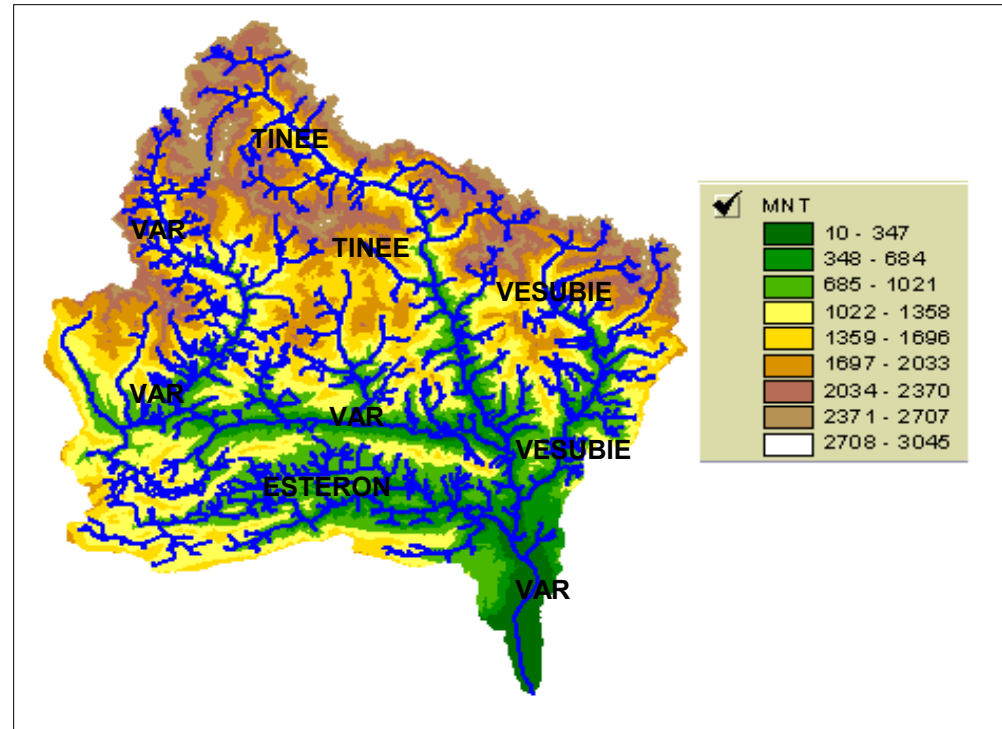
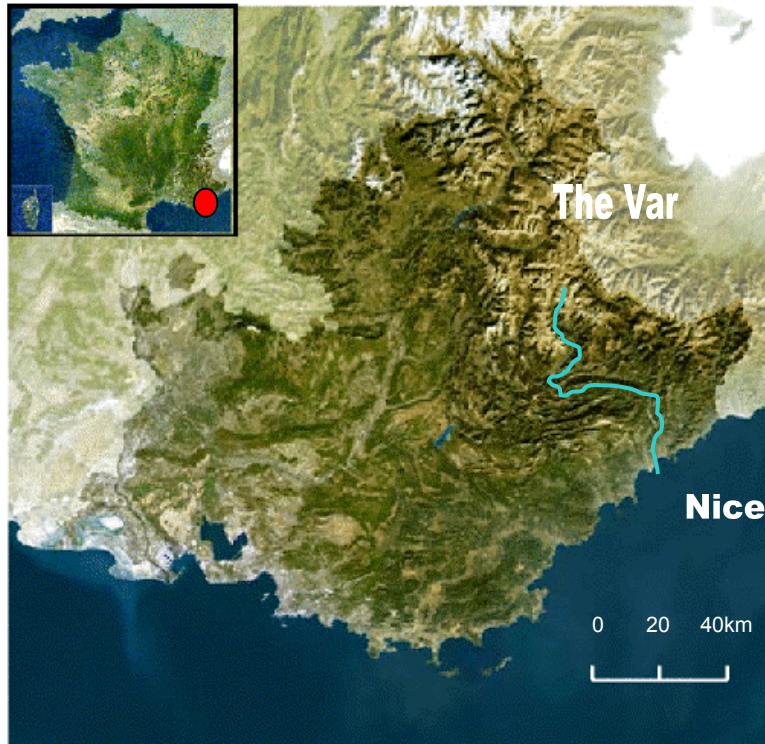


