Application of *Salix* species and meadow plants for renaturization of degradated peat bog – field experiment (Goslub the Bzura river valley)

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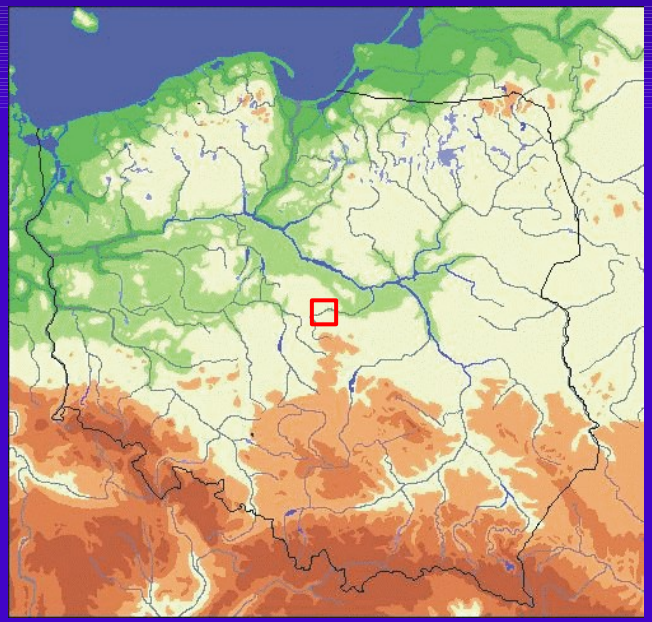
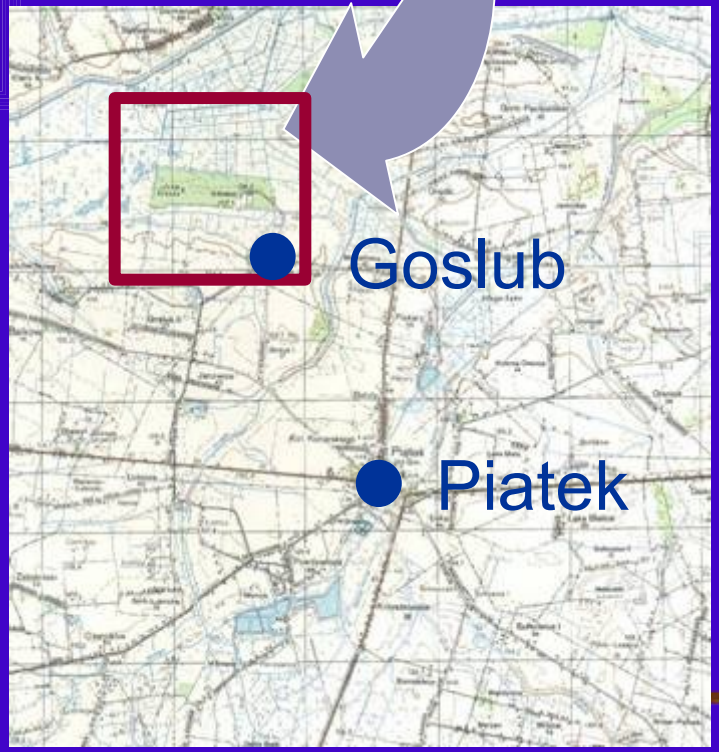
Lodz

