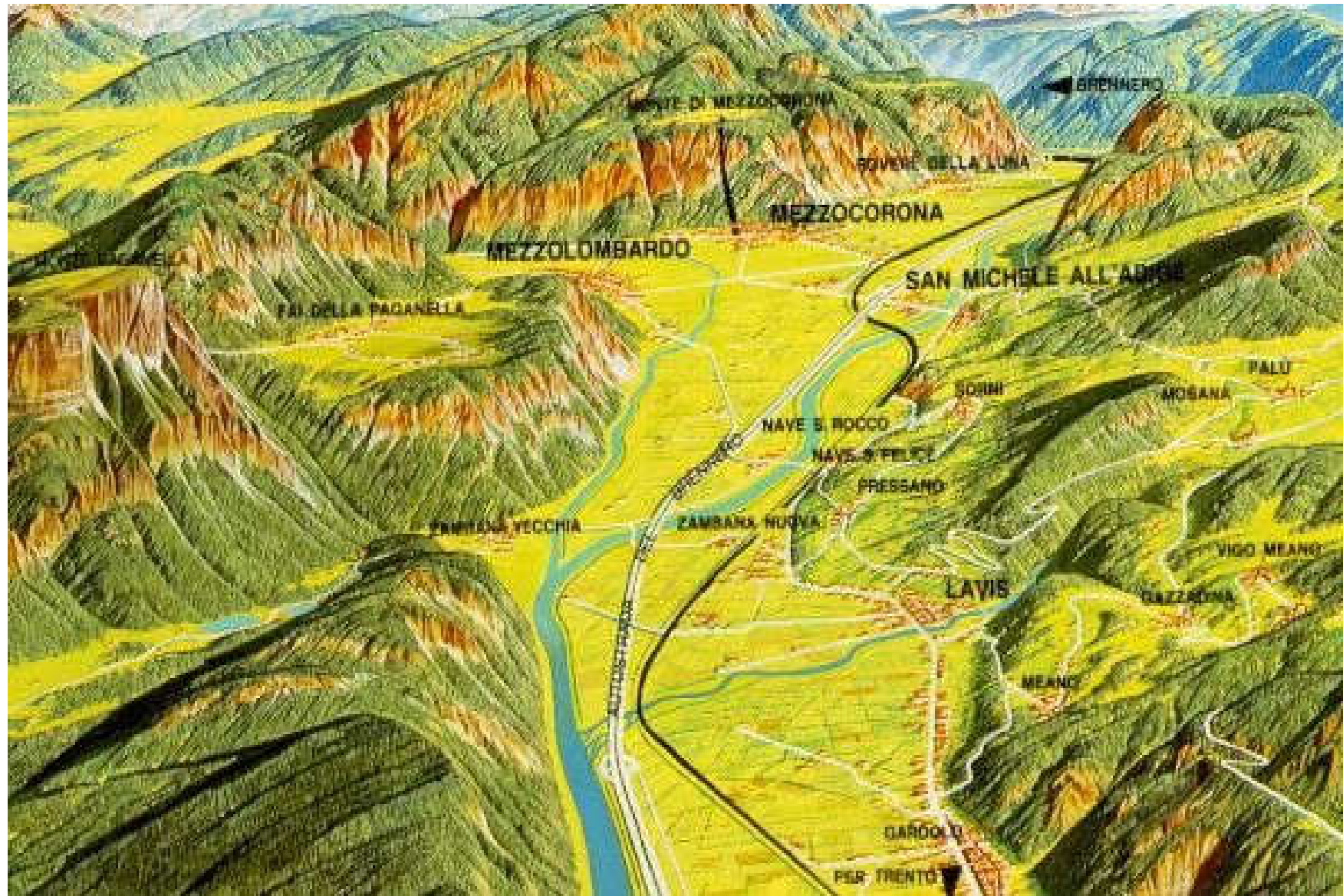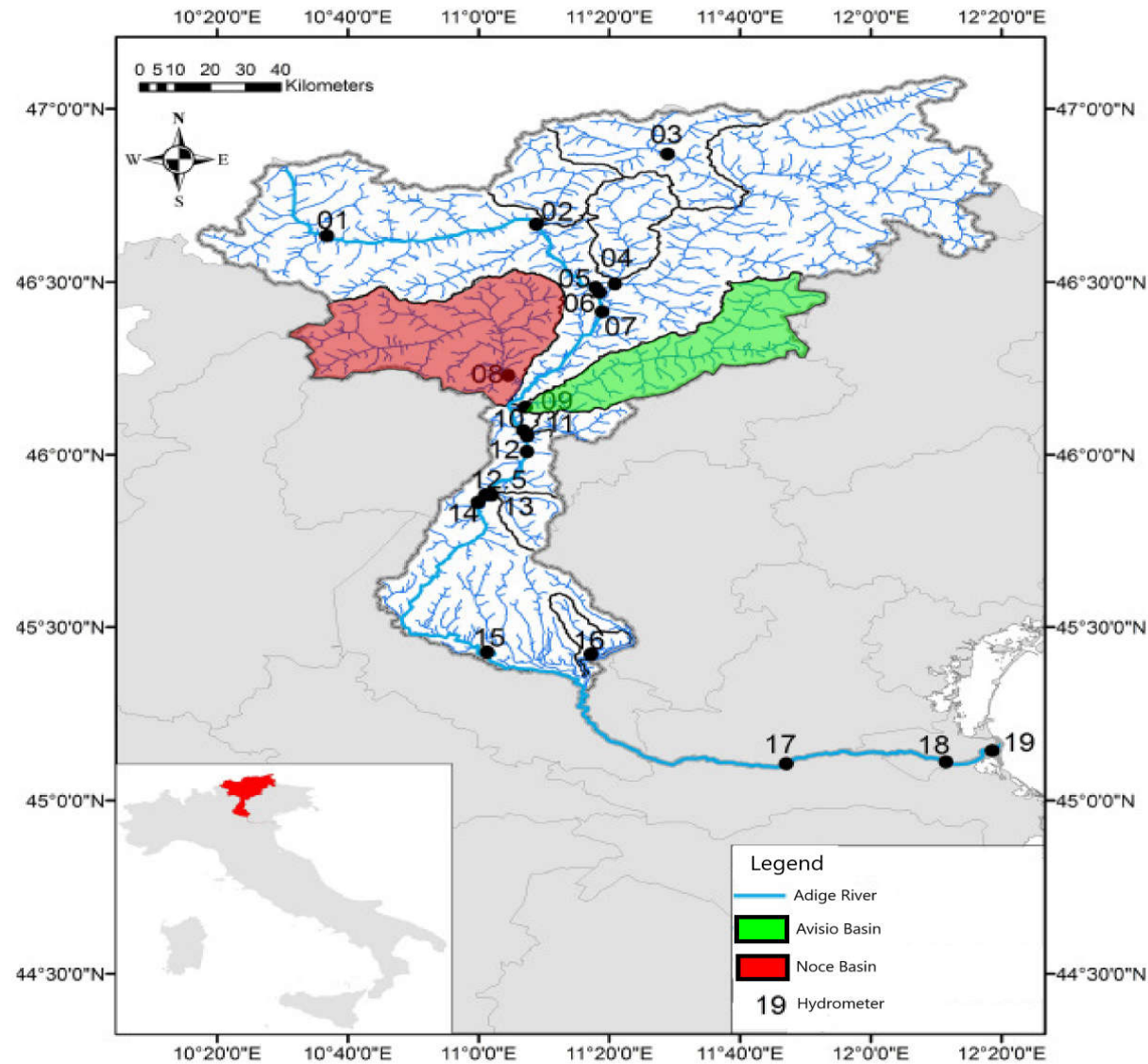# DETECTION OF CHANGES IN RIPARIAN VEGETATION IN PIANA ROTALIANA (ITALY): COMPARISON OF THREE DIFFERENT FLUVIAL SYSTEMS