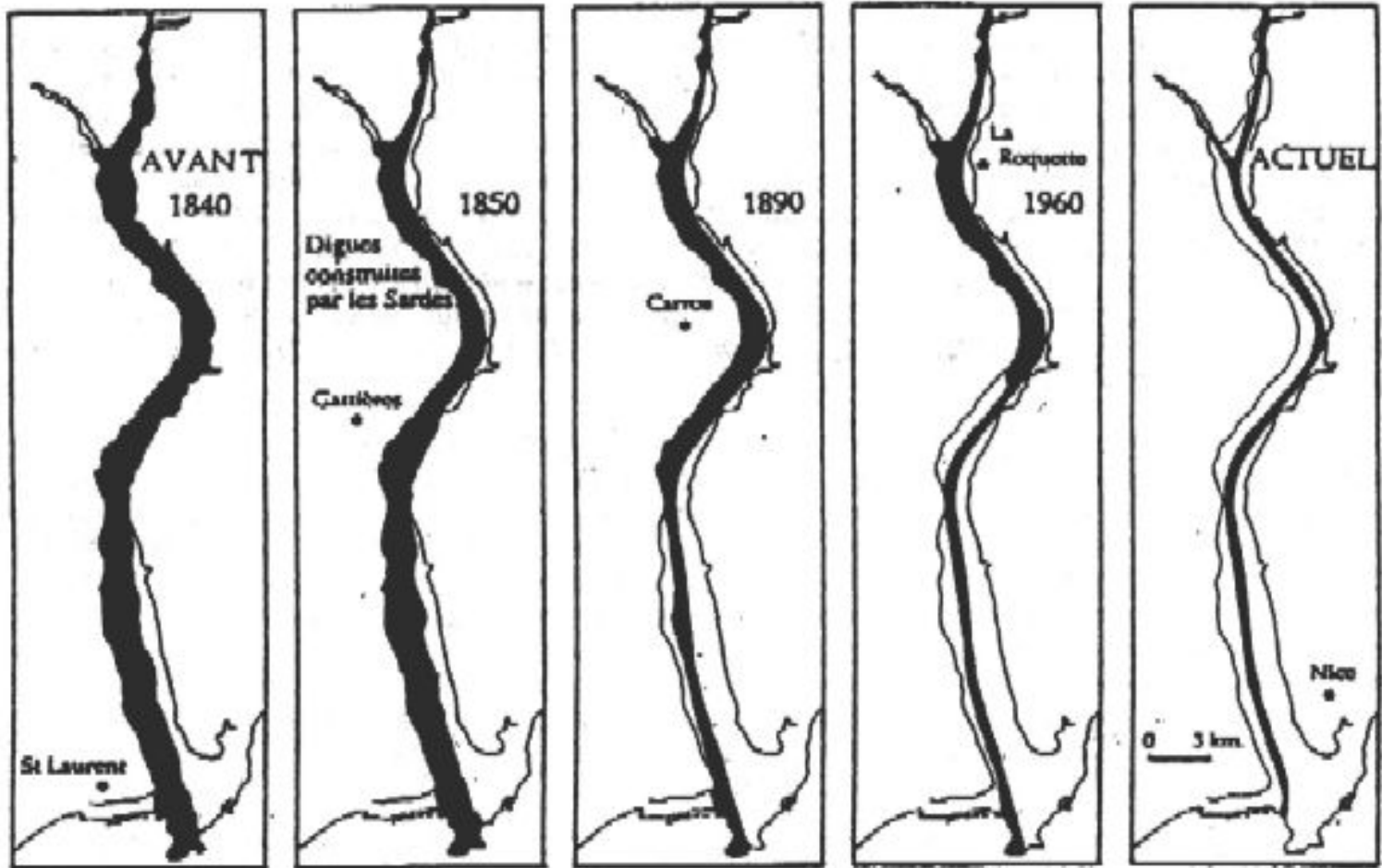
The Var River in Southern France

The Var river and its development



- South of France, alpine torrential river
- Entrenched valleys with risk for landslides
- Carrying coarse sediment loads and fines