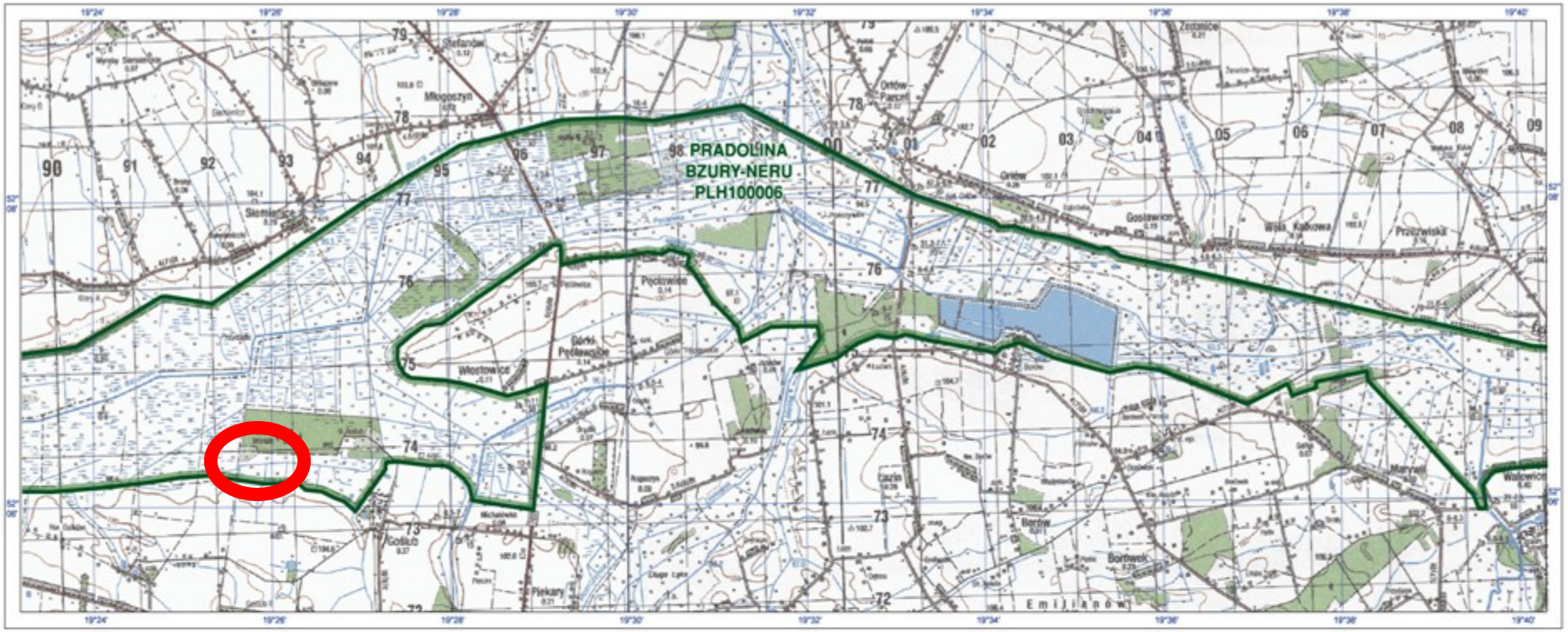
STUDY AREA



Province: Lodz

Commune: Piatek





NATURA 2000
Habitats Directive

Ministerstwo Środowiska

PLH100006
PRADOLINA
BZURY-NERU

map produced on 10th March 2004

Scale 1: 50 000

500 m 0 0,5 1 km

arkusz/sheet 3 of 4

Projection: Albers
Units: meter
Spheroid: sphere
Projection parameters
1st standard parallel: 50 30' 0.000"
2st standard parallel: 53 30' 0.000"
Central meridian: 19 0' 0.000"
Latitude of projection's origin: 52 0' 0.000"
False easting (meters): 0.00000
False northing (meters): 0.00000

