

INFILTRATION ASSESSMENT OF TRANSFERRED WATER IN THE MANAGEMENT OF A MEDITERRANEAN ARTIFICIALLY MAINTAINED WETLAND: LAS TABLAS DE DAIMIEL NATIONAL PARK (SPAIN)

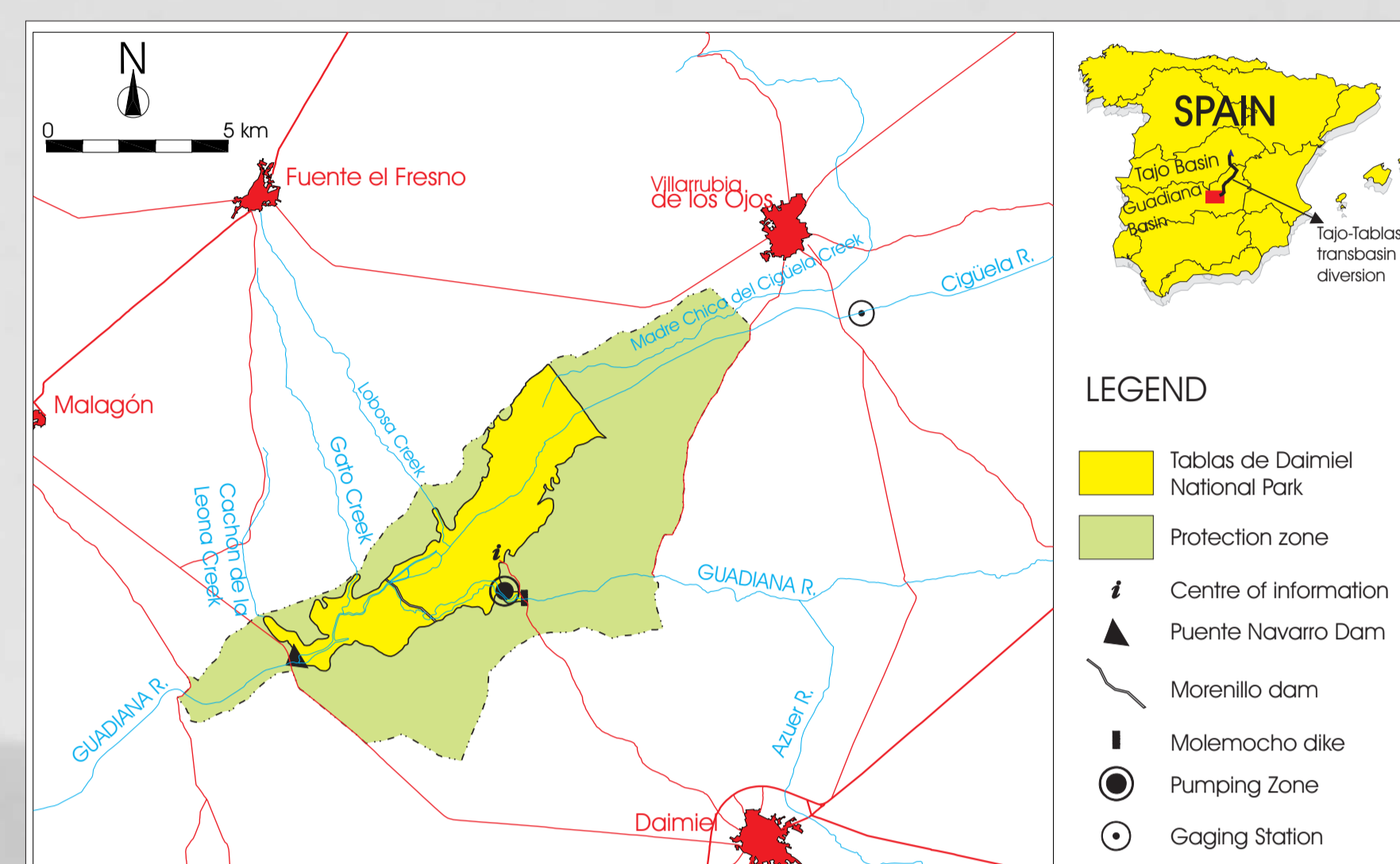
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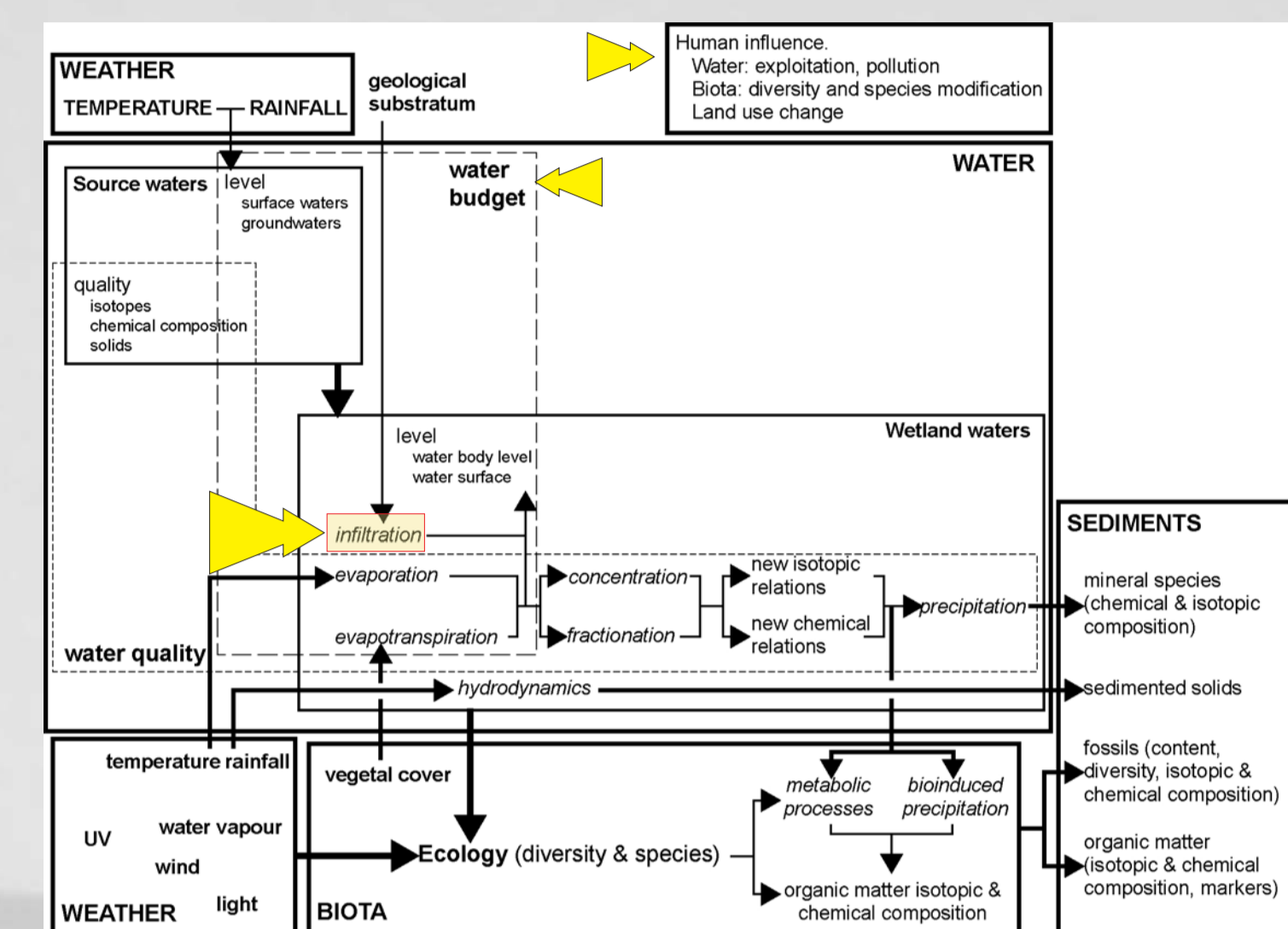
INTRODUCTION

The Tablas de Daimiel National Park wetlands (Central Spain) had their main origin in discharges from the West La Mancha aquifer. Once inflows ceased due to aquifer intensive exploitation, the progressive deterioration of the wetlands brought about several attempts of remedial actions like building of little dams and groundwater pumping to Las Tablas basin. The main one of such actions is the transbasin transfers from Tajo basin, although part of the water is lost within the wetland due to infiltration.

