APPLICATION OF SWAT MODEL ON THREE WATERSHEDS WITHIN THE VENICE LAGOON WATERSHED (ITALY): SOURCE APPORTIONMENT AND SCENARIO ANALYSIS

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Aims of the study

APPLICATION OF SWAT MODEL TO THREE BASINS OF THE VENICE LAGOON WATERSHED TO

- Assess the apportionment of point and non point sources

- Quantify the non point sources in terms of *rain-driven* and *not-rain-driven* diffuse sources

- Simulate a scenario analysis to assess the effect of a reduction of agricultural loads

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Study area

Dese Zero
Watershed
290 km²

Vela
Watershed
101 km²

Naviglio Brenta
Bondante
Watershed
307 km²

About 35% of
the VLW area

~ 5.000 tN y^{-1}

3.000 tN y^{-1}

Venice
Lagoon Watershed
2038 km²

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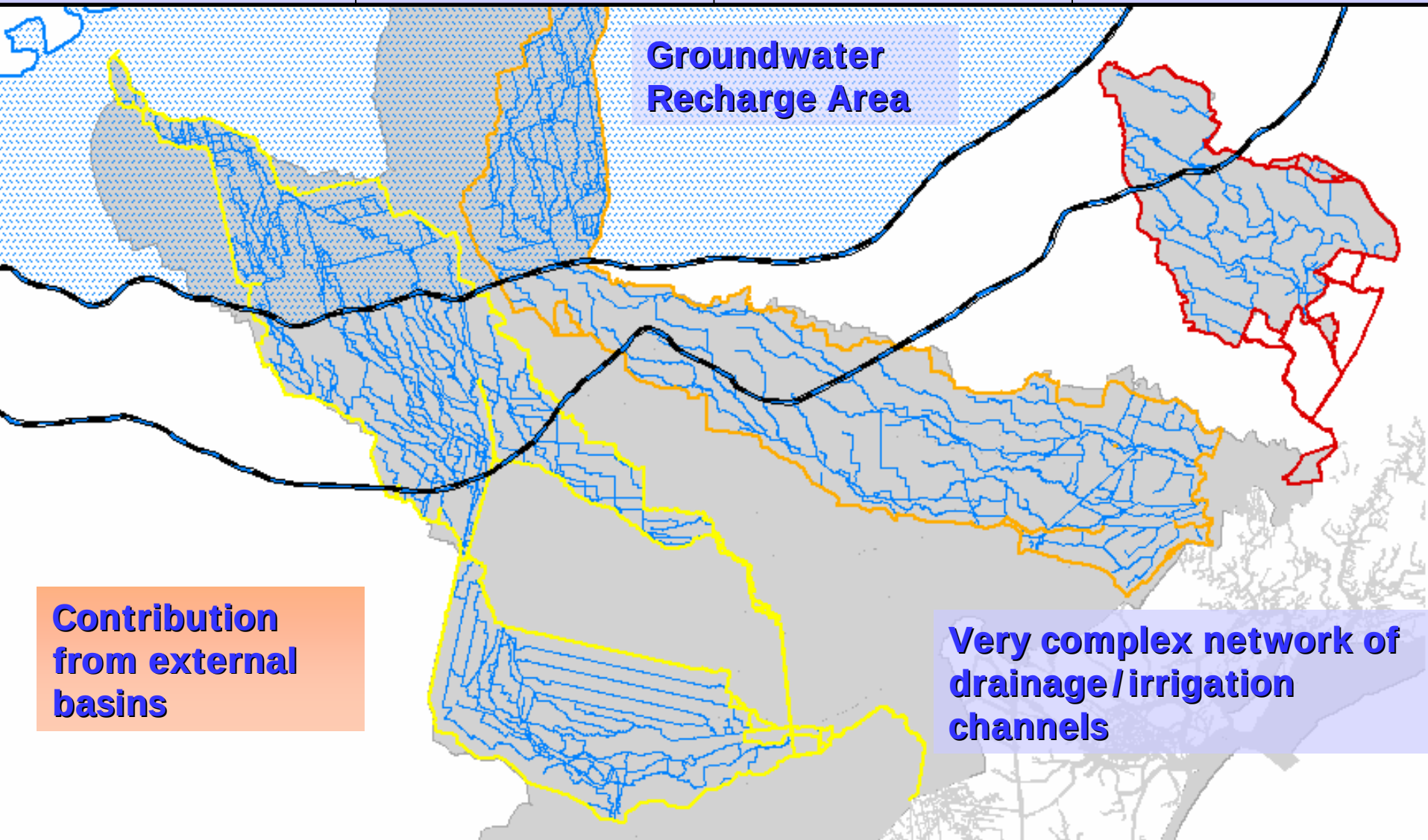
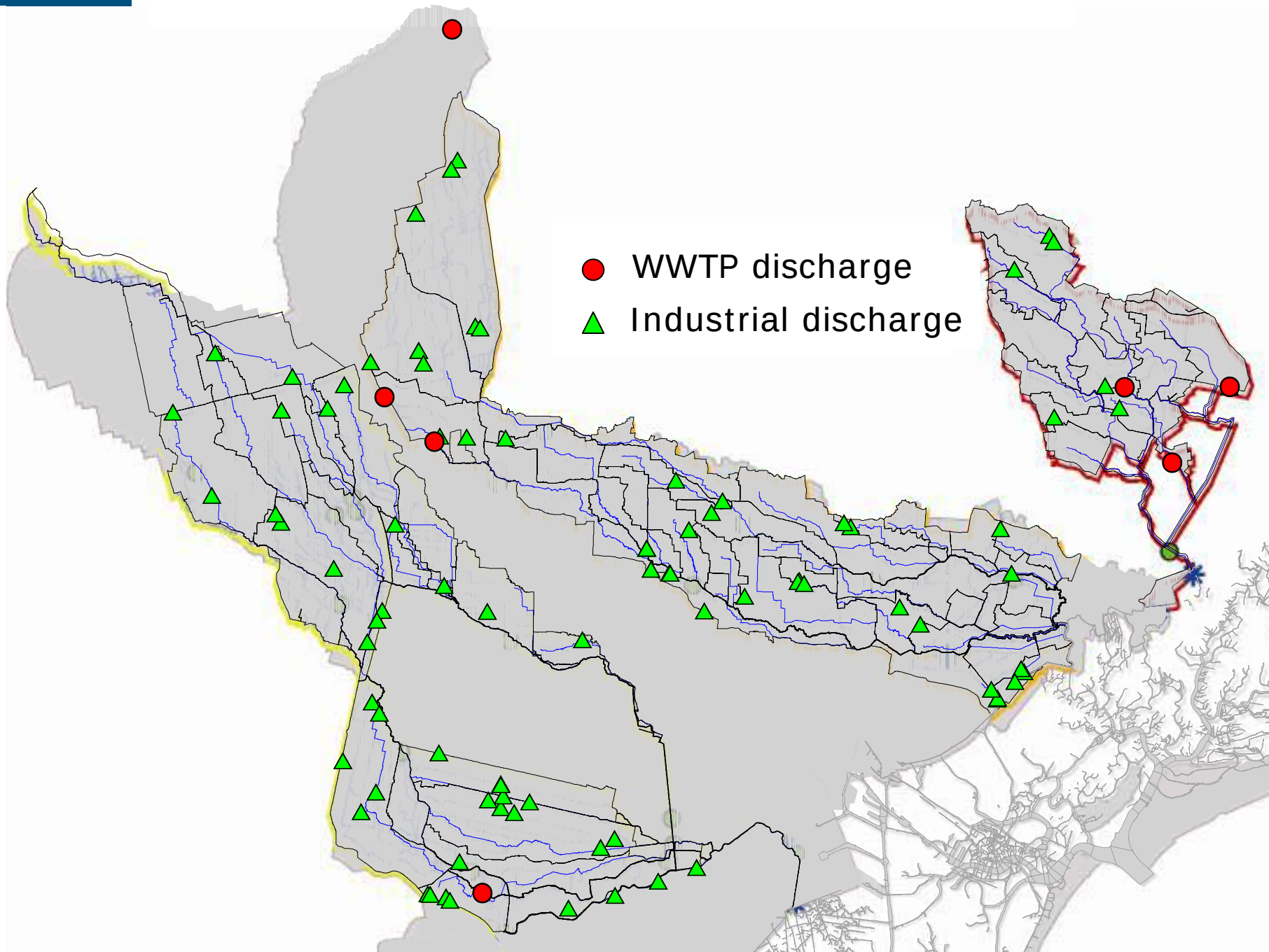
Watershed characteristics