granice SOO
SCI boundaries

parki narodowe
national parks

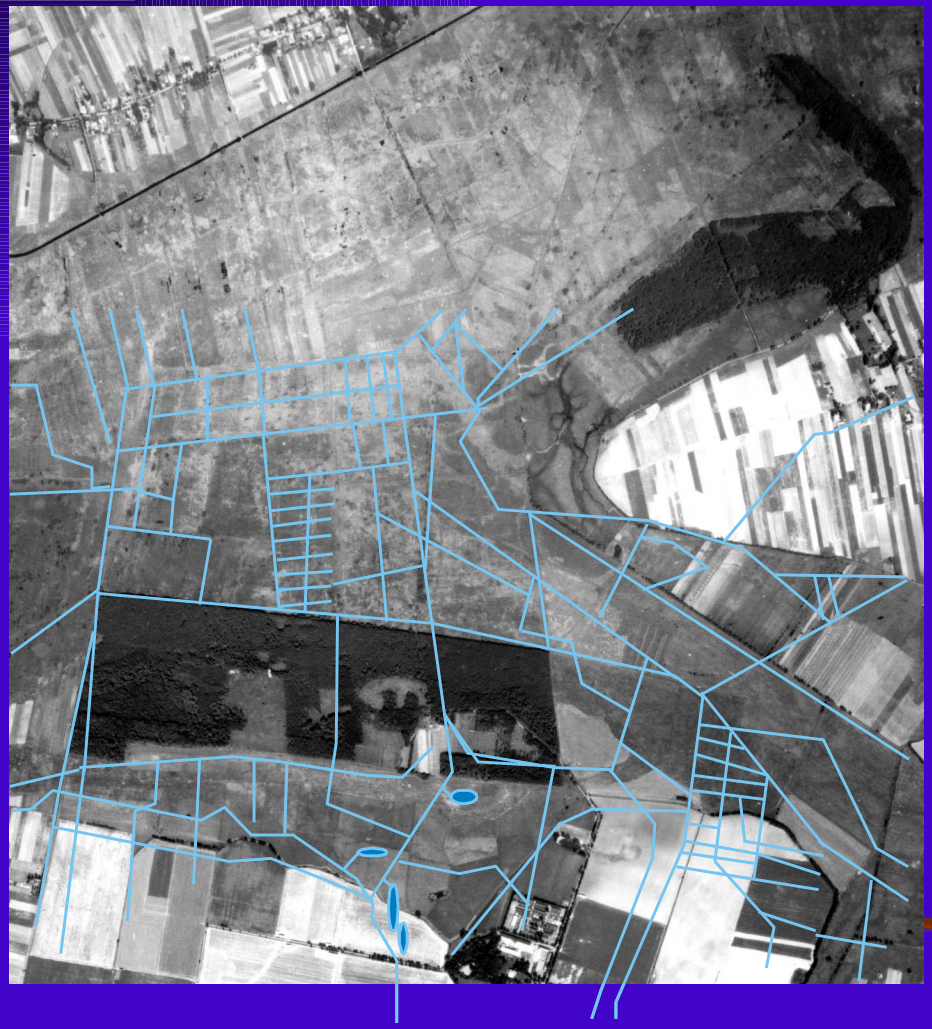
parki krajobrazowe
landscape parks

rezerwaty przyrody
nature reserves

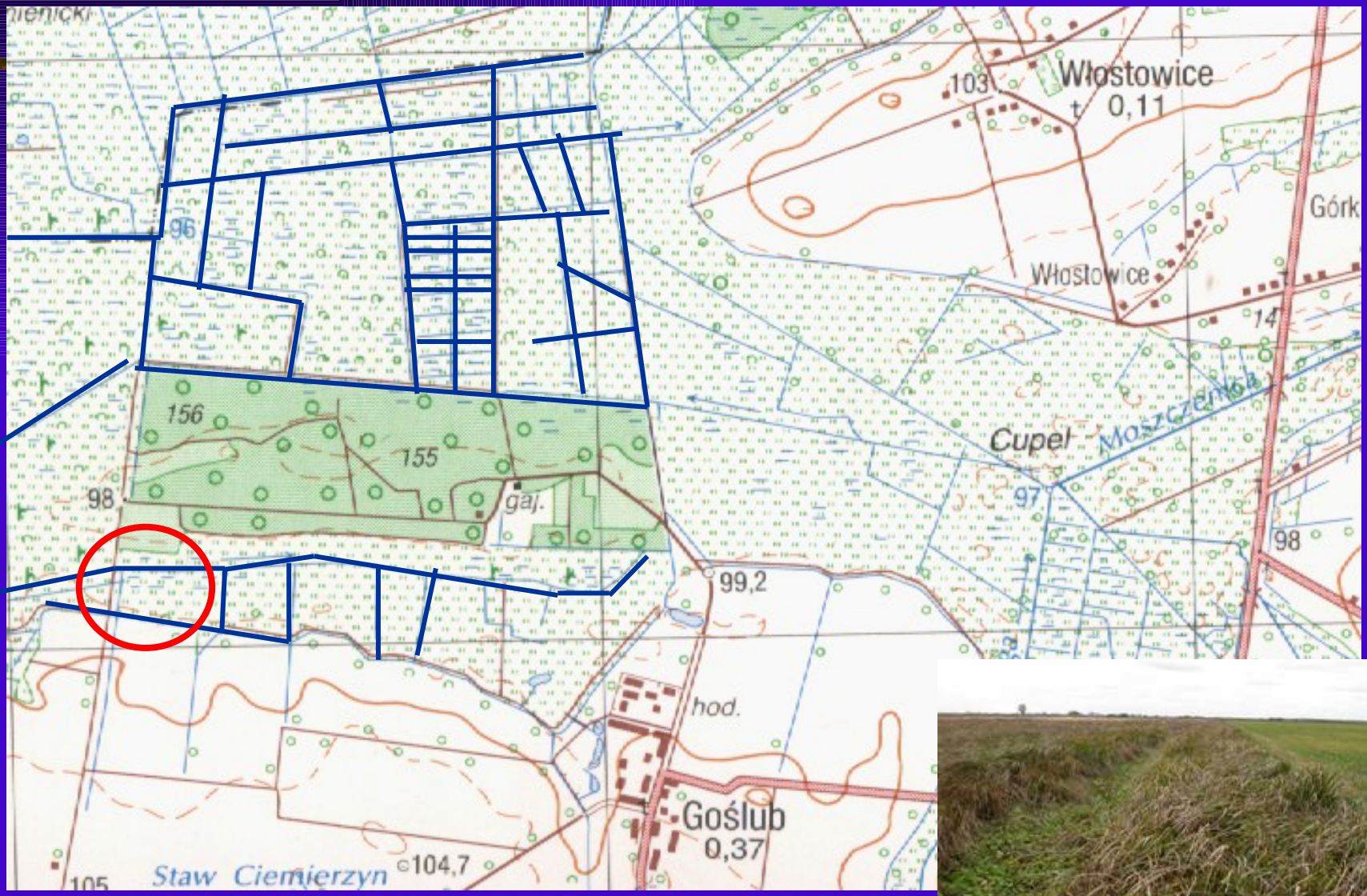
Surface water

Studied site is located in the area belonging to ‘’Nature 2000’’ – PLH100006
Marginal Stream Bzura River – Ner River valley