The Var river and its development



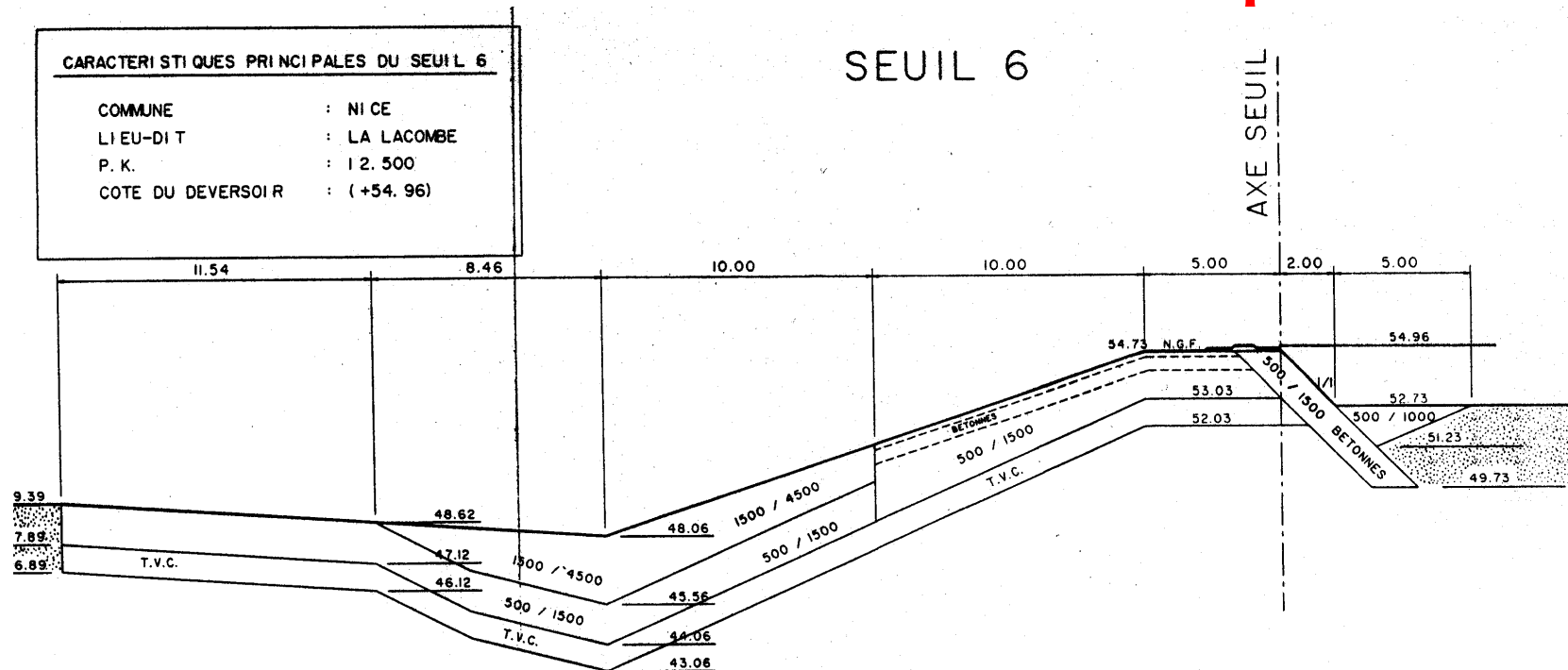
- Progressive land reclamation through embankment and compartments in flood plain

The Var river and its development



- Inlet structure to compartments in the flood plain

The Var river and its development



- Sills (fixed weirs) constructed for bringing the water table back to its original level
- Hidden agenda: to have hydraulic structures to demonstrate the new low-head power stations

The Var river and its development



- First sill halted the transit of coarse sediment, so that fine-grained silt deposited in between the next sills (process similar as for land reclamation)

Sills / weirs, for what?