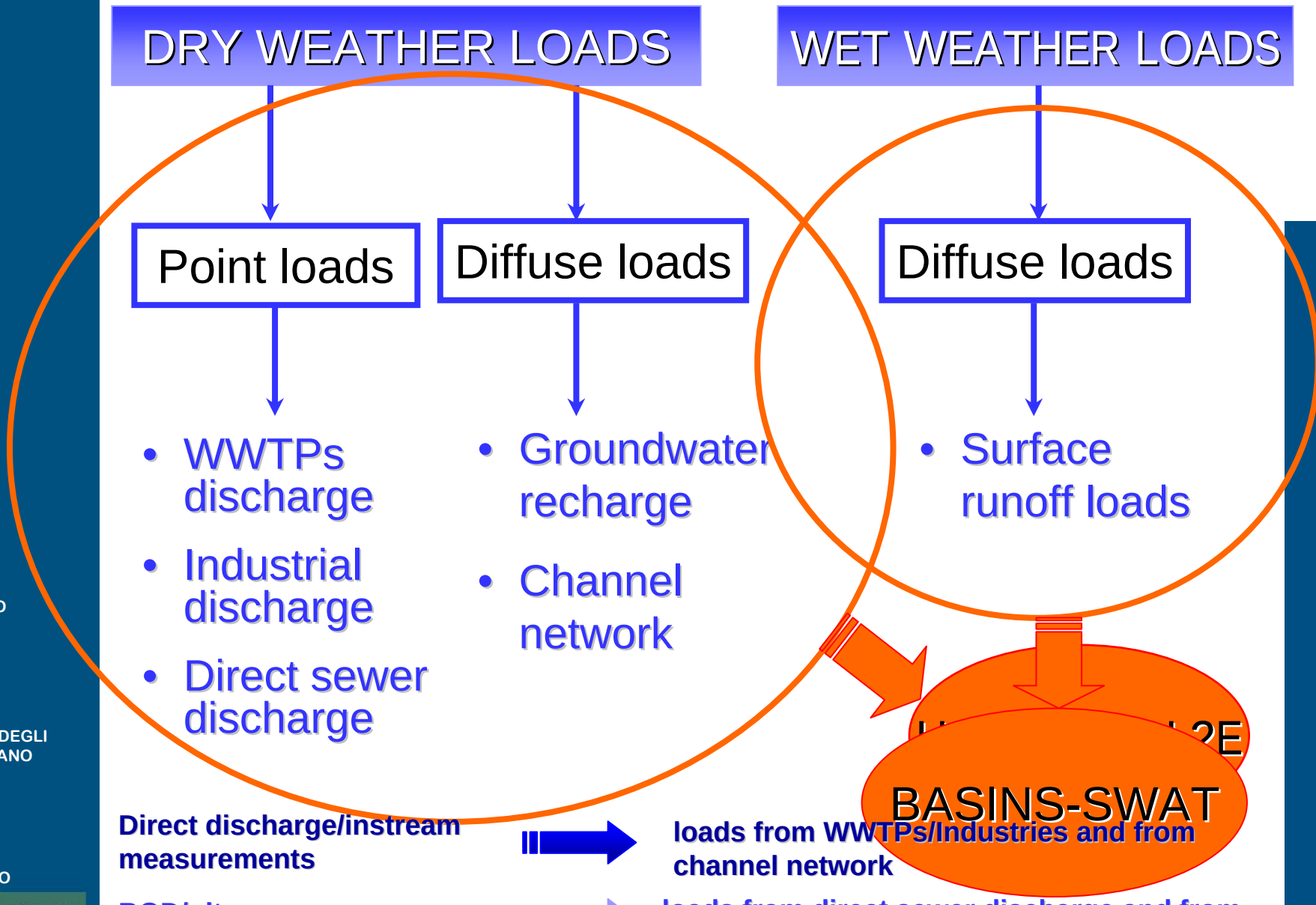
	NBB	DZ	VL
Urban Area	24%	26%	13%
Agricultural Area	69%	72%	86%
Dominant crops	Corn, soy, wheat, sugar beet	Corn, soy, wheat, sugar beet	Corn, soy, wheat, sugar beet