Drainage and reclamation of peatland



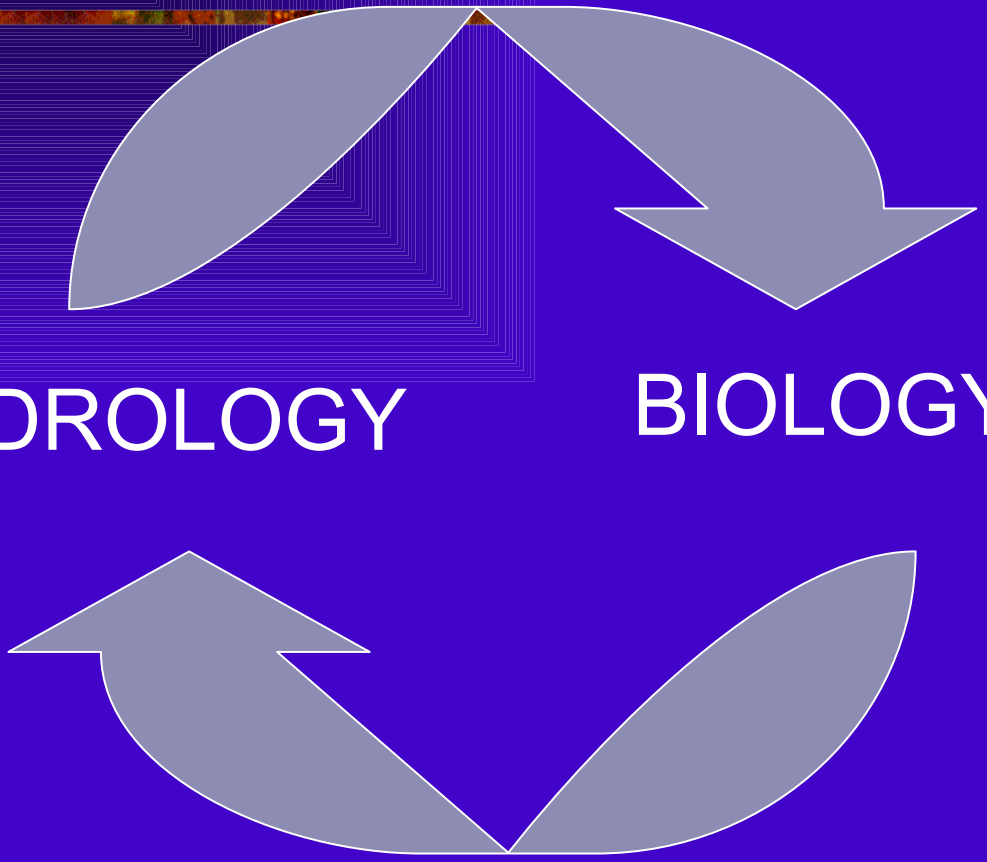
Drainage and reclamation of peatland



Functions of peatlands

	Natural conditions	Degradated - drained conditions
Hydrological	▪ Increase of water retention in a catchment ▪ Mittigation of hydrological fluxes	Limitation in the regulation of water cycles in a catchment
Geochemical	▪ Acumulation of nutrients ▪ Role of protection zone for water bodies	Mineralization and soil exhaustion
Biological	▪ Increase of biodiversity and habitat complexity	Reduction of biodiversity

Ecohydrological principles for regulation of soil properties



Transformation of natural landscapes as a result of agriculture practices

Natural landscape

?

Agriculture

Degradated landscape

Post – agriculture area

Secondary succession

HYPOTHESIS

- Planting strains of *Salix sp.* - native and allochtonic species, can be used for renaturization of degraded peat bog and improvement of socio-economic conditions of the area;

- The survival of native, and allochtonic *Salix sp*. depend on hydrological conditions.

THE AIM OF THE STUDY

- Estimation of survival rate and biomass of *Salix sp* on the degraded peat bog;
- Estimation of the effect of seasonal changes of ground water level and chemistry;