Stefano GOBBI, Marco CIOLLI, Giulia CANTIANI, Duccio ROCCHINI, Clara TATTONI, Nicola LA PORTA

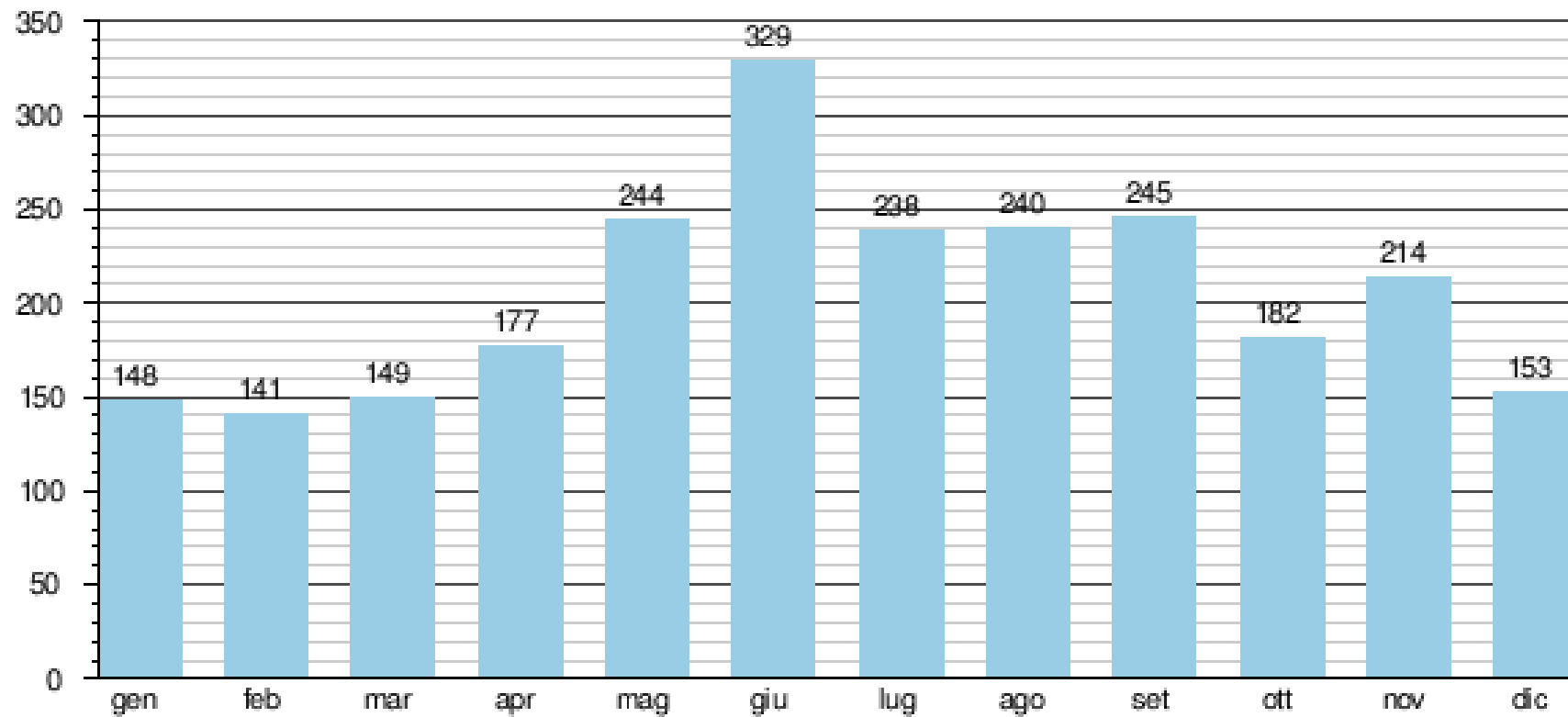# Piana Rotaliana with rivers Adige and Noce (left) and Avisio (right)

# The basins of the three rivers interested by the study

Rivers traits

RIVER	Lenght (Km)	Basin size (Km²)	Elevation average (m a.s.l.)	Average slope (%)	Flow rate average (m³/sec.)	Lenght in Piana Rotaliana (Km)
Adige	410	12,100	1,500	49	235	15,74
Noce	105	1,367	1,624	50	34	8,75
Avisio	88	910	1,663	52	23,5	7,20

Average montly flow rate of Adige river

Adige flooding in 1882 in Piana Rotaliana

La Valdadige
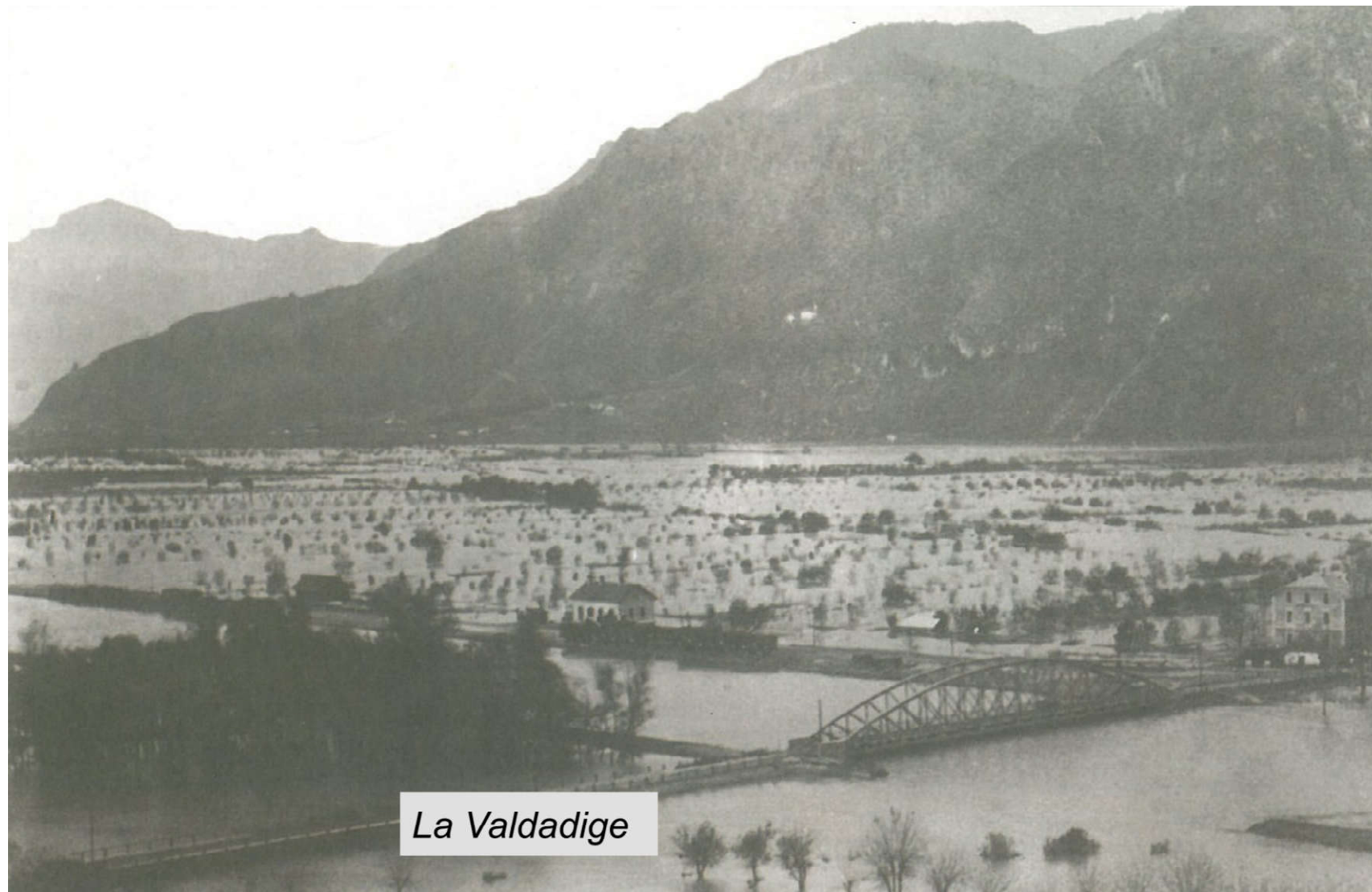
Adige flooding in 1966 at Trento city