Measures available



Sources apportionment



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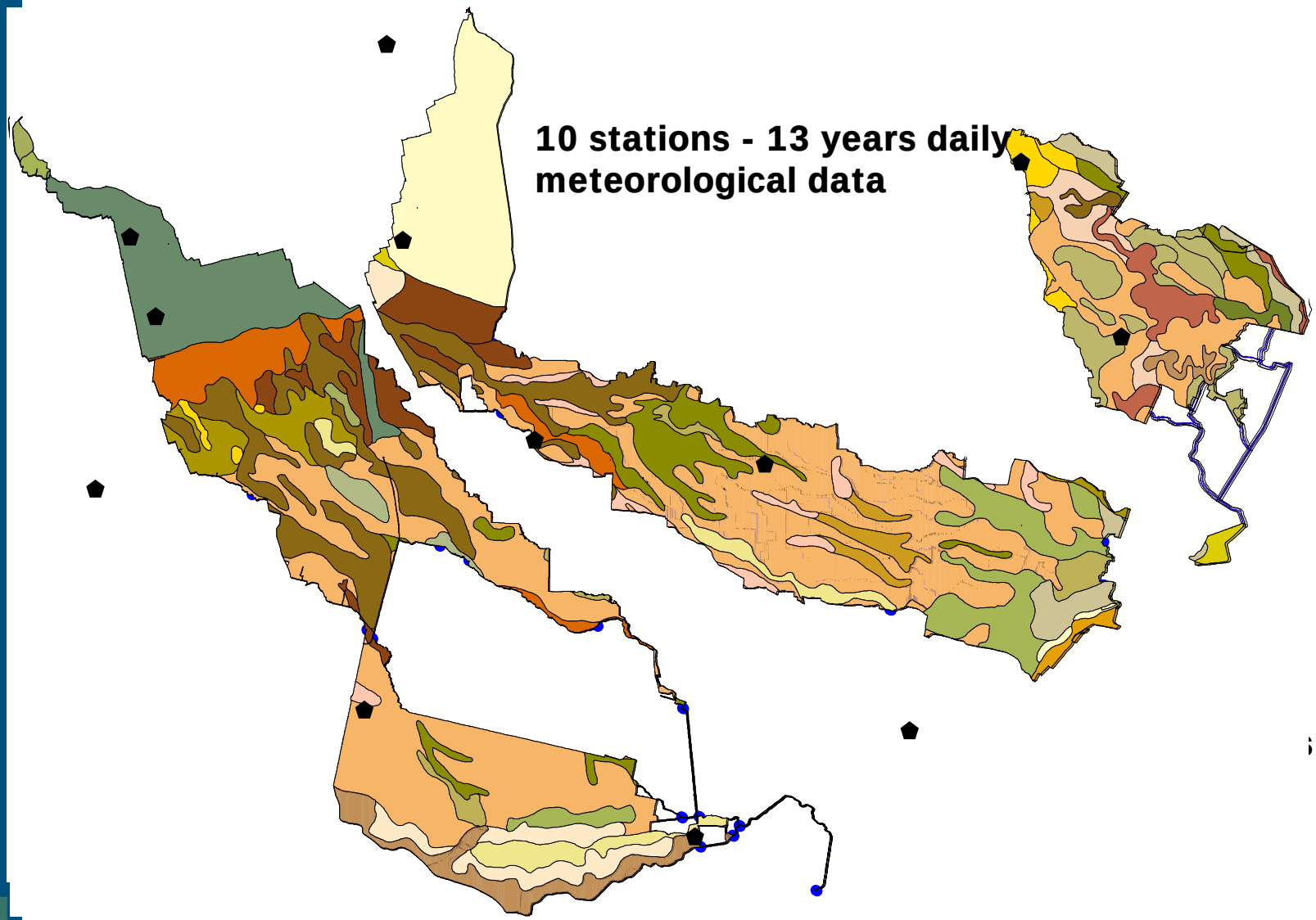
BASINS-SWAT input