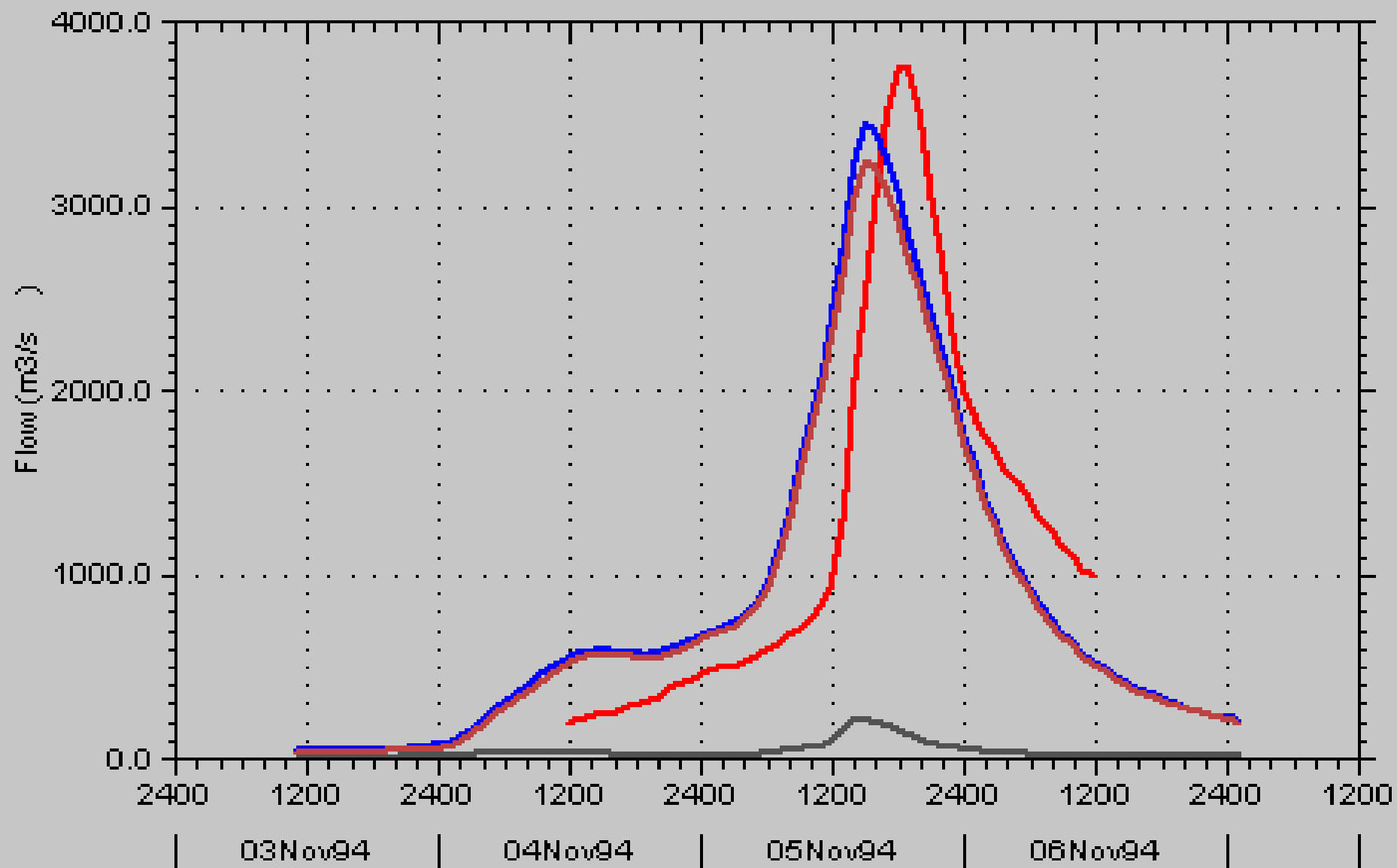
- To control the water levels.
- To generate hydropower.
- Negative impact was not anticipated.

The 1994 flood & inundation

- The storage of coarse river sediment upstream the dams made the riverbed drop at the foot of last dam, the head passing from 6 to 12 m in 12 years
- On 5 November 1994, an extreme flood event produced the collapsing of the lowest and the second-lowest dam, the flood wave inundating Nice's international airport.

**Estimations,
Napoleon III bridge
(Nice airport)
(source: DIREN-
Cemagref)**

QuickTime™ et un
décompresseur TIFF (LZW)
sont requis pour visionner cette image.



