PROYECTO DE RESTAURACIÓN DE UN TRAMO DEL **RÍO JARAMA** A LA ALTURA DE VALDETORRES DEL JARAMA

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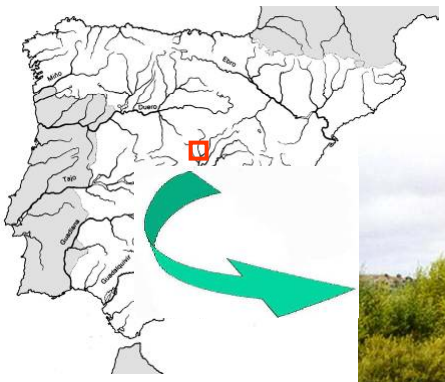
Jarama River: middle reach
El Molar (Madrid)



Jarama River: middle reach
El Molar (Madrid)

- Altitude: **630 m**
- Natural M.A. Flow: **15 m^3/s**
- Real M.A. Flow: **5 m^3/s**
- Native Fishery:
  - –Barbel
  - –Nase
  - –Cobitis

OBJECTIVES:

- Rehabilitate the fluvial ecosystem according to actual flow regulation and watershed conditions
- Implement a physical habitat structure self-regulated
- Defense and conservation of Natural values from future impacts
- Promote Public Use

Project Plan:

- Fluvial Ecosystem analysis
- Problematic Diagnostic:
  - riparian and channel alterations by gravel extrctions
  - Flow regulation by large reservoirs
  - Fine sediments comming from upstream
- Design and proposal of Actuations

Design Limitations:

- Water Authority forbids any change in the actual instream channel
- Only 1,2 km lenth

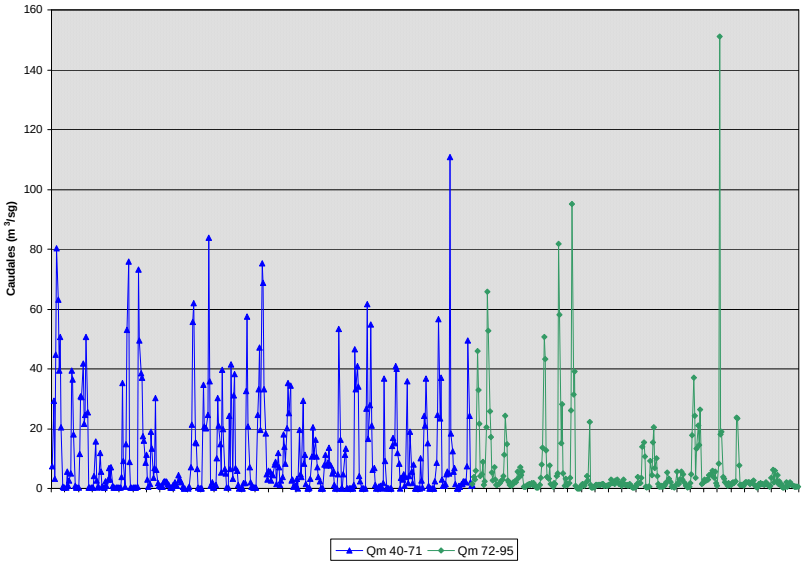
FLUVIAL ECOSYSTEM ANALYSIS

- Geomoirphology and fluvial dynamics
- Hydrological and hydraulical conditions
- Water quality
- Biological conditions

Fotografía aérea de 1956

Fotografía aérea de 1995

River Jarama flow regime



River Jarama Mean monthly flow values from 1940-95. Blue line before the construction of large reservoirs (El Atazar, Pinilla & El Vado)

- Natural Flow regime alteration:
  - Summer lentic conditions
  - Significant decrease of bakfull discharge
  - But the probability of extraodinary floods still exists (reservoir false security)