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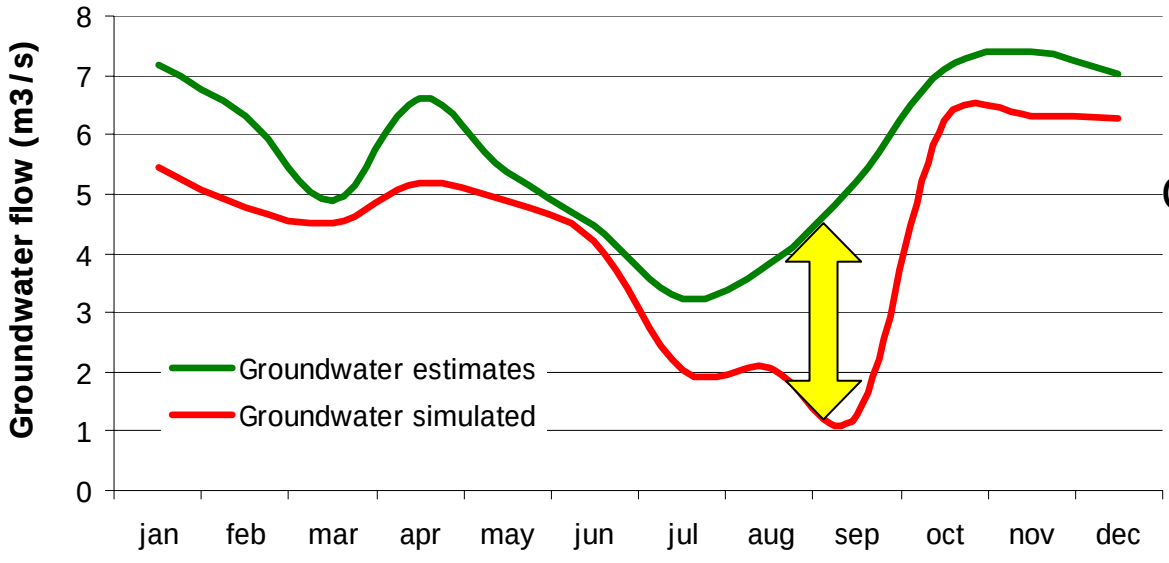
SWAT calibration



