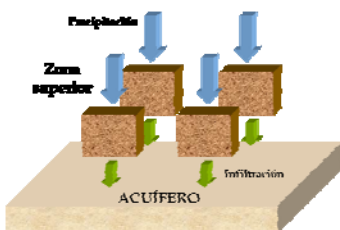
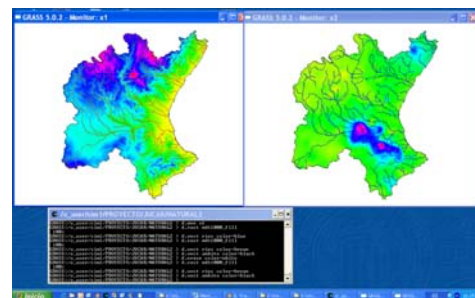
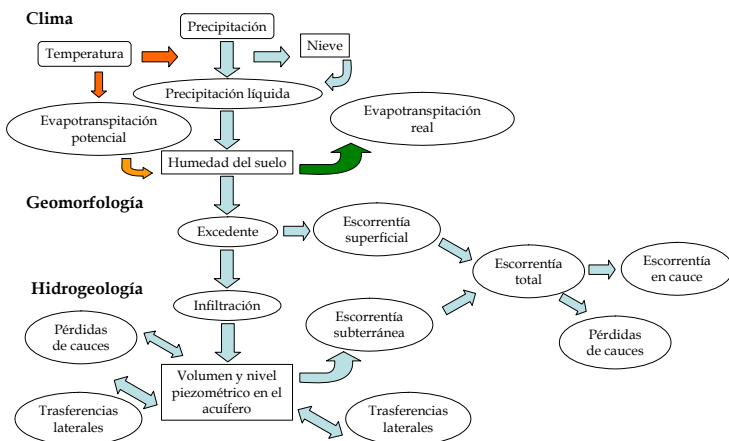


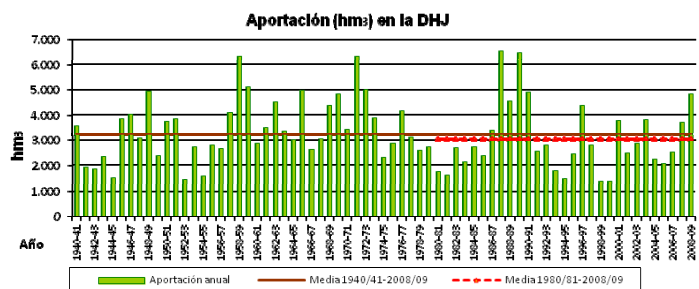
- Water resources assessment
 - Flows and storages in hydrological cycle
 - Aquifer hydrodynamics
- Water uses and pressures on water bodies
 - Ecological river flows and wetland water needs
 - Water pollution: surface and groundwater
- Water resources systems:
 - Water resources allocation to water demands
 - Water resources exploitation
- Floods
 - Risk maps



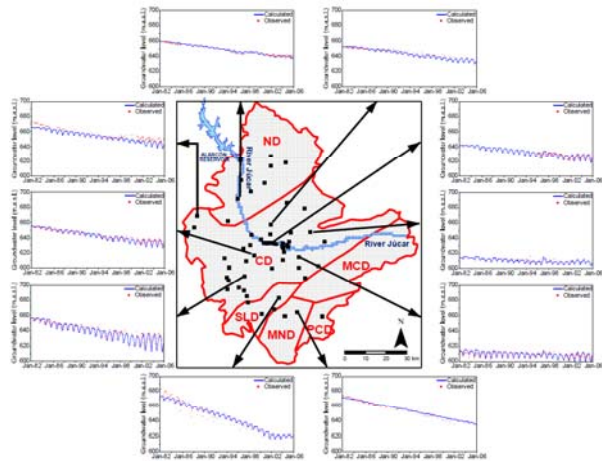
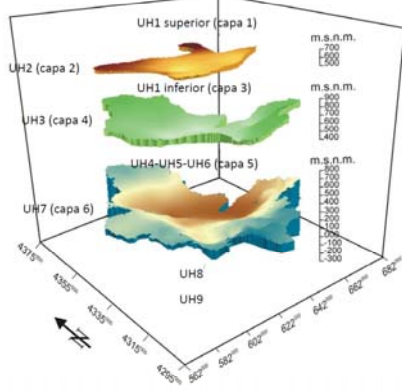
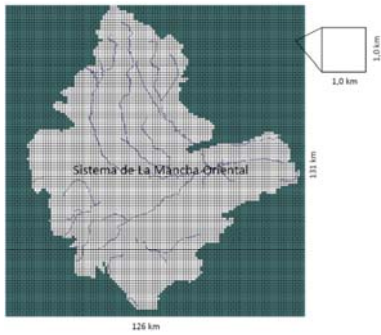
Water resources assesment models