MATERIAL AND METHODS

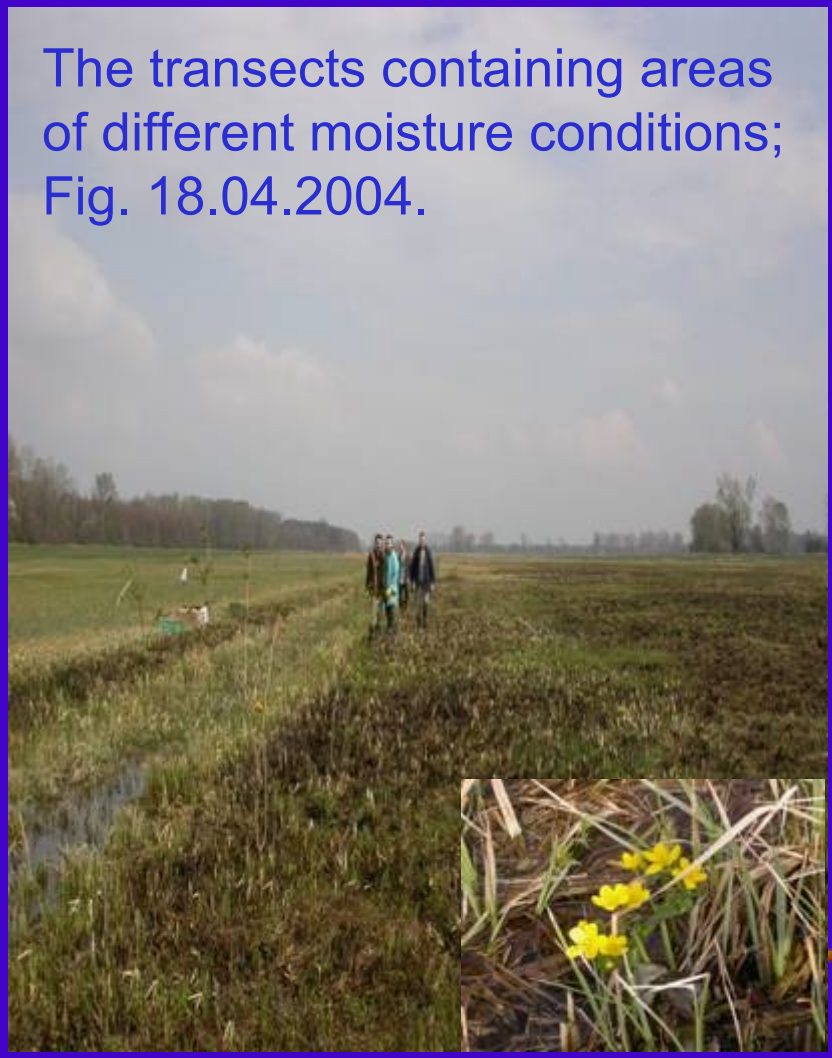
Field study

Assessment of transects

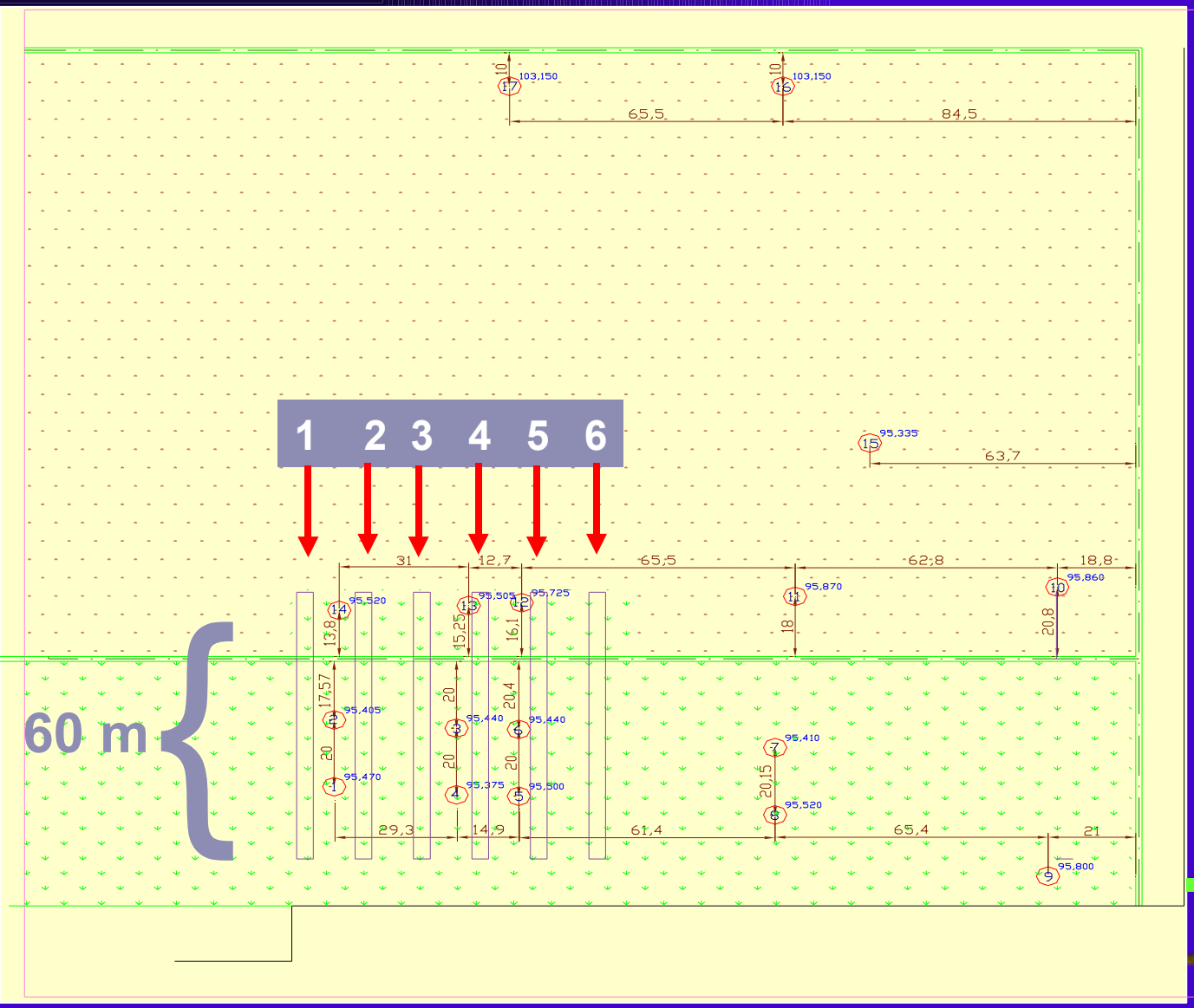
Native species of *Salix sp.*

Allochtonic species of *Salix sp.*

The transects containing areas of different moisture conditions; Fig. 18.04.2004.



Plan of plantings



1 – *Torhild*

2 – *Sven*

3 – *Olof*

4 – *Salix alba*

5 – *Salix caprea* (female)

6 – *Salix caprea* (male)

canal

piezometer

(Prof. J. Hereźniak,

Plantation of *Salix sp.*

On the plantation of *Salix viminalis* were 4 (25 m^2) research stations (Fig. 06.07.2004).