GW from external watersheds

Additional inlet contribution

Parameter calibration

- **BLAI (corn, wheat)**
- **HVSTI (corn, wheat)**

- **CN**
- **OV_N**

- **USLE_P**
- **ERORGN**
- **ERORGP**
- **NPERCO**
- **FRT_LY1**

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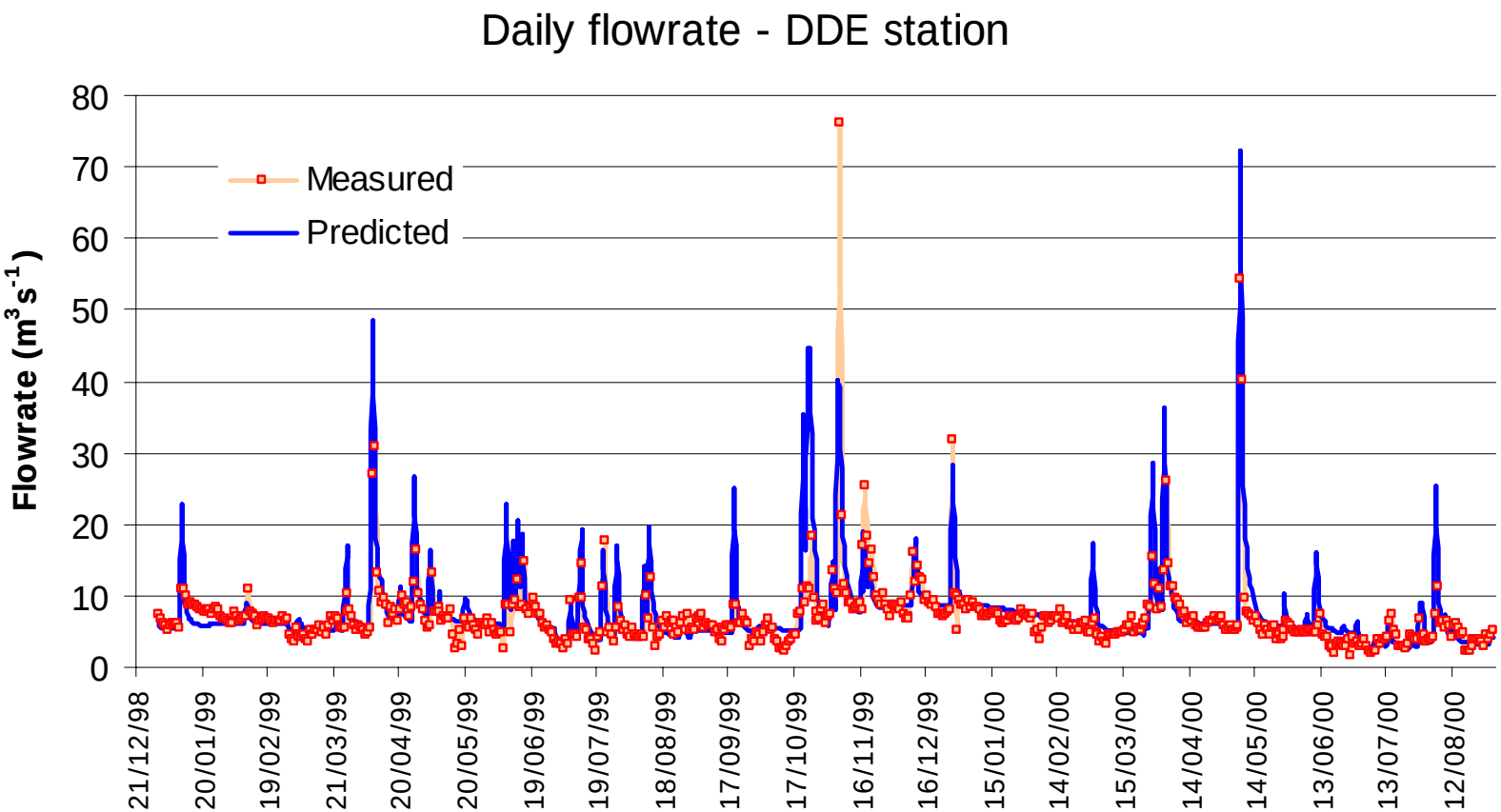
SWAT model: hydrological calibration

DDE station

Nash Sutcliffe coefficient of efficiency

E ~ 0.4



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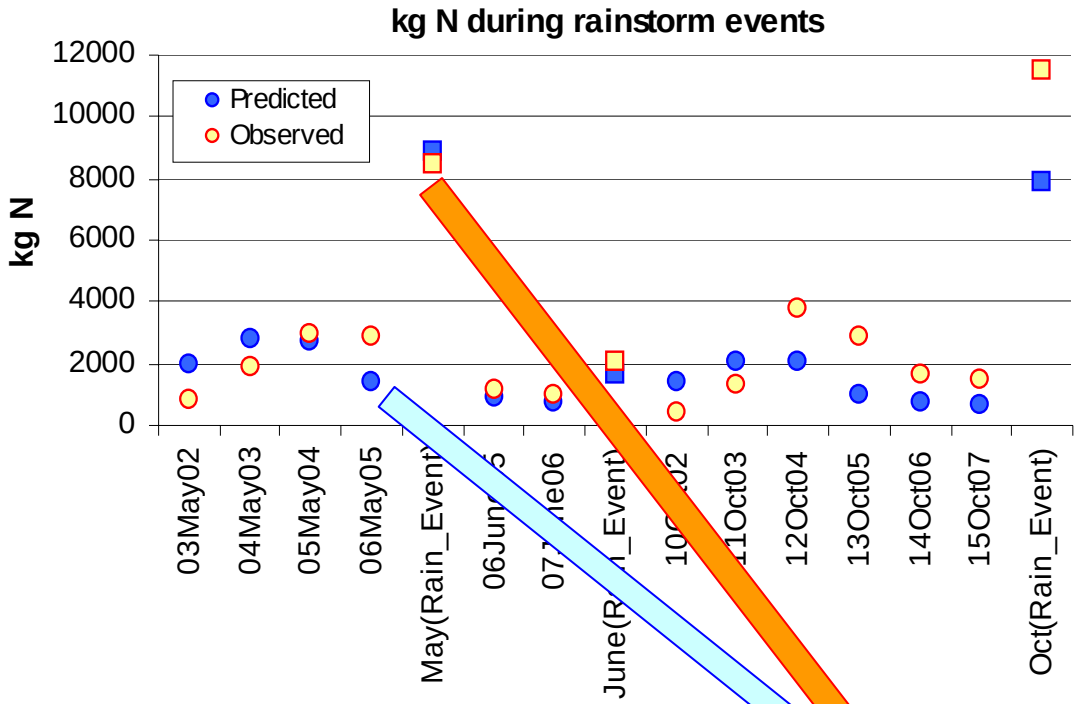
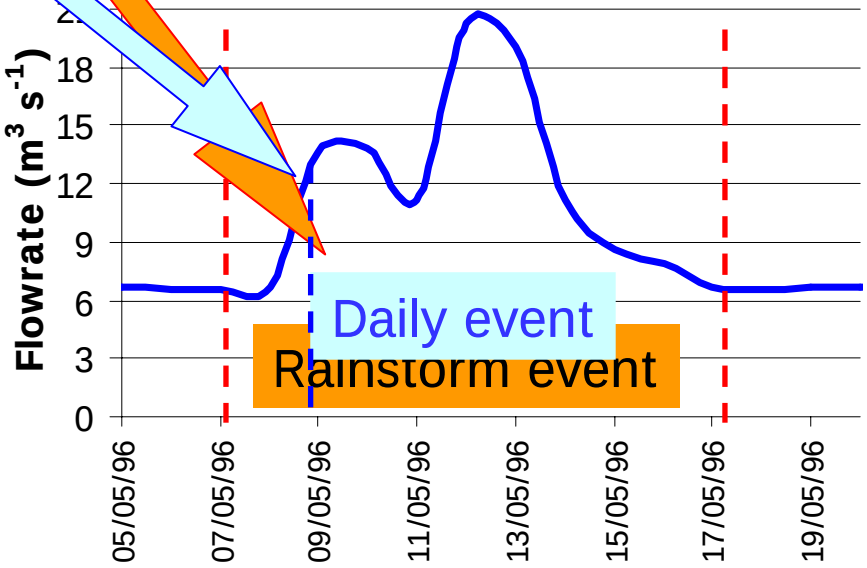
SWAT model: RESULTS