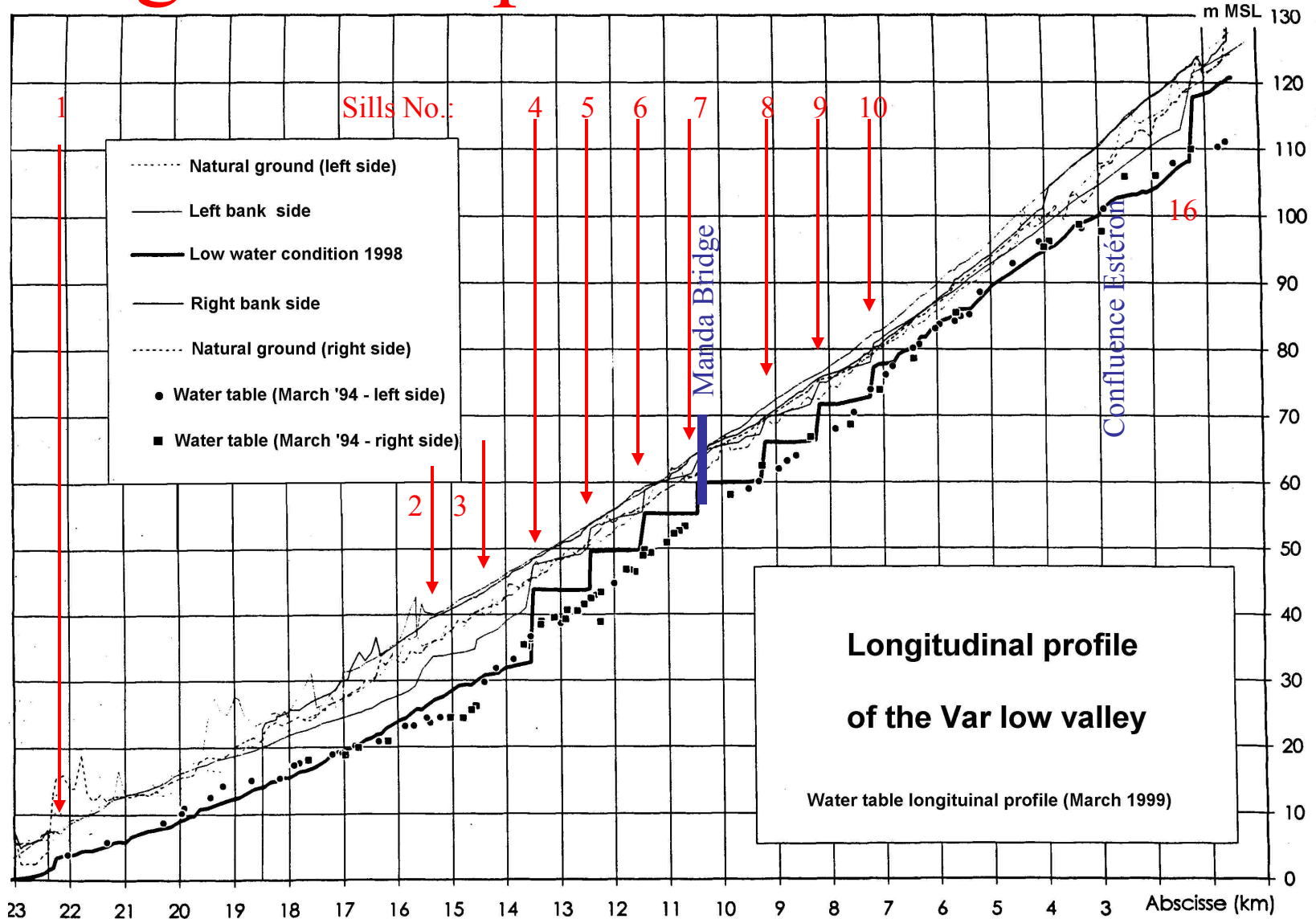
HEC
HMS

Outlet_Ur_02
Var_down
Low_valley

Observed

Basin: ok_changaslope
Run: Run 15
Time: 23Feb06, 18:49

Longitudinal profile 1998



Impact on transit of sediment



The Var river at
Bridge La Manda

- Only fine material passed the sills after these were constructed.
- Deficit in sediment created scouring downstream of lowest sill (Nr. 2), which head passed from 6 to 12 m.

Morphological impact of the sills



- Fine silt deposits changed the river environment: narrow channels bordered with lateral terraces.
- Dense vegetation grew on terraces in between sills, changing the flow resistance.

The collapse of sills 2 & 3

Sill No. 2

Sill No. 3

Sill No. 4



- During the flood event of 5/11/94, sills 2 & 3 collapsed and the flood wave inundated part of the city and airport.
- Sill 4 is in danger of collapsing because of high head.