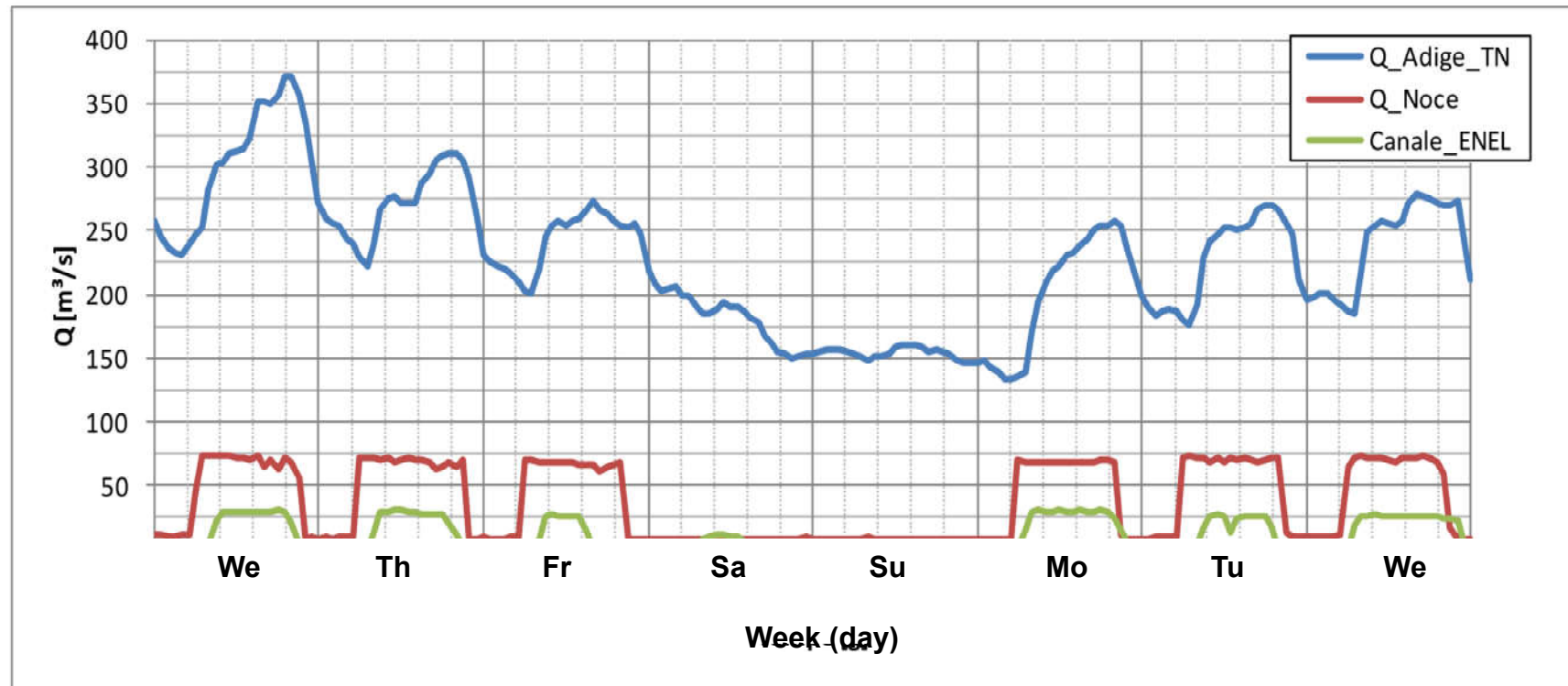# Adige flooding in 1966 at Trento city

Dams distribution in the Adige-Noce-Avisio basins

Santa Giustina dam (182,000,000 m³) along Noce river

Example of Adige river flow rate along the week

Maps projection and resolution

Maps of **1859**, **1954**, **2006** and **2015**   Maps of **1973** and **1994**

WGS84, UTM 32 N projection   **RM40 Gauss-Boaga** projection.

Resolutions (m x pixels):

1859 **1m**
1954 **2m**
1973 **1m**
1994 **1m**
2006 **1m**
2015 **1m**

It was not possible to use the **1936** maps (*Italian Kingdom Forest Map*), because the little scale (1:100000) and no report on riparian vegetation in agricultural sites.

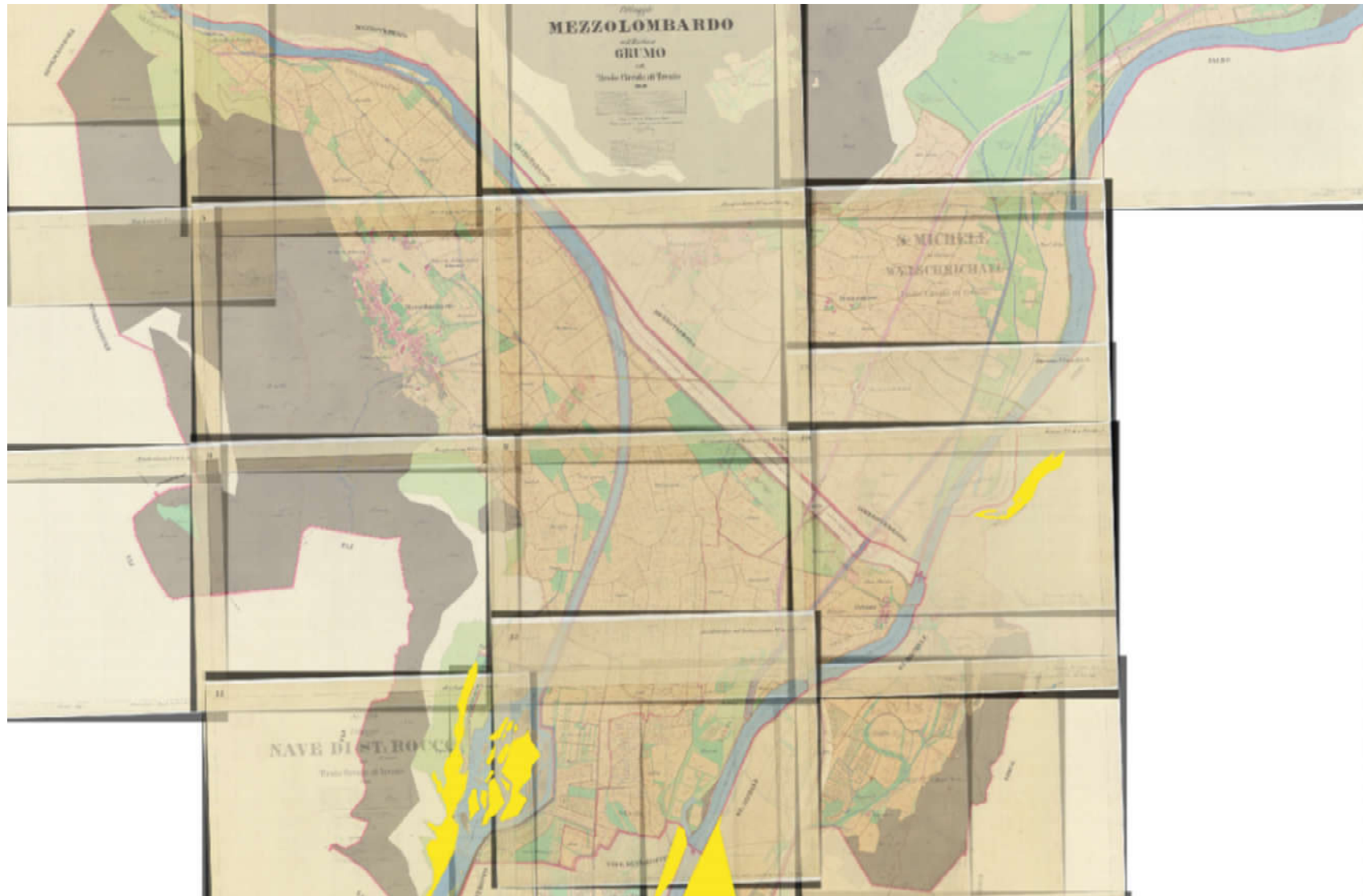# The land use classification used to extract riparian vegetation

Object Base Image Algorithm (OBIA), implemented in GRASS GIS, a Free and Open Source Software, was used. The algorithm is based on the segmentation of images into elements which are then recognized, through machine learning, in different land use categories based on the **spectral**, **textural** and **geometric** response of the elements of the images under examination.