Groundwater samples from the piezometers

- Sampling frequency – twice a month;
- Determine groundwater level – measurement of whistle;
- Physical parameters:
  - record water temperature (WTW electrode)
  - record oxygen (conductivity metre)
  - record pH (pH – metre)
  - record conductivity (WTW electrode)

Soils samples

- Sampling frequency – once a month;
- Collection of soil samples from 0 – 30 cm depth.

Plants samples

- Phytosociological records located by each piesometer;
- Sampling of meadow plants frequency – 3 times during the vegetation seasons from 1 m^2;
- Measure the survival rate of *Salix sp.*, height and quantity new shoot – November 2004 and May 2005;

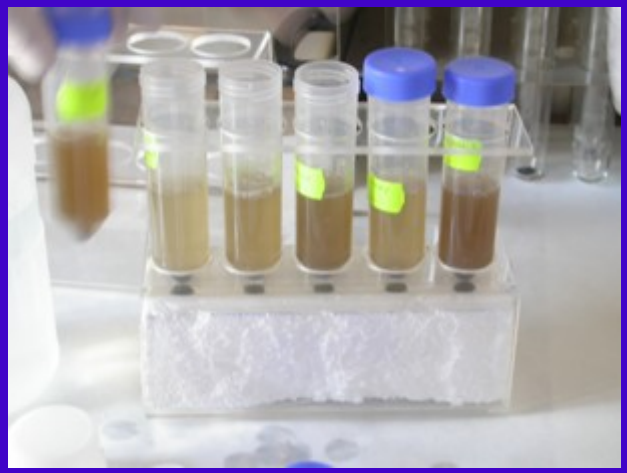
Laboratory methods

Groundwater samples

- concentration of: P – PO_4, TP, N – NH_4, N – $NO_{2/3}$, TN using colorimetric methods;

Soils saples

- Organic matter content
  Content of organic matter in the soil samples will be estimated according to Ostrowska at al. (1991). The mass loss (before and after burned at 500°C) will estimate content of organic matter.
- Determination of pH
  All biochemical transformation in soil is affected by pH (actual, H+ exchangeable and hydrolytic). pH will be determined in sample according to the Ostrowska at al. (1991) and Heada (1992, for Myślińska, 2001).
- Estimation of moisture
  The moisture analyses will be conducted according to the Bednarek at al. (2004) and Myślińska (2001).
- Estimation of total phosphorus
  The soil sample will be mineralised according to the Ostrowska at al. (1991).



Plants sample

- Estimation of biomass

The sample will be clean and dry (105^{o}C) (Chmielewska, 1955). The dry weight of plant will be re – count on the 1 m^{2}.

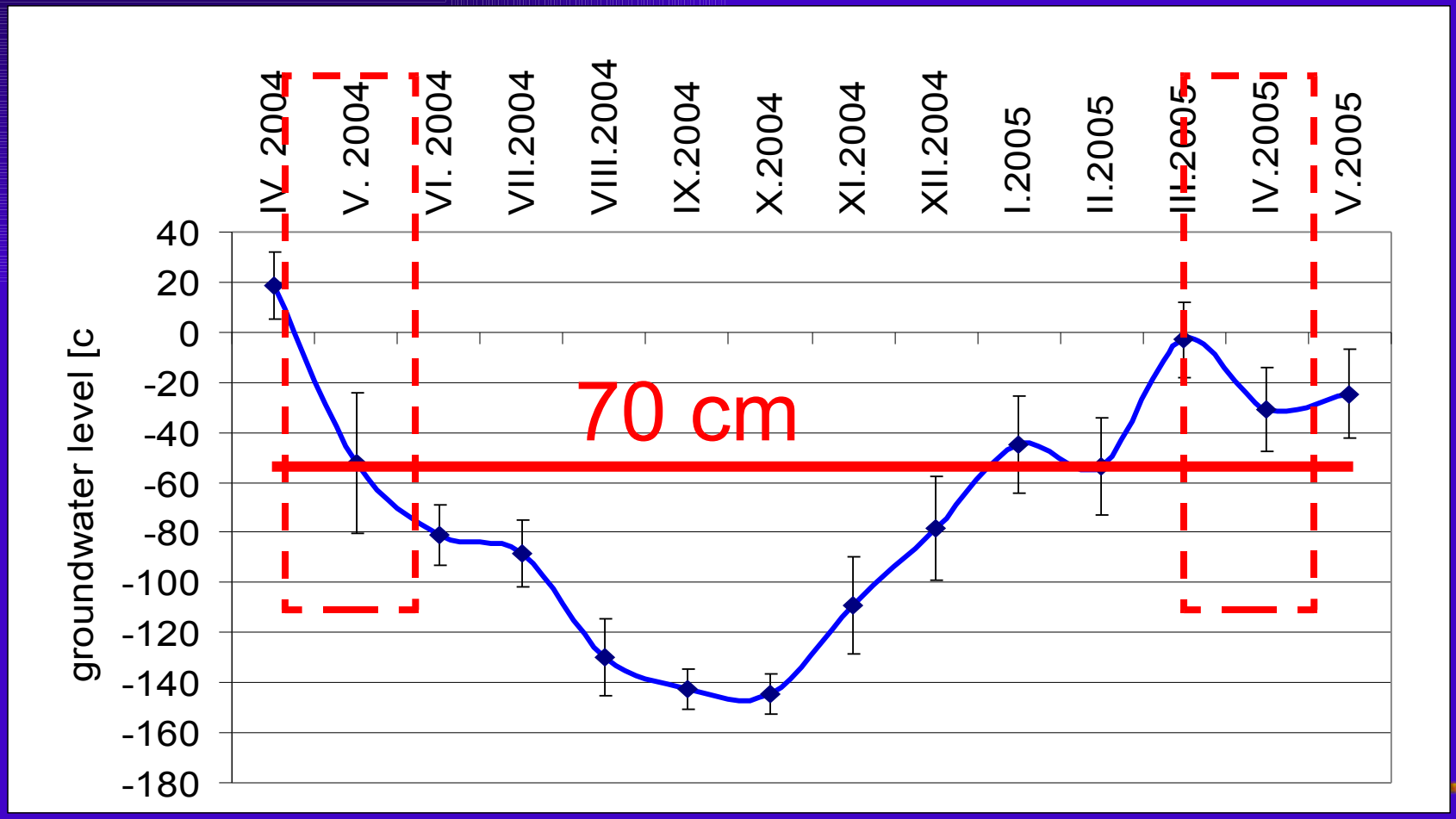
- Estimation of total phosphorus in the plant tissue