Downstream: Sill 4 in great danger



Still sediment deficit below sill 4

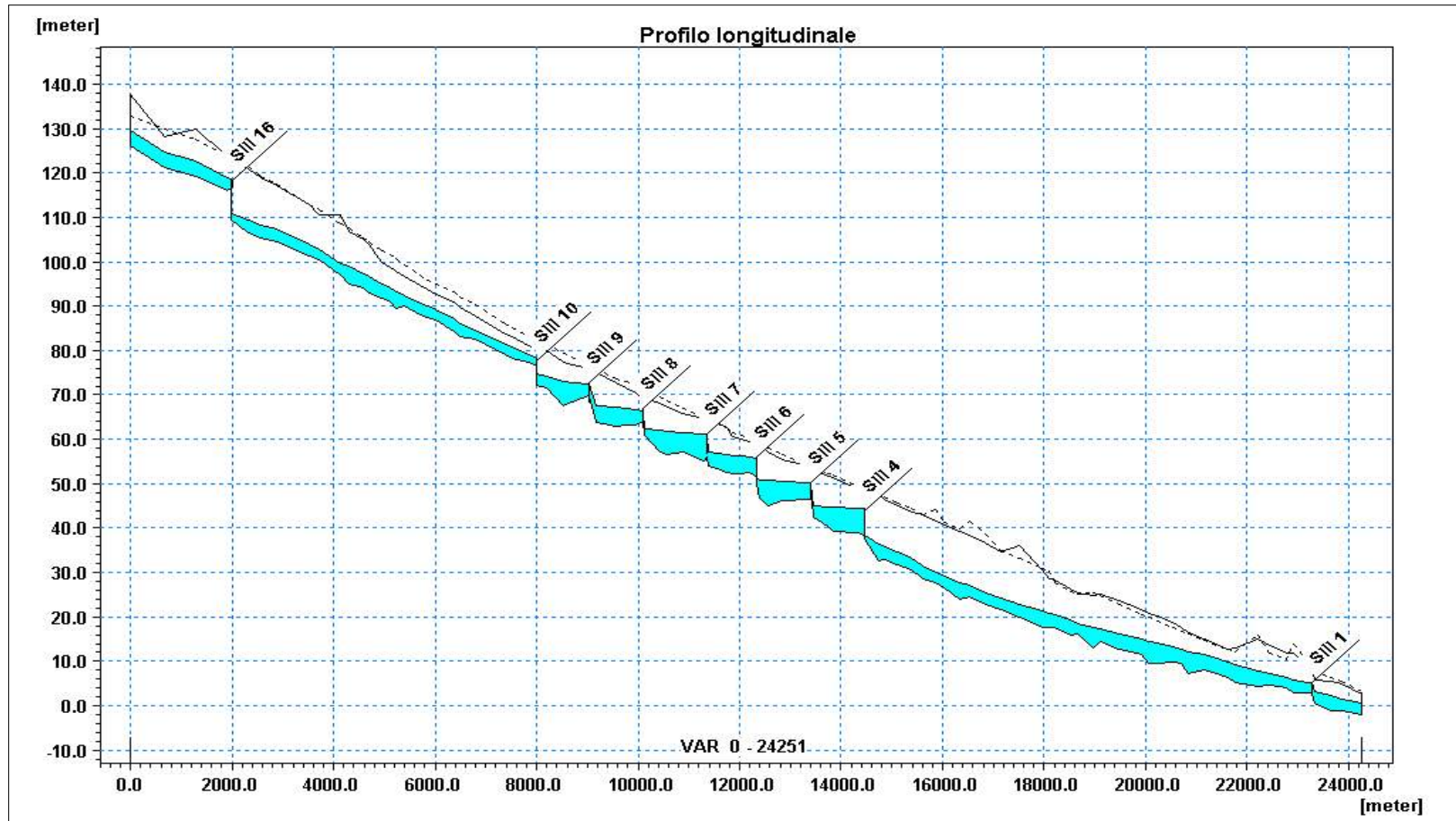


Upstream: Sill No 10 in 2002



Sediment tongue passing the sill

The Var river and its development



- Sills constructed to “correct” the artificial lowering of the riverbed and groundwater table