In this way it was possible to classify single gray band and multiple band images **using a single algorithm**. Since the input data are very heterogeneous OBIA has been chosen because its **flexibility** in treating different data sources.

The precision achieved in the recognition of the areas is quantified with the Kappa di Cohen method ($0 < k < 1$). In the current case results are accepted with **k > 0.8 (high concordance)**

The river area was buffered starting from the talweg of the rivers, and the vegetation **considered "riparian"** included a **strip of 20 m** from the visible bank line of the image, with exceptions where the high slope of the mountains was a natural obstacle to the eventual flood.
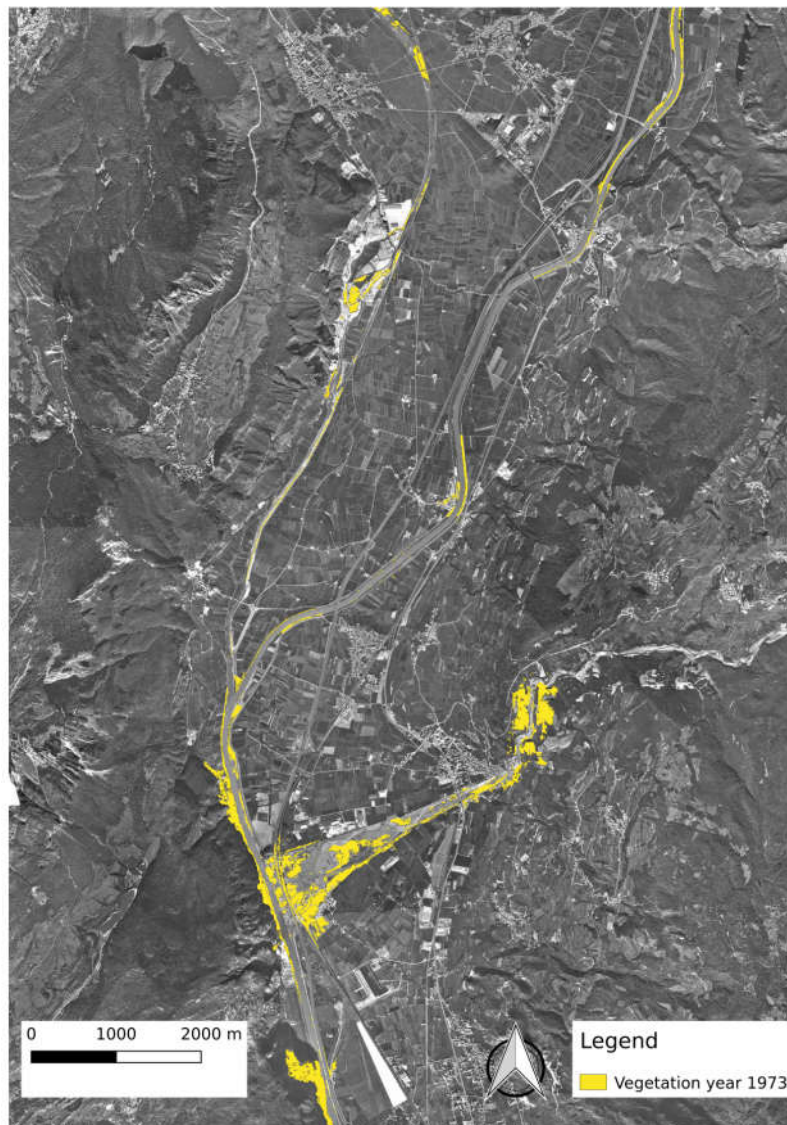
1859

1954

Legend

Vegetation year 1859

0   1   2 km

Legend

Vegetation year 1954

0   1000   2000 m

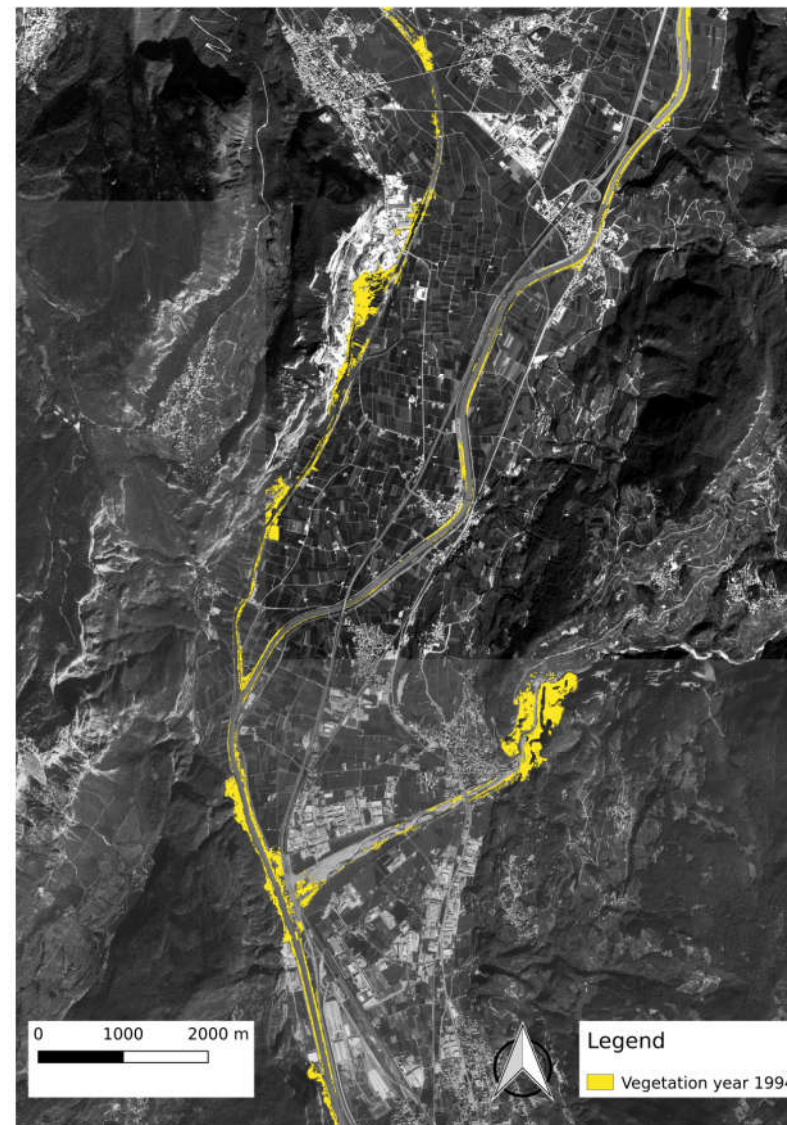# Rectification of the river Noce in the Piana Rotaliana 1850-1853