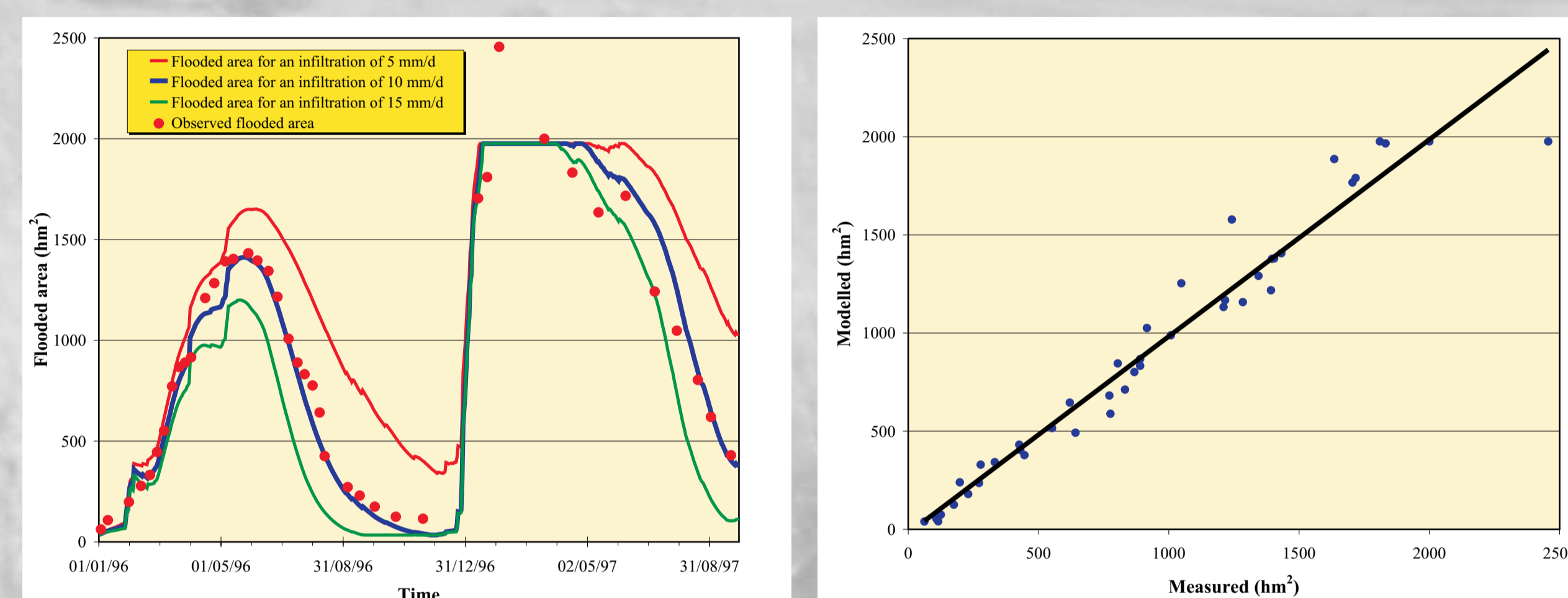
Current studies exist in order to assess CO₂ variations, which are significant due to general geographical settings and sedimentary nature of the area. In order to carry out this characterisation, it is essential to know natural and human-induced variations in the hydrological state of the wetland. In this case, water losses from the system have a direct impact upon storage volume and flooded surface.



Location of Tablas de Daimiel National Park and some of the elements influencing its current water balance



Influence of some water-related aspects on Las Tablas de Daimiel sediments



Comparison between observed and estimated flooded areas considering several (left) and only 10 mm/d (right) infiltration coefficients

The table below compares measured data of flooded area and those obtained by means of preliminary balance and PEST program from January to September 1996, when the whole surface input came from Tajo basin. It shows the maximum flooded area and percentage of days that the ponding surface is bigger than 600000 and 8500000 m². Managers consider these values as critical for the optimal ecological function of the National Park.