Geomorphology and Fluvial Dynamics

STUDY OF A LONG RIVER SEGMENT

Longitudinal profile

Valley morphology

Plant view

ANALISYS OF PROJECT REACH

Longitudinal profile

Plant view

Hydraulic Geometry

Long river segment

Comparison between river Jarama reference condition (1956) and actual (1995)

photo	!956 Area (Ha)	1995 Area(Ha)	Balance	1956 Width (m)	1995 Width (m)
1	28.24	10.1	-18.14	72.4	36.2
2	35.87	15.87	-20	95	36.7
3	30.21	14.55	-15.66	72	38.5
4	15.57	10.14	-5.43	52	35
5	25.18	21.21	-3.97	60	56
6	29.2	21.6	-7.6	65	50
7	26.58	13.14	-13.44	59	30.4
8	20.99	15.26	-5.73	70	48.4
9	14.43	10.32	-4.11	37	26
10	26.76	11.29	-15.47	81	31.2
11	19.74	11.41	-8.33	73	42.2
12	22.5	19.4	-3.1	90	72
13	33.55	15.2	-18.35	93	42.2
Total	329	189.5	-139.3	70.7	41.9

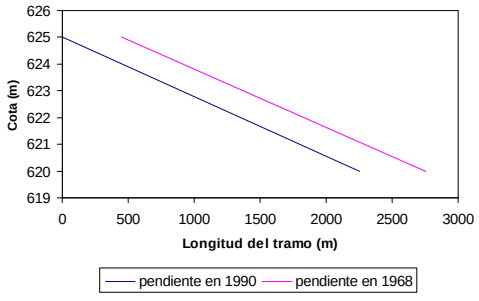
River Jarama Sinuosity (Leopold & Wolman): Comparison between 1956 and 1995.

TRAMO	Coeficiente de sinuosidad (56)	Clasificación
A	1.9	Meandriforme
B	1.4	Sinuoso
C	1.7	Meandriforme
D	1.5	Sinuoso
Media	1.6	Meandriforme

TRAMO	Coeficiente de sinuosidad (95)	Clasificación
A	1.5	Meandriforme
B	1.1	Sinuoso
C	1.3	Sinuoso
D	1.2	Sinuoso
Media	1.3	Sinuoso

PROJECT REACH STUDY

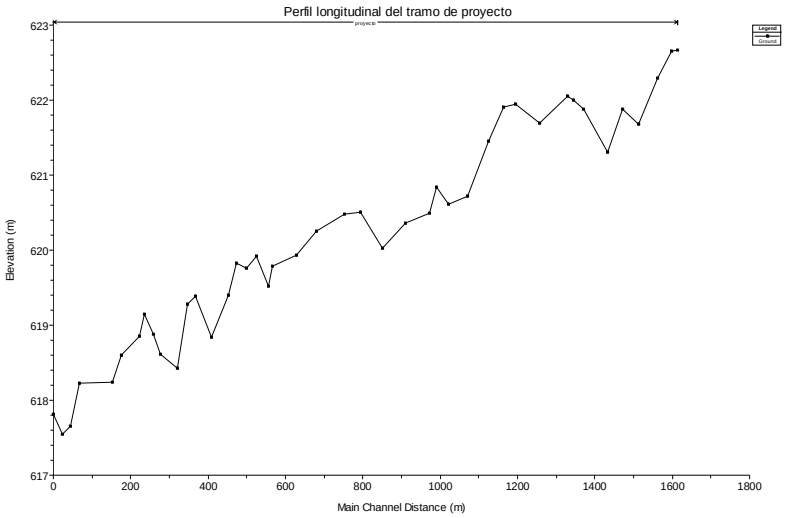
Longitudinal Profile



River Jarama base level lowered due to:

- Gravel extractions directly from river bed, and also from the riparian system
- Decrease of bed load and tranported sediments

Longitudinal profile of the project reach (43 sections)