Rectification of the river Adige in the city of Trento 1850

1973

1994
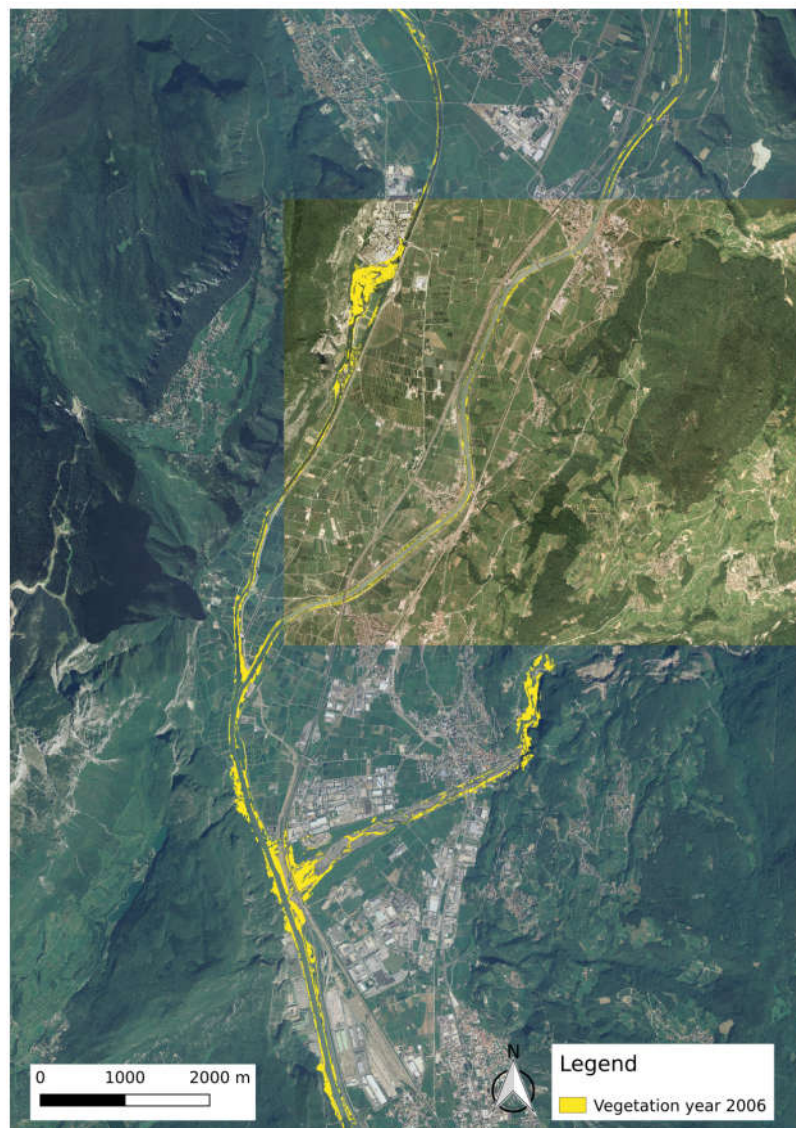

Legend

Vegetation year 1973

0 1000 2000 m

Legend

Vegetation year 1994

0 1000 2000 m

2006

2015

Legend

0   1000   2000 m

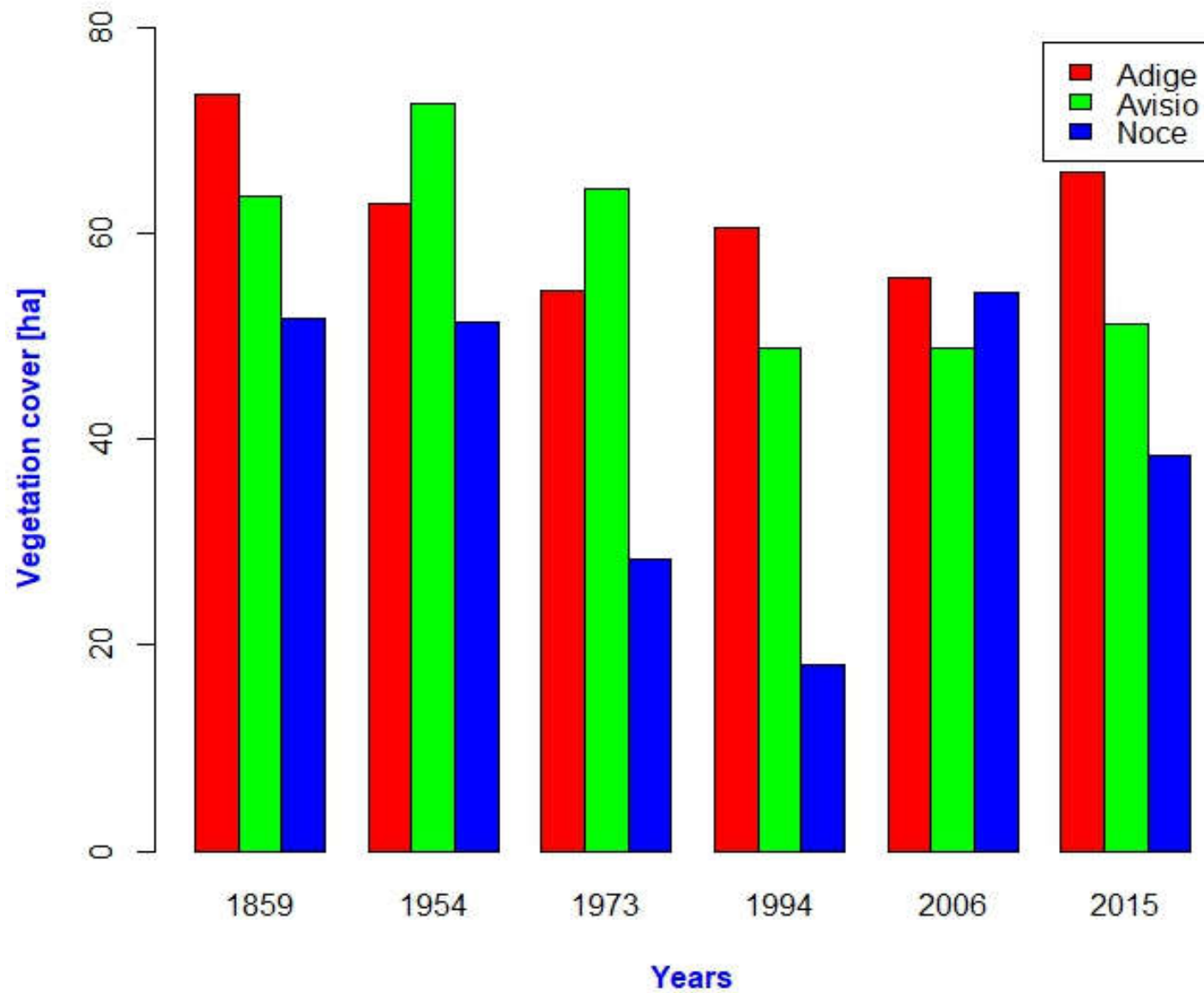Vegetation year 2006
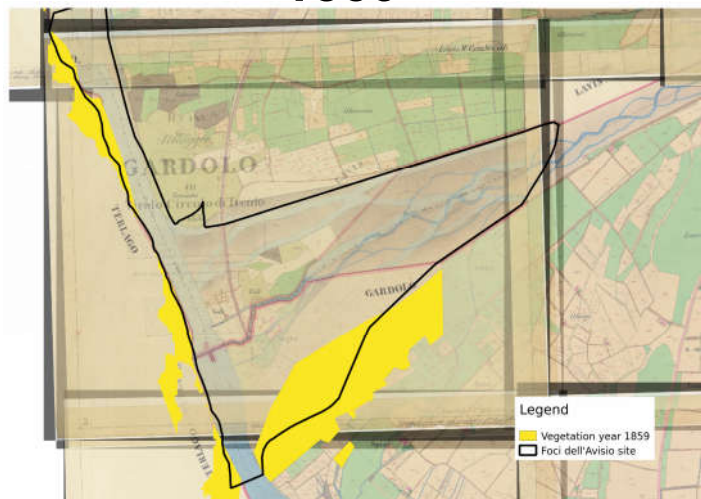
Legend

