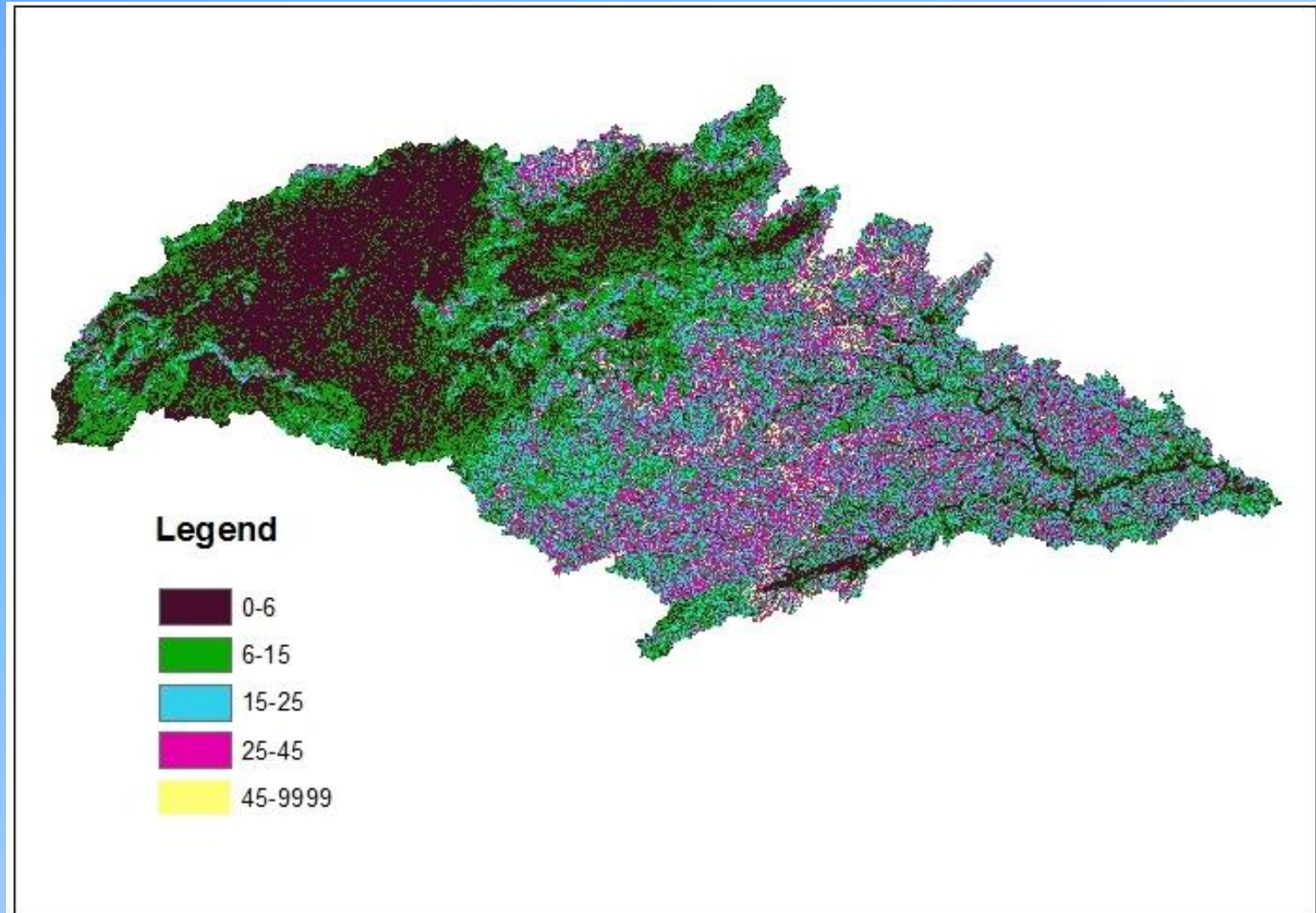


	Calibration	Validation
R ²	0.817	0.732
Nash	0.699	0.460

Conclusion

- Good results of streamflow.
- Working in progress
 - More accurate land use map
 - Work with another class of slope
 - Study/Analysi precipitation data
 - Better results?

Slope



Obrigado

Thanks

Gracias

➤ ze.ambiental@gmail.com