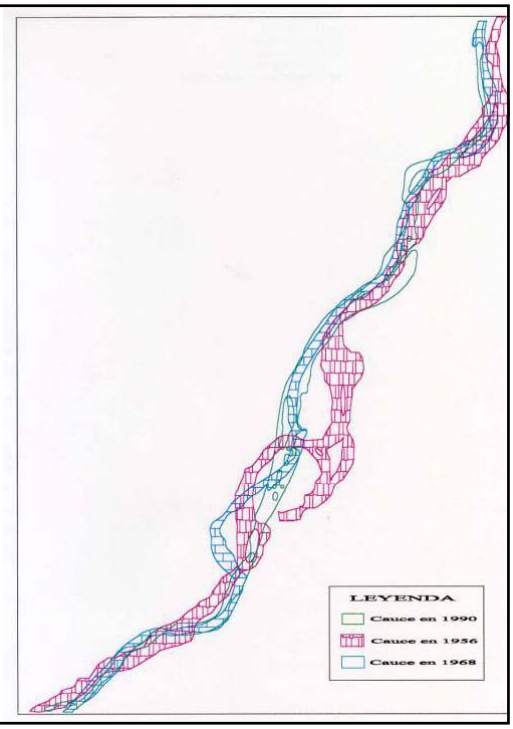
Project reach Plant view

Historical evolution:

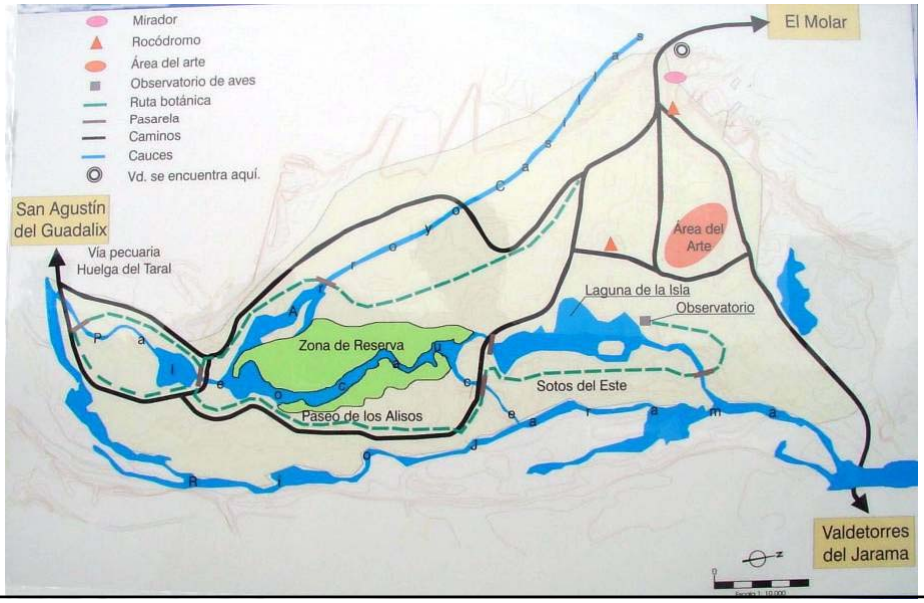
- Sinuosity
- Surface
- Channel width

Años	Sinuosidad	Longitud (m)	Superficie (ha)	Anchura del cauce (m)
1956	1.2	3500	18.69	53.39
1968	1.125	3100	9.154	29.53
1990	1.04	3000	11.72	39