0   1000   2000 m

Vegetation year 2015

Variation of riparian vegetation in Piana Rotaliana

Site of Community Importance - Foci dell'Avisio

1859

1954
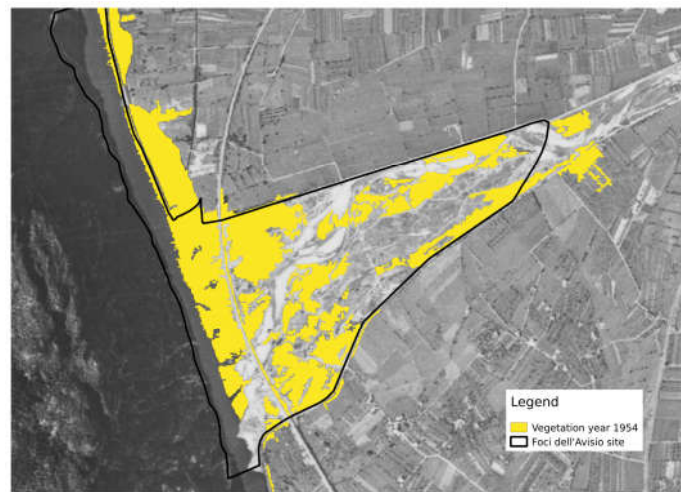
1973

1994
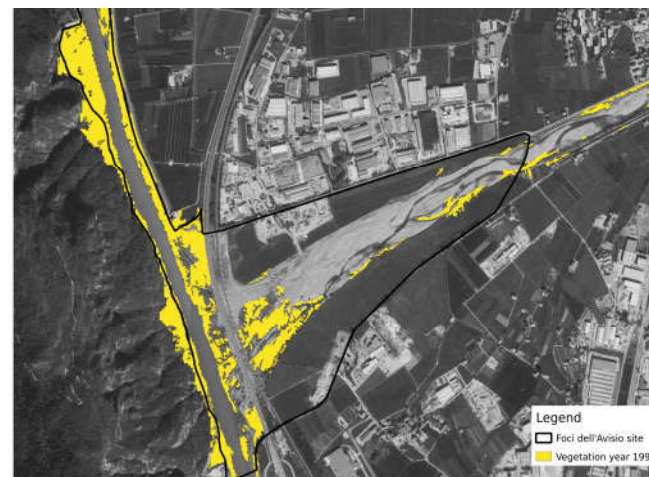
Site of Community Importance - Foci dell'Avisio

2006
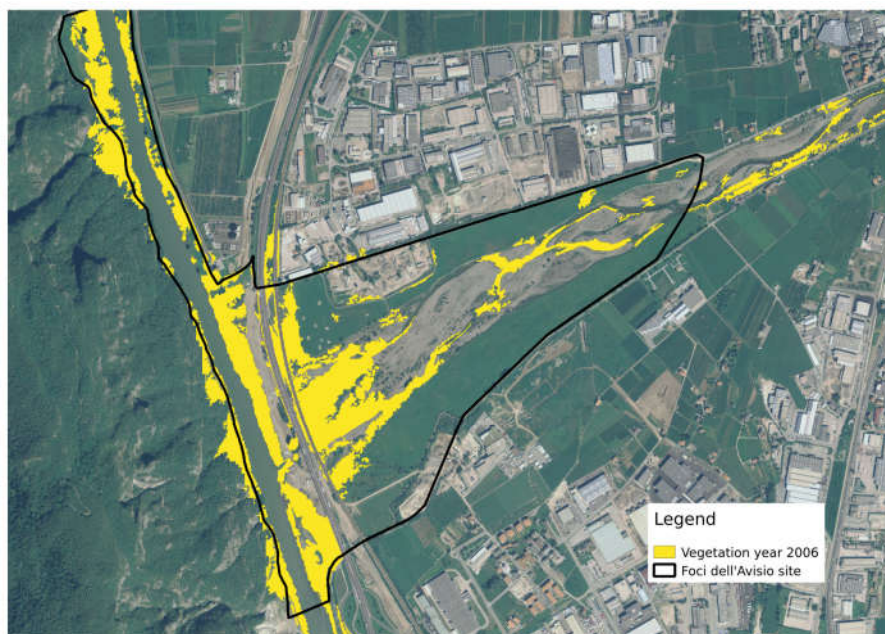
2015
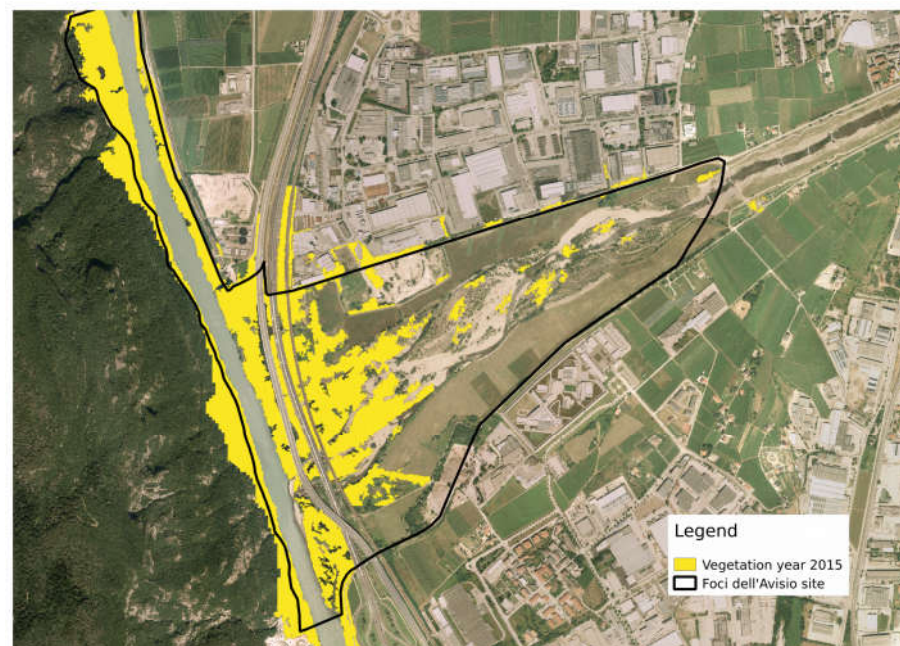
Variation of riparian vegetation in Foci dell'Avisio Site
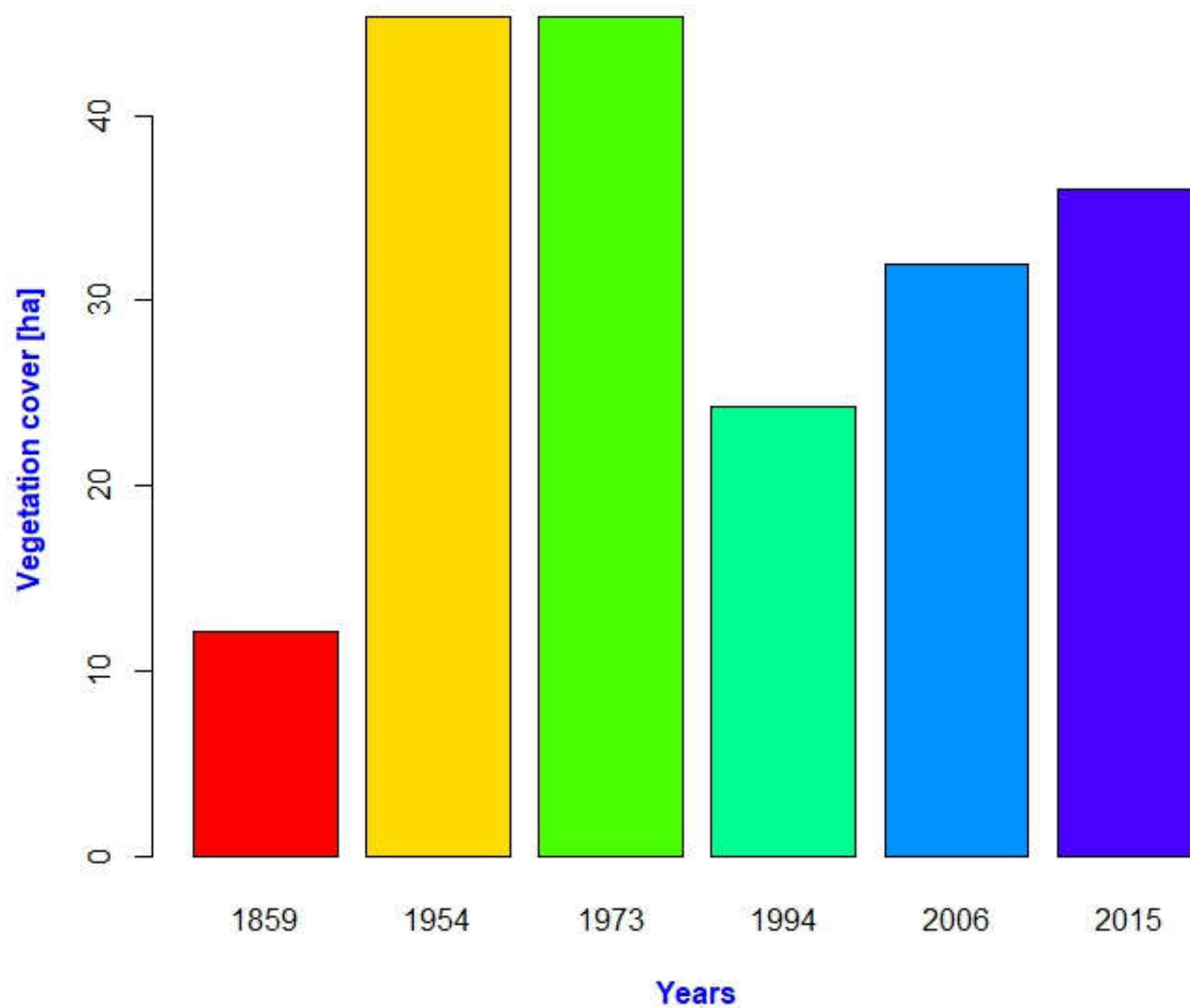
Site of Community Importance - Foci dell'Avisio (born 1992)