The total phosphorus will be measured by ascorbic acid method (Ostrowska at al 1991).

PRELIMINARY RESULTS

The groundwater analysis

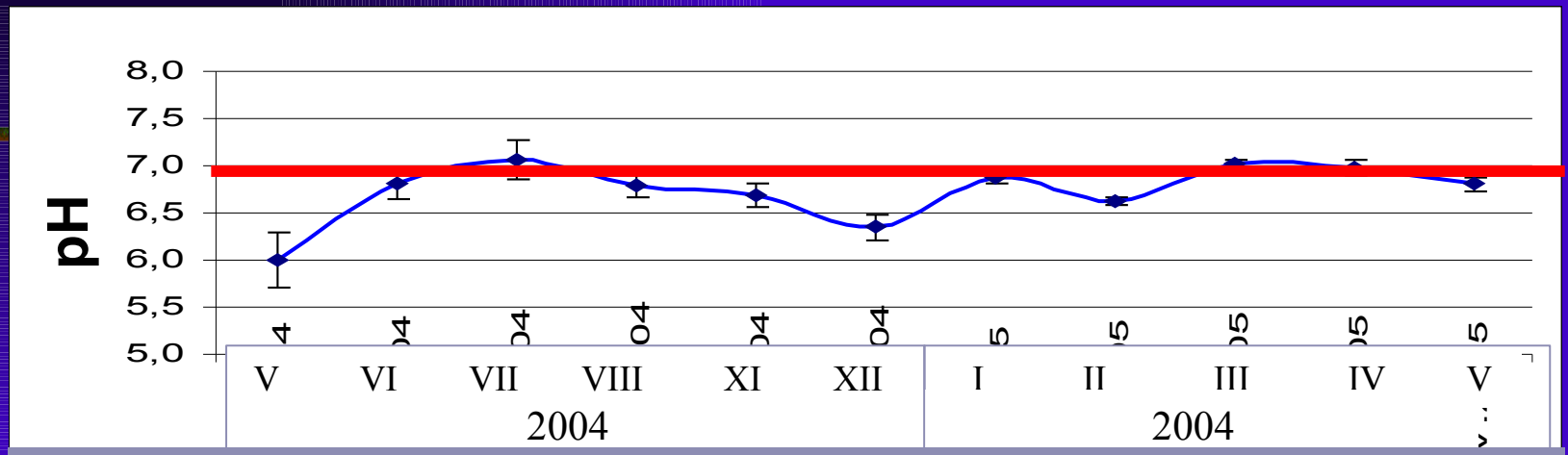
Rapid groundwater fall during vegetation season in 2004/ 2005



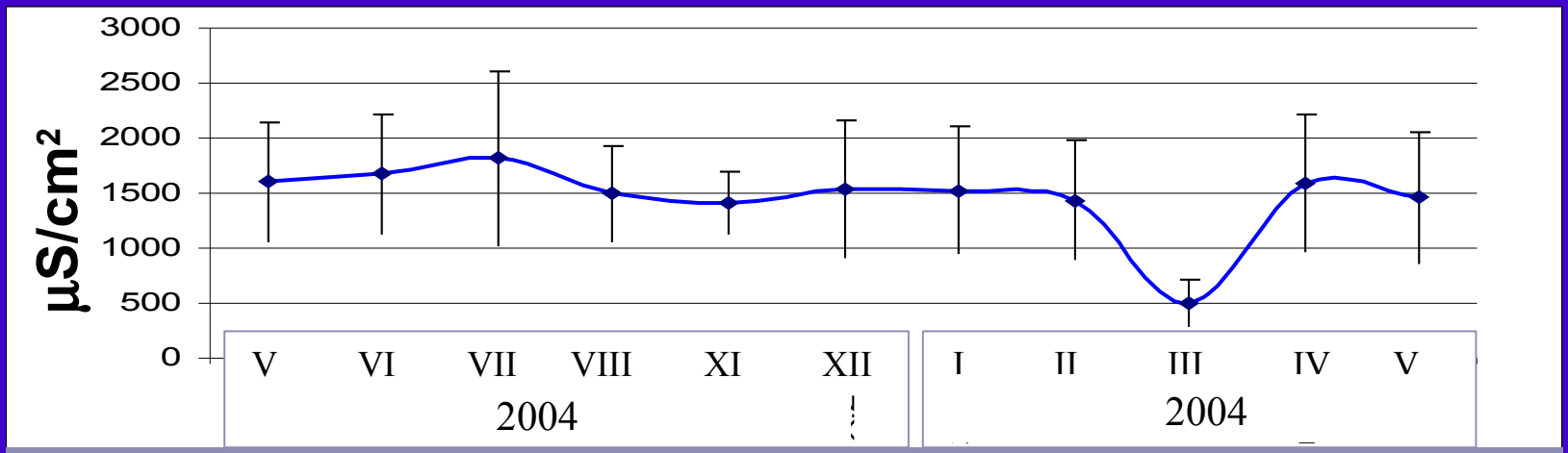
Springer stagnation of water on the field study