Error rainstorm event
± 15%



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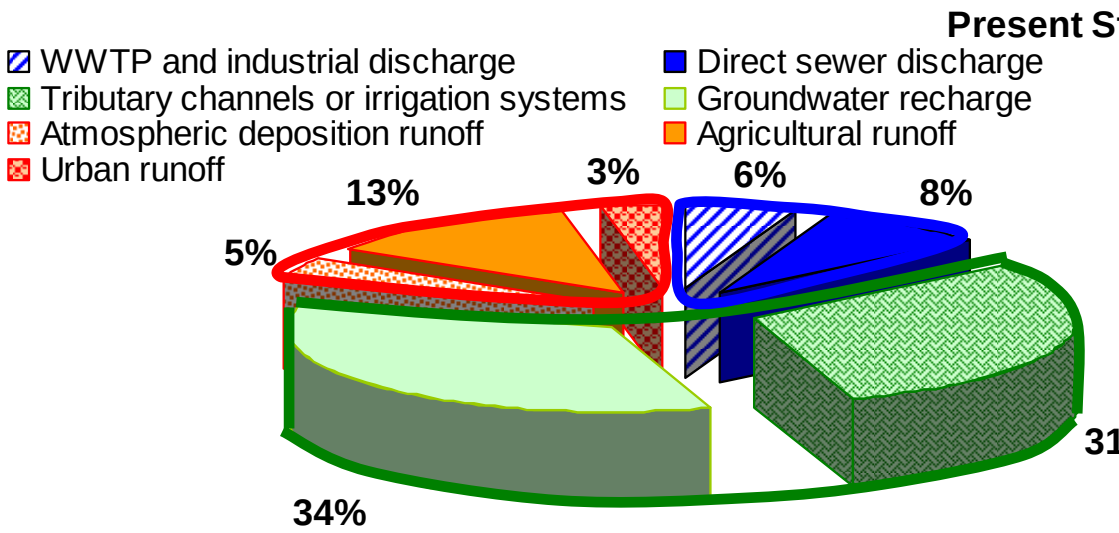
SWAT model: RESULTS – mean of 10 years simulation