Forest types in Piana Rotaliana

Legend

Most common forest types

- Black Pine forest
- Spruce forest
- Primary hornbeam and Ash tree forest
- Oak-Ash tree forest
- Typical Beech forest
- Beech and Yews tree
- Larch forest
- Oak-hornbeam forest
- Pubescent Oak forest
- Black Locust and Chestnut forest
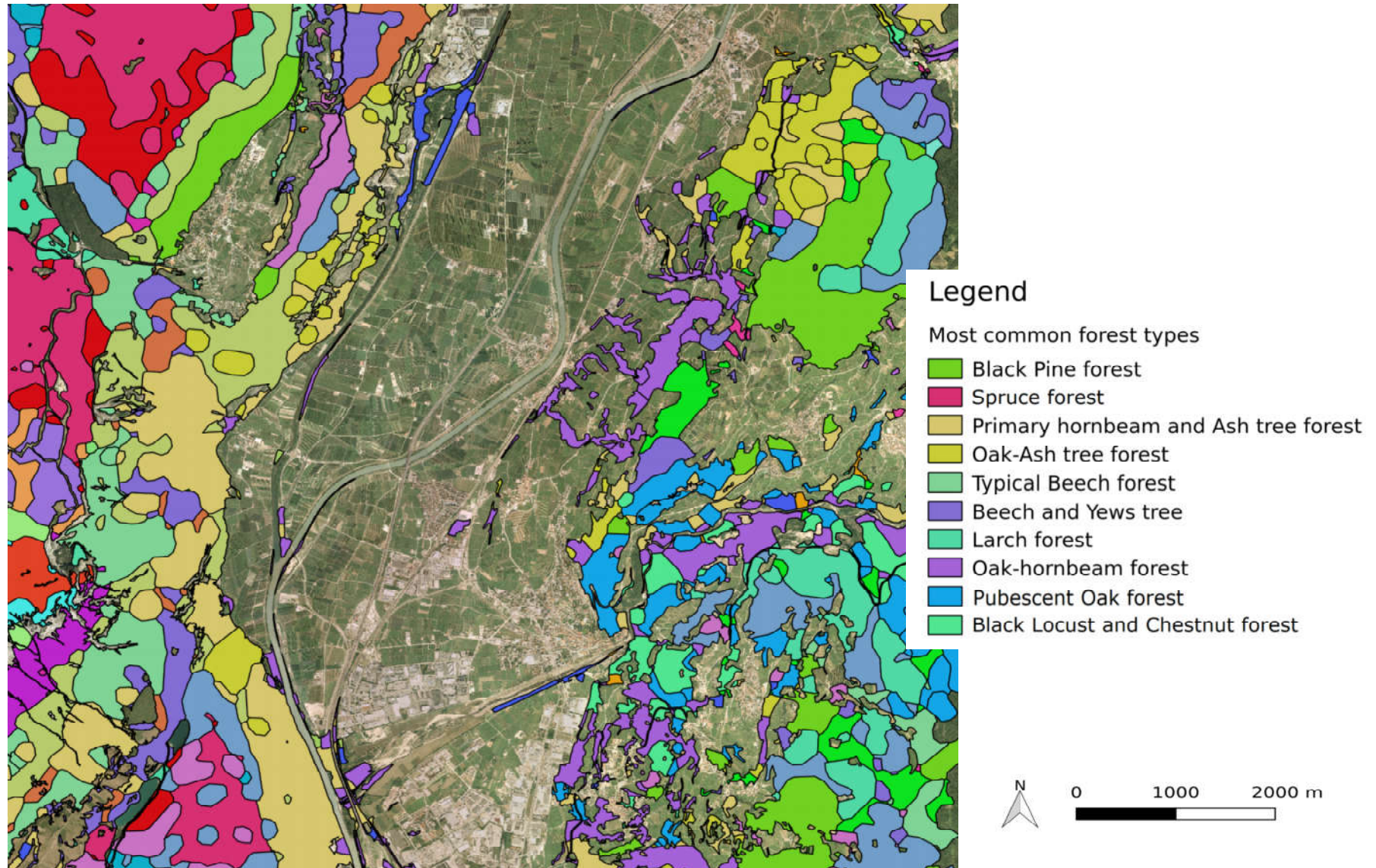
Forest types along Noce river

Legend

Forest types

- Black Locust and chestnut forest
- Pioneer riparian formations
- Holm and Hornbeam forest
- Xeric Holm forest
- Black Alder forest
- Primary Hornbeam and Ash tree forest
- Typical Hornbeam and Ash tree forest
- Ash tree and Oak forest
- Pubescent Oak forest
- Oak and Hornbeam forest