PATRICAL model



Aquifer models



3D MODFLOW model
Mancha Oriental aquifer



Environmental river flows

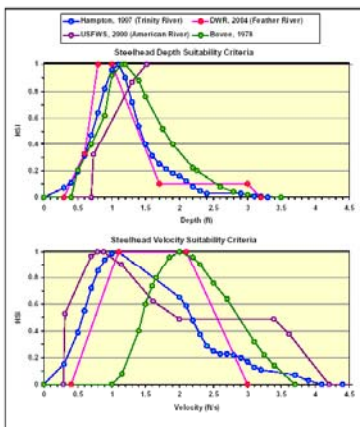
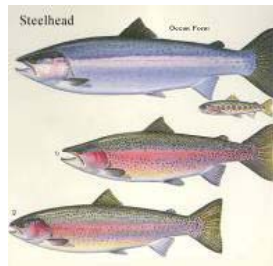


Figure C-1. Comparison of Steelhead Depth and Velocity Habitat Suitability Index (HSI) Curves



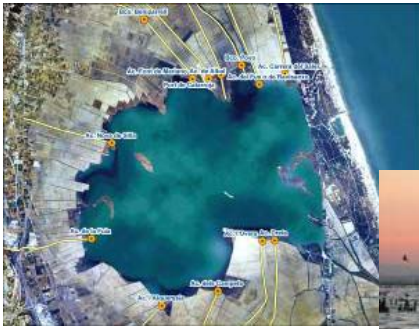
Indexes of habitat sustainability

Balmeñía	0	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5	23.5	24.5	25.5	26.5	27.0	27.5	28.5	29.5	30.5	30.6	
Distancia a margen izquierda (m)	0.35	0.46	0.61	0.83	1.11	1.44	1.74	2.01	2.26	2.50	2.79	3.12	3.34	3.45	3.44	3.29	3.26	3.37	3.41	3.38	3.24	2.99	2.74	2.50	2.26	2.02	1.80	1.60	1.39	1.16	0.91	0.64	0.60		
Calado (m)	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30.6		
Margen izquierda (m) hasta	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30.6			
Velocidad (m/s) en calado 0 a 0,5	0.00	0.00	0.02	0.05	0.08	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.18	0.19	0.21	0.24	0.25	0.24	0.23	0.23	0.23	0.22	0.21	0.20	0.19	0.18	0.16	0.14	0.12	0.09	0.07	0.06	0.00		
0,5 a 1,0																																			
1,0 a 1,5																																			
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4,0 a 4,5																																			
4,5 a 5,0																																			
Calado mínimo (m)	0.35	0.46	0.61	0.83	1.11	1.44	1.74	2.01	2.26	2.50	2.79	3.12	3.34	3.45	3.44	3.29	3.26	3.37	3.41	3.38	3.24	2.99	2.74	2.50	2.26	2.02	1.80	1.60	1.39	1.16	0.91	0.64	0.60		
Caudal en la vertical (m³/s)	0.00	0.01	0.03	0.07	0.13	0.20	0.26	0.33	0.43	0.51	0.59	0.64	0.68	0.69	0.71	0.72	0.72	0.71	0.70	0.65	0.57	0.50	0.44	0.36	0.27	0.20	0.15	0.10	0.07	0.04	0.03	0.00			
Sección en la vertical (m²)	0.00	0.20	0.54	0.72	0.97	1.28	1.59	1.88	2.13	2.38	2.64	2.95	3.23	3.40	3.44	3.36	3.27	3.32	3.39	3.40	3.31	3.12	2.86	2.62	2.38	2.14	1.91	1.70	1.51	1.31	1.03	0.78	0.60		

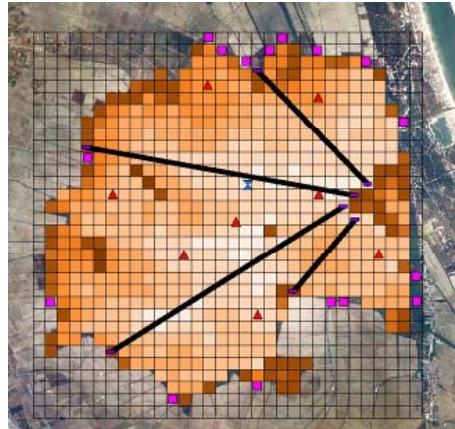
Velocities obtained with hydraulic models