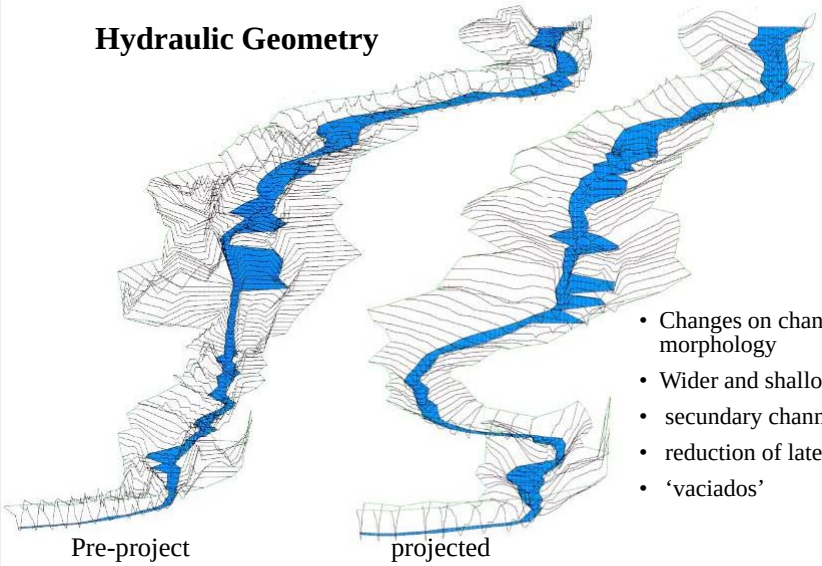
Planta presentada por el cauce en el tramo de estudio en 1956, 1968 y 1990 a través de los planos 1:5.000 de 1990 y 1968 y la fotografía aérea de 1956.



The project



Hydraulic Geometry



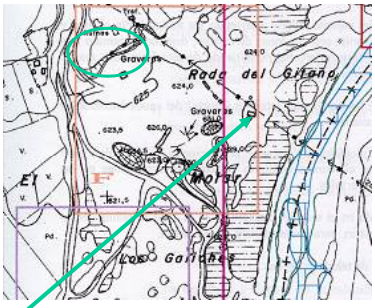
Pre-project

projected

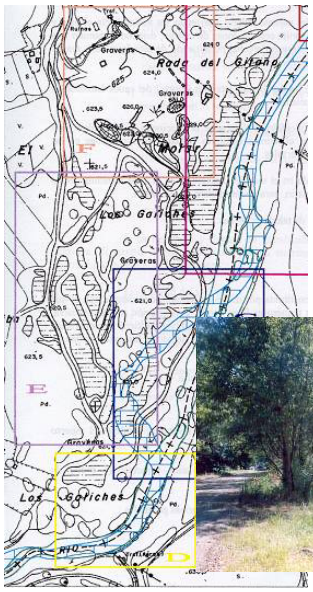
- Changes on channel morphology
- Wider and shallow sections
- secundary channels
- reduction of lateral slopes
- 'vaciados'

Study hydraulic conditions from topographic cross sections (pre-project) and from designed ones (HEC-RAS).

- Remains of gravel industry infraestructure gravera in the riparian zone



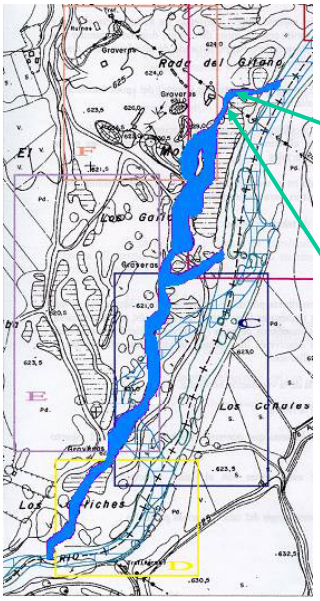
· **Presence of many open holes, aisolated by dykes and covered by freatic vegetation**



Old levees & dykes

Flow entrance

Construction of river channel and wetlands



Lagoon construction

Recovered natural channel, below the lagoon

Costruction of a secundary channel (conectivity and braided)

Water quality at entrance and at out-let (2002)

Problems

- Eutrophication and water warming below main lagoon
- Fine sediments coming from upstream
- New water outlet
- Flood lamination
- No funds for monitoring results
- Connected Lagoon promoted **non native lenthic fish species**

RESTORATION GOALS

- Recover old river channel (as seen on 56 photo)
- Rehabilitation of the riparian system
- Recover the conection of the river with its flood plain
- Redesign of a channel connecting the Jarama river with its affluent Arroyo de la Casilla.