	Maximum flooded area (m ² · 10 ⁴)	Maximum flood Date	Difference with measured (%)	% Days flooded area > 600 m ² · 10 ⁴ (%)	% Days flooded area > 850 m ² · 10 ⁴ (%)
Preliminary	1412	05/25/1996	1.40	52.19	41.24
PEST01	1425	05/25/1996	0.49	53.28	41.97
PEST02	1425	05/25/1996	0.49	52.90	41.67
PEST03	1412	05/25/1996	1.40	52.19	41.24
PEST04	1356	05/26/1996	5.31	52.92	41.24
Measured	1432	05/29/1996		62.96	48.15

Note: Only 27 flooded area measures in 274 days from 1st January to 30th September 1996

Comparison between calculated and observed maximum flood area, and percentage of days with ponded surface areas surpassing two critical values

CONCLUSIONS

Due to the balance uses the relationship between storage capacity of the Las Tablas de Daimiel basin and the flooded area, the program can be utilized for the management of water in the National Park, the main variable for the ecological functions of the wetland. Moreover, it can be used for the management of both the underlying aquifer where part of the infiltrated water recharges and the Tajo Basin system, where the transferred water comes from.

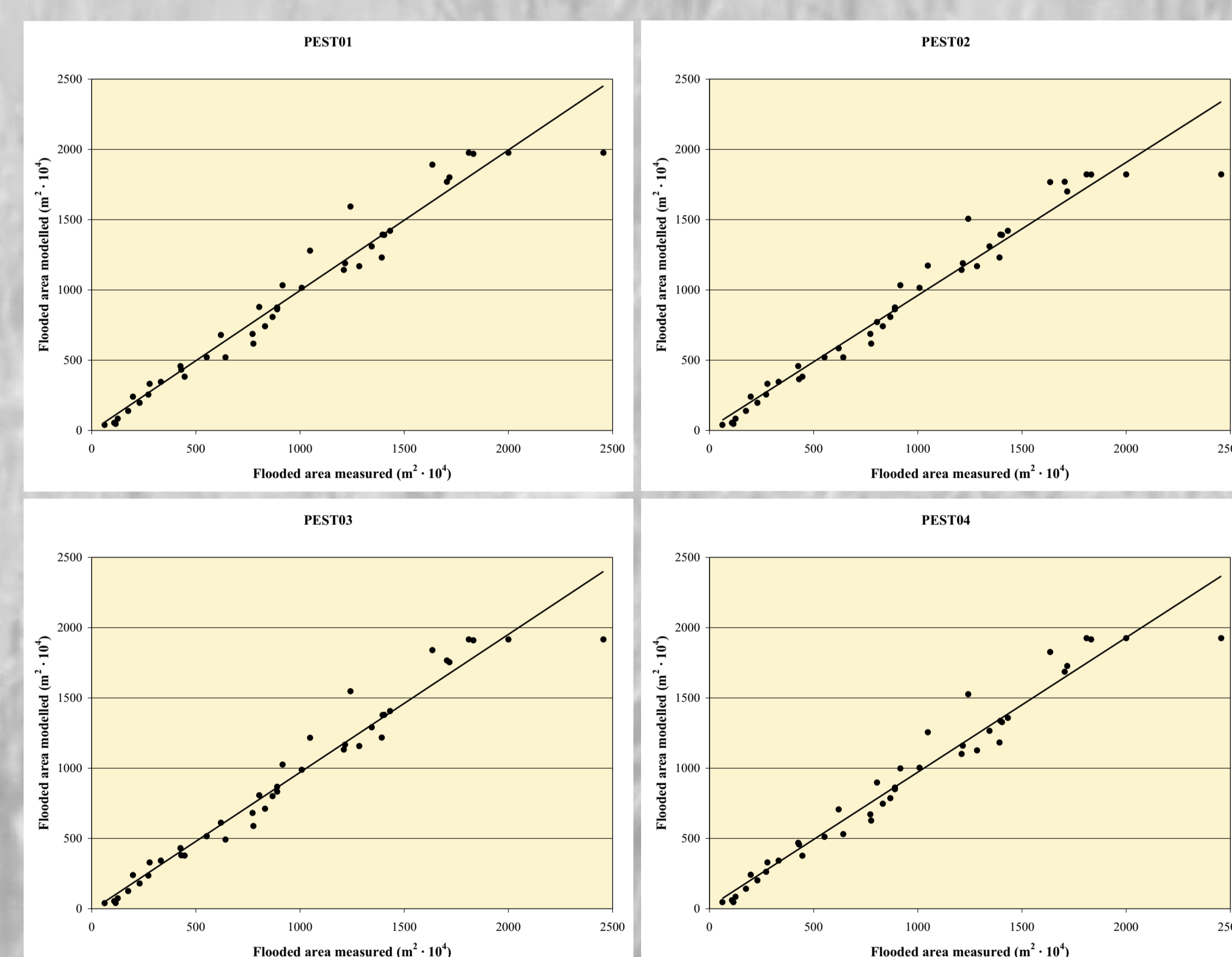
RECOMMENDED BIBLIOGRAPHY

- ALVAREZ-COBELAS, M., CIRUJANO, S., SÁNCHEZ-CARRILLO, S., 2001 - Hydrological and botanical man-made changes in the Spanish wetland of Las Tablas de Daimiel. In: Biological Conservation vol. 97, p: 89-98.
 BERZAL, V., GARCÍA-BERRIO, F., VICENS, J.M., 1987 Estudio de la viabilidad de un plan de regeneración hídrica en el Parque Nacional de las Tablas de Daimiel. In: Hidrogeología y Recursos Hidráulicos (IV Simposio de Hidrogeología) vol. 11, p: 581-594.
 CRUCÉS, J., MARTÍNEZ-CORTINA, L., 2000 - La Mancha Húmeda. Explotación intensiva de las aguas subterráneas en la cuenca alta del río Guadiana. In: Papeles del Proyecto Aguas Subterráneas, Serie A vol. 3, p: 1-66. Fundación Marcelino Botín. Madrid.
 MARTÍNEZ-ALFARO, P.E., CASTAÑO, S., 2001 - Infiltration assessment in the Tablas de Daimiel National Park. In: New approaches characterizing groundwater flow (Seilers, K.P. and Wöhnlich, S., eds.). A.A. Balkema Publishers. Lisse. Vol. 1, p: 135-138.