SWAT output

Total N annual load ~ 2200 t N y^{-1}

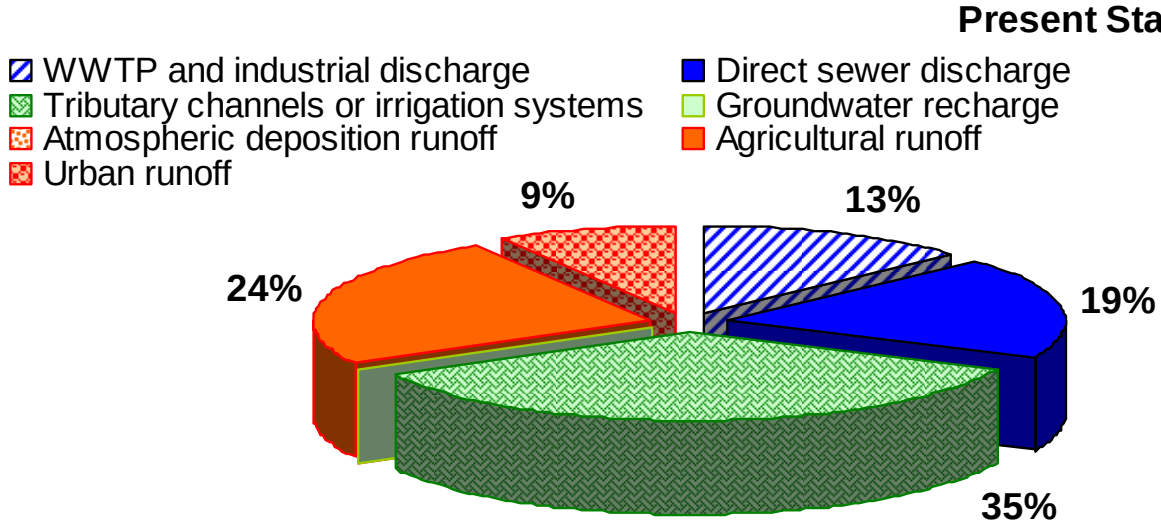
Total P annual load ~ 140 t P y^{-1}



20% runoff loads

15% point loads

65% dry weather diffuse loads



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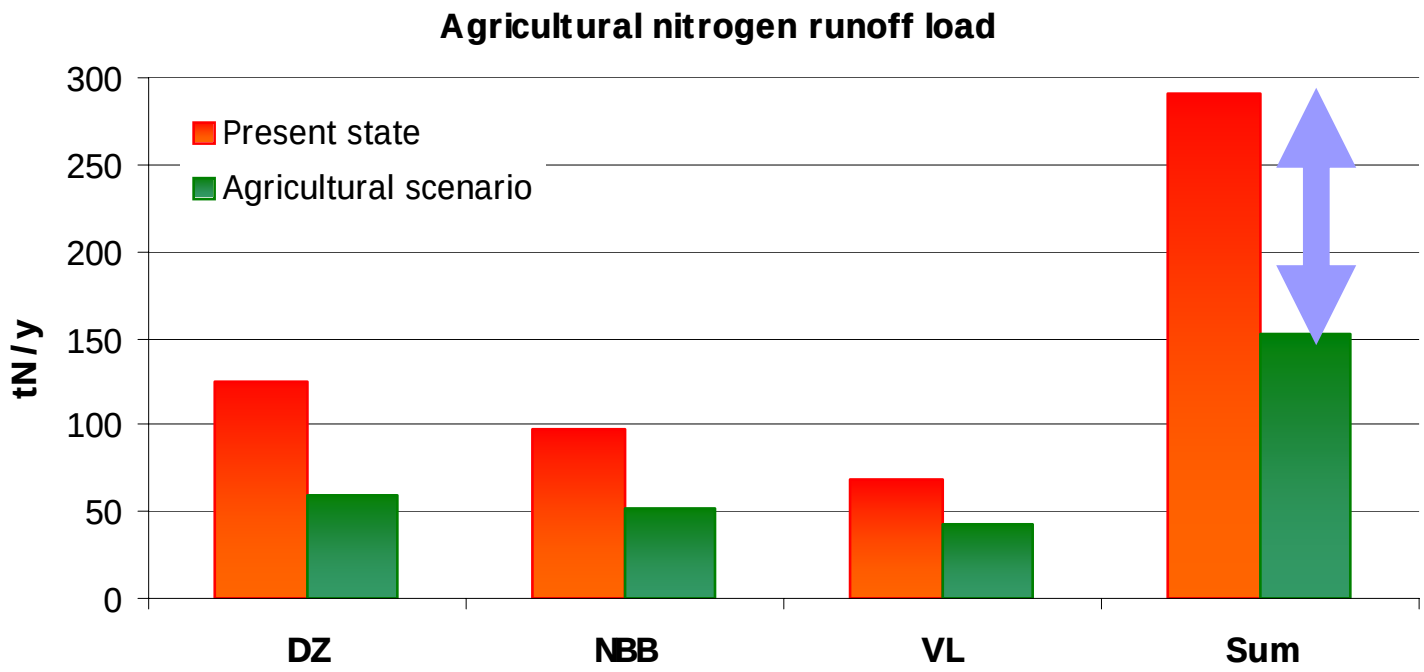
Implementation of an agricultural scenario

	kg N ha^{-1} y^{-1}	kg P ha^{-1} y^{-1}
Corn	- 37%	-17%
Corn + manure	-53%	-27%



ΔN = 139 tN y^{-1} (~ 50% agricultural nitrogen runoff load)

ΔN = 7 tP y^{-1} (~ 15% phopshorus runoff load)