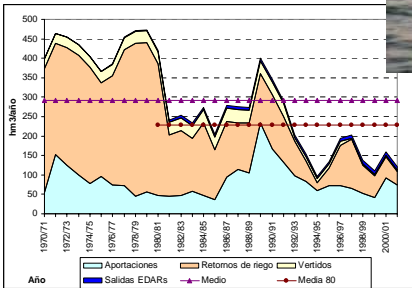
Water requirements for wetlands



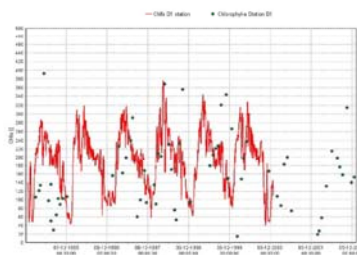
Water needs (quantity and quality) to maintain the functionality and structure of ecosystems in the wetlands



Hydrodynamics and water quality: 3D mathematic SOBEK model



Inflows to Albufera Lake: hydrologic and hydraulic models

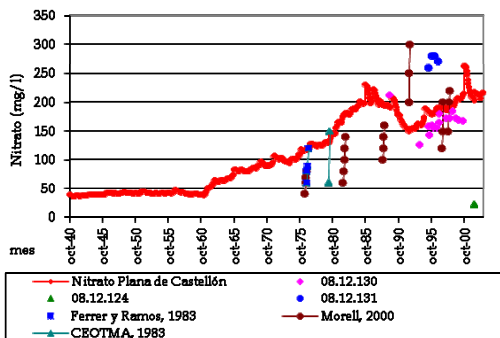


Chlorophyll a

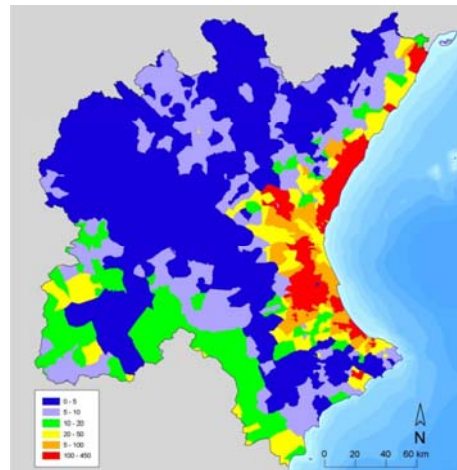


Water pollution

Nitrate simulation models (PATRICAL) are being used to define groundwater environmental objectives, including exemptions.



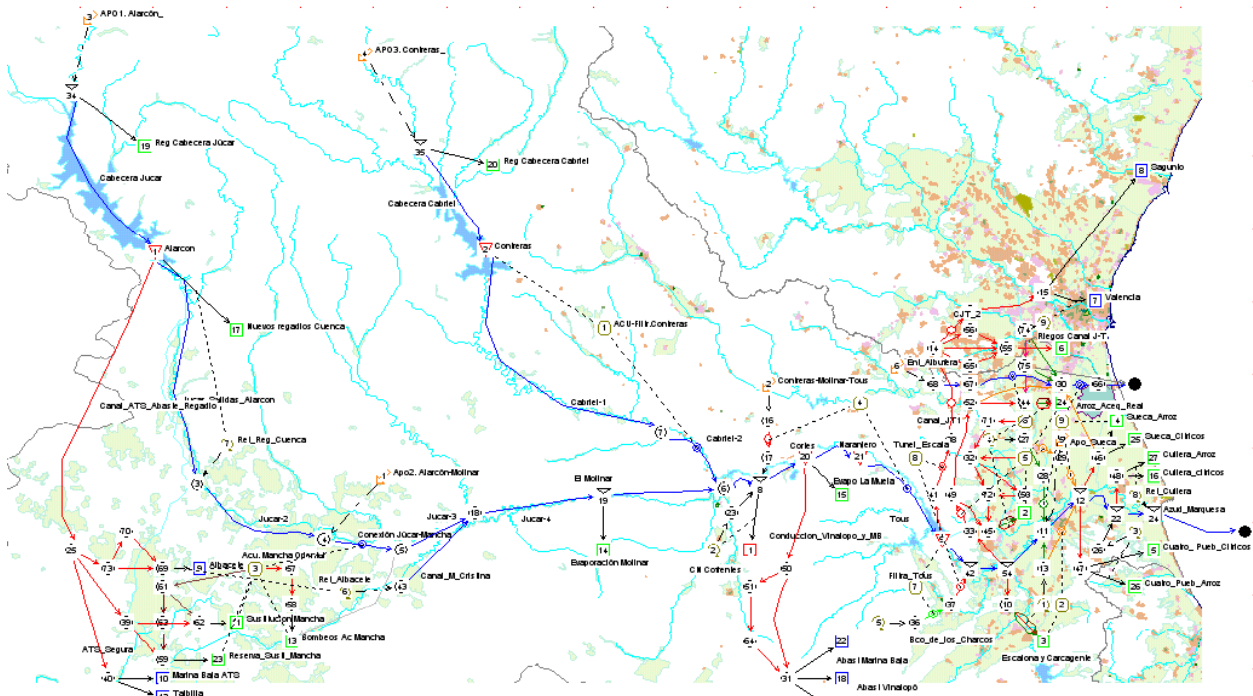
Nitrate concentration in Plana Castellón aquifer