 SÁNCHEZ SOLER, M.J., CARRASCO, M., 1996 - El Plan de Regeneración Hídrica. In: Las Tablas de Daimiel. Ecología acuática y sociedad (Álvarez Cobelas, M. and Cirujano S., eds.) p: 253-256. Organismo Autónomo Parques Nacionales. Madrid.

INFILTRATION AND PONDING ASSESSMENT

Infiltration becomes an essential parameter in the attempts to maintain water in the basin and, therefore, in the integrated management of wetland-related water resources. The actual extent of infiltration losses is difficult to quantify due to the poor quality of existing data as well as to the indetermination of various important parameters.

A methodology for estimating a preliminary infiltration coefficient has been developed (Martínez-Alfaro and Castaño, 2001). Such methodology works on the calculation of daily water balances while taking into account the geometry of the basin and the flooded area. A two-years period under influenced-regime conditions was considered: 1996, when water from Tajo basin was transferred to Las Tablas, and 1997, when extraordinary surface runoff took place. The calculated infiltration coefficient was 10 mm/d. Complementarily, PEST software has been applied to a specific program designed to calculate the water balance in Las Tablas. The estimated parameters were the infiltration coefficient and some geometrical values. The results were similar to that used in the preliminary balance. The balance was calculated using the flooded area, so the program can be utilised for the integrated management of water in the National Park, in the aquifer where part of the infiltrated water recharges and in the Tajo Basin, where the transferred water comes from.



Comparison between measured and calculated flooded surface values for the estimation of different parameters influencing the Tablas de Daimiel water balance. Simulated values were obtained using PEST program.



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