0   500   1000 m

N
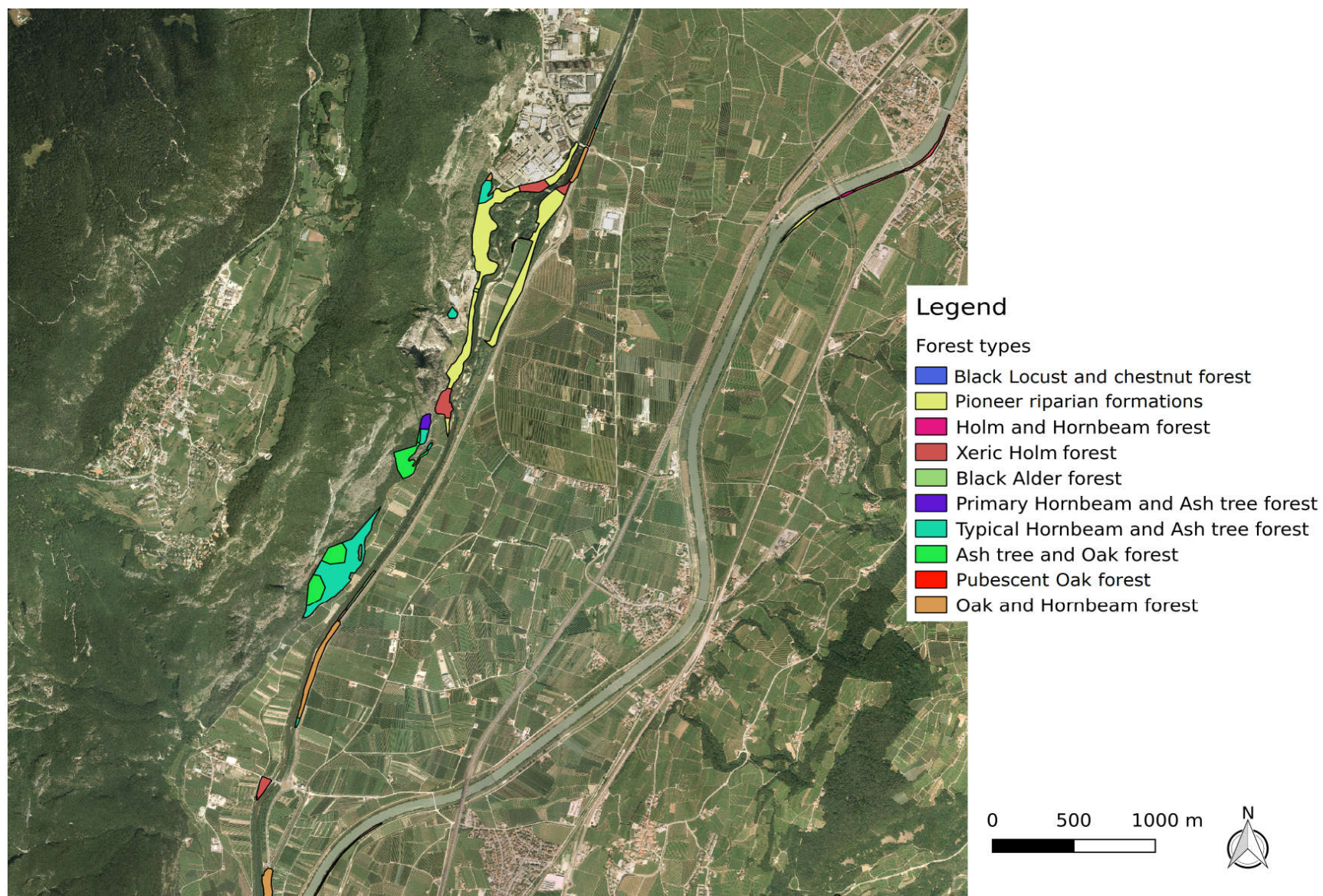
Forest types along Avisio river

Legend

Forest types

- Black Locust and chestnut forest
- Pioneer riparian formations
- Holm and Hornbeam forest
- Xeric Holm forest
- Black Alder forest
- Primary Hornbeam and Ash tree forest
- Typical Hornbeam and Ash tree forest
- Ash tree and Oak forest
- Pubescent Oak forest
- Oak and Hornbeam forest

0   500   1000 m

N

Different forest types in Piana Rotaliana

Spruce forest 15%
Black pine forest 21%
Typical Hornbeam and Ash tree forest 13%
Oak-Ash tree forest 7%
Other 16%
Typical Beech forest 6%
Black Locust and Chestnut forest 2%
Oak-hornbeam forest 3%
Beech and Yews forest 6%
Primary Hornbeam and Ash tree forest 6%
Larch forest 5%

Different forest types in Piana Rotaliana

- Spruce forest 15%
- Black pine forest 21%
- Typical Hornbeam and Ash tree forest 13%
- Other 16%
- Oak-Ash tree forest 7%
- Typical Beech forest 6%
- Beech and Yews forest 6%
- Primary Hornbeam and Ash tree forest 6%
- Larch forest 5%
- Oak-hornbeam forest 3%
- Black Locust and Chestnut forest 2%

Different forest types in riparian vegetation

Typical Hornbeam and Ash tree forest 42%

Pubescent Oak forest 8%

Black Locust and Chestnut forest 8%

Pioneer riparian Formations 17%

Oak and Hornbeam Forest 25%
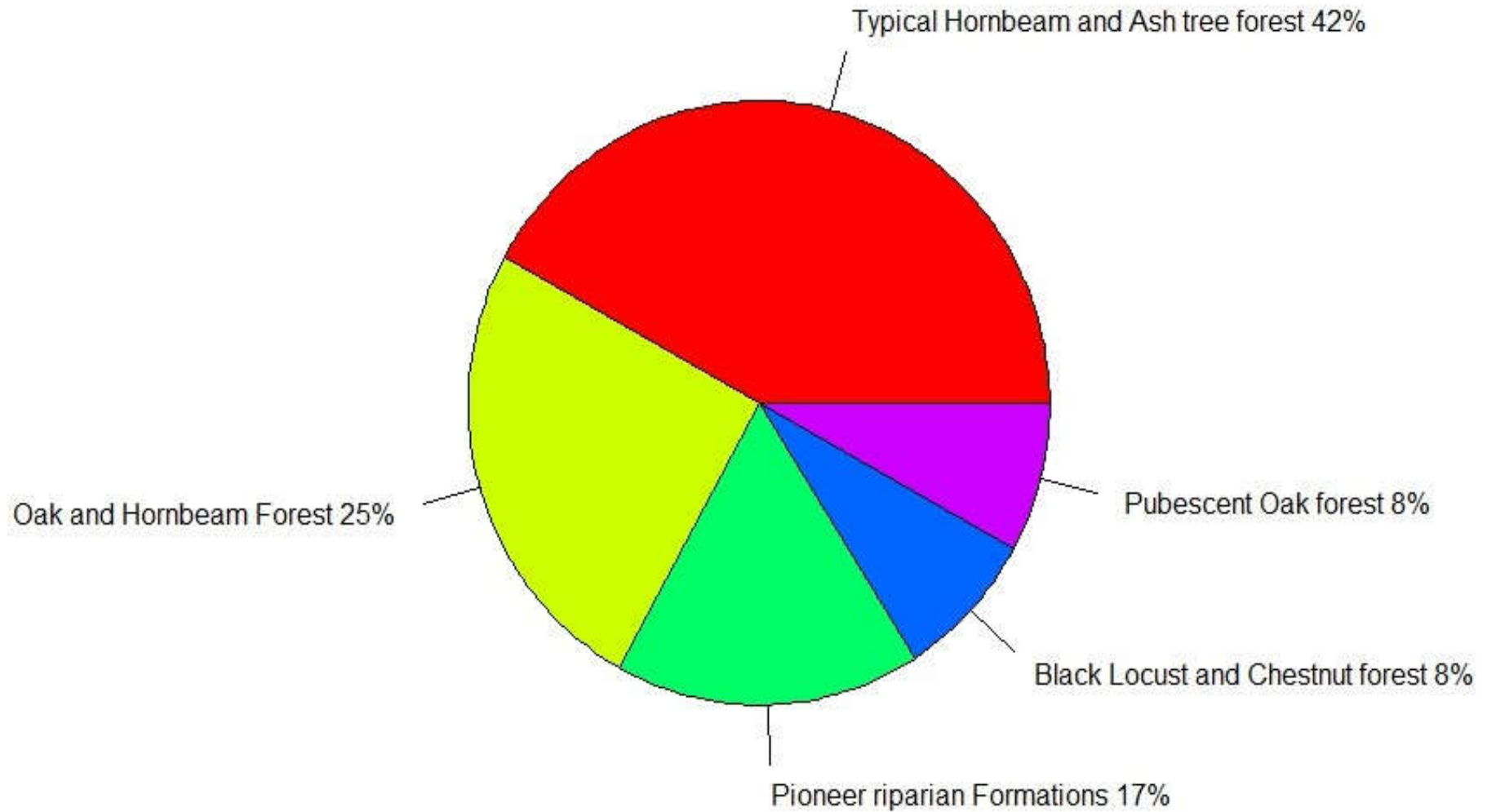
THANKS FOR THE ATTENTION

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