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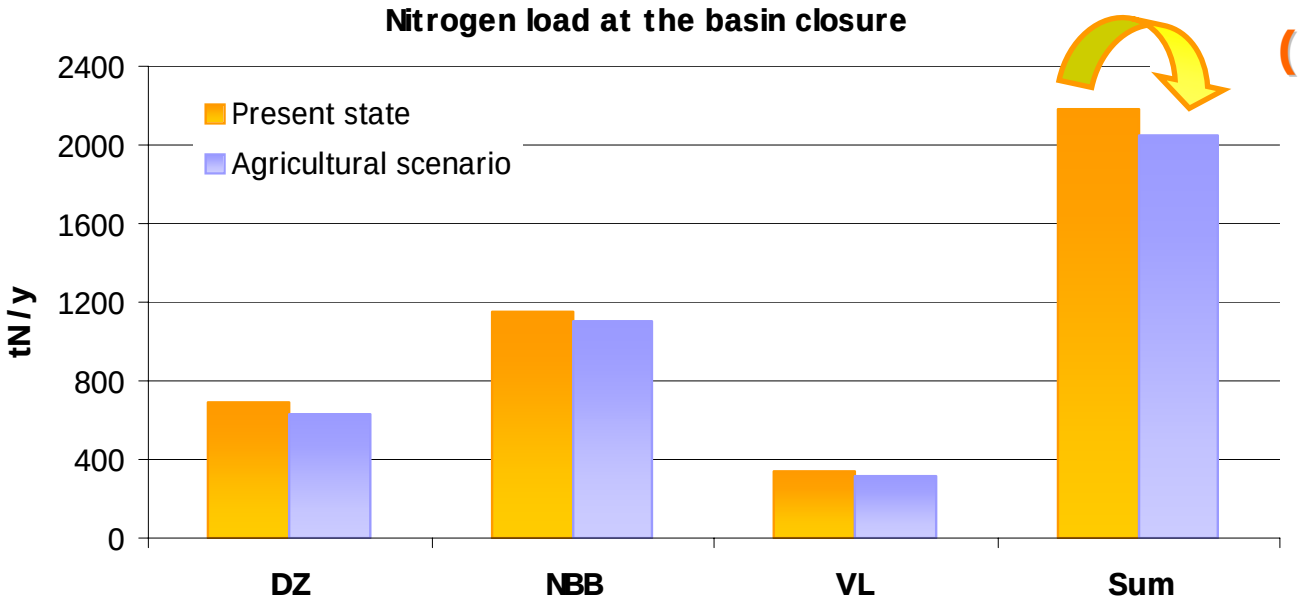
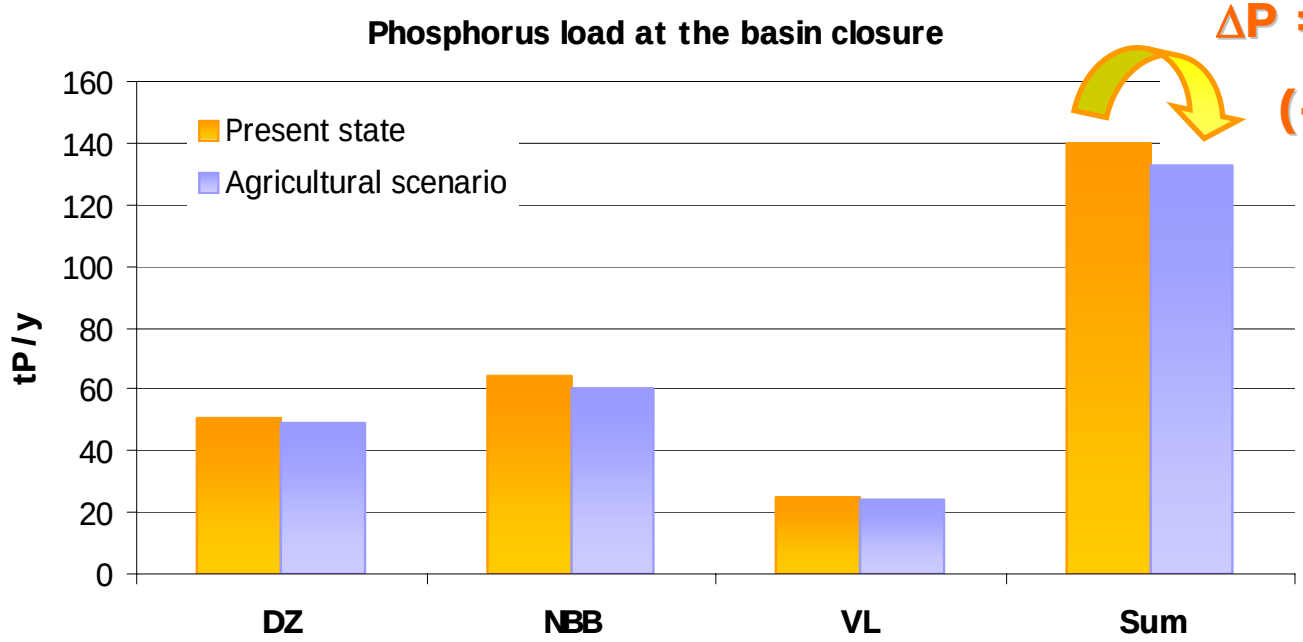
Loads at the basin closure

$\Delta N = 139$ tN y^{-1} (- 6 %)



$\Delta P = 7$ tP y^{-1} (- 5 %)



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Conclusions

- The application of SWAT model allowed to quantify the total annual nutrient load and to assess the source apportionment
- The dry weather diffuse sources (i.e. groundwater/spring recharge and tributary/irrigation channels coming from bordering watersheds) constitute the most important source (65% N and 35% P);
- Runoff loads cover about 20% of the total N load and about 30% of the total P load. Agricultural runoff constitute about 2/3 of the runoff load;
- Better-business agricultural scenario: reduction in agricultural runoff loads of about 50% for N and of about 15% for P → decrease in the total annual load of about 5-6%.
- Most significant model outputs → implemented in a decision support system software (mDSS)

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