Agrarian nitrogen excess (kg/ha/year)



Water resources systems: models



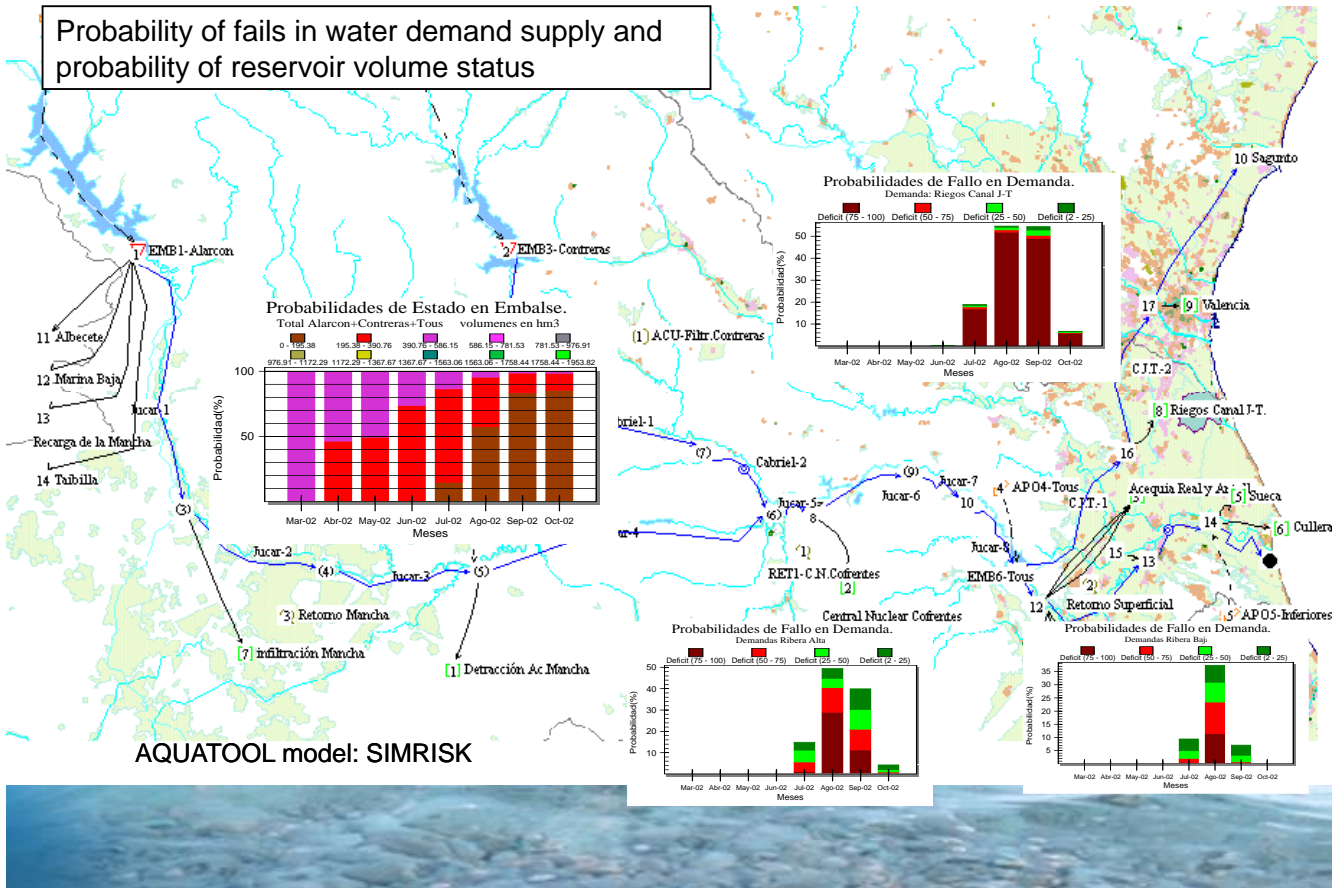
Júcar system: AQUATOOL scheme (SIMGES)



Water resources systems: allocations



Probability of fails in water demand supply and probability of reservoir volume status



Software: Infoworks RS 2D:

- Finite elements
- Triangular irregular cells

DEM: Lidar 1x1 m

Manning rugosity: CORINE + Orthophoto

Boundary conditions: design hydrographs for different T and sea water levels



Rio Girona: Flooding area



- River Basin Organisations (RBOs) in Spain use advances modelling tools in the main IWRM water issues.
- Water manager decisions are supported by these IWRM tools.
- Need of RBOs IWRM tools should be prioritised in R+D+I programmes.
- Coordination between RBOs, Consulting Firms, Research Institutes and Universities is crucial.