Fig. 23.03.2005

Seasonal changes of mean pH and conductivity

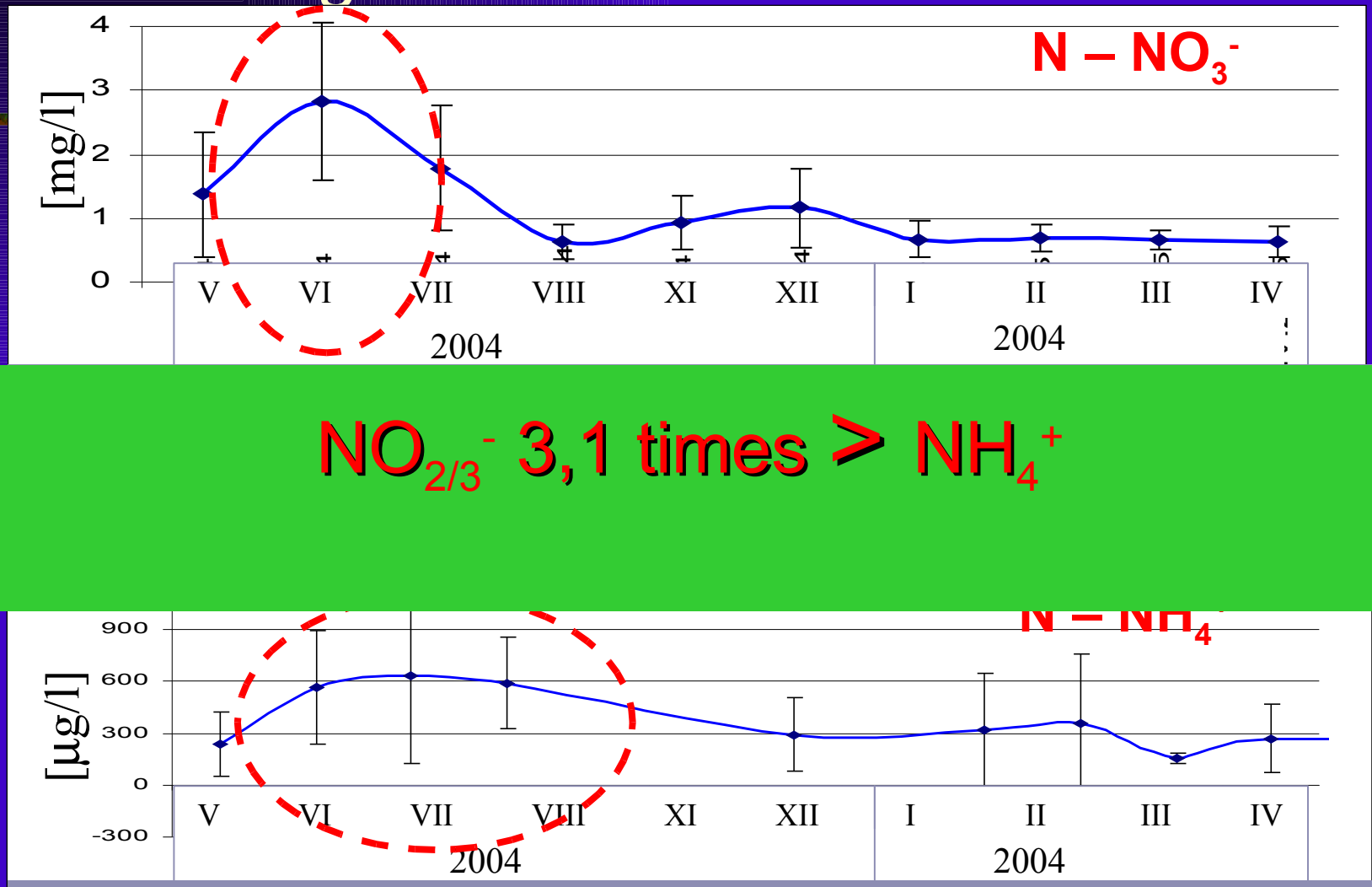


pH of soils samples 6,61 – 7,94: values favoring acceleration of mineralization (Gotkiewicz J. and Gotkiewicz M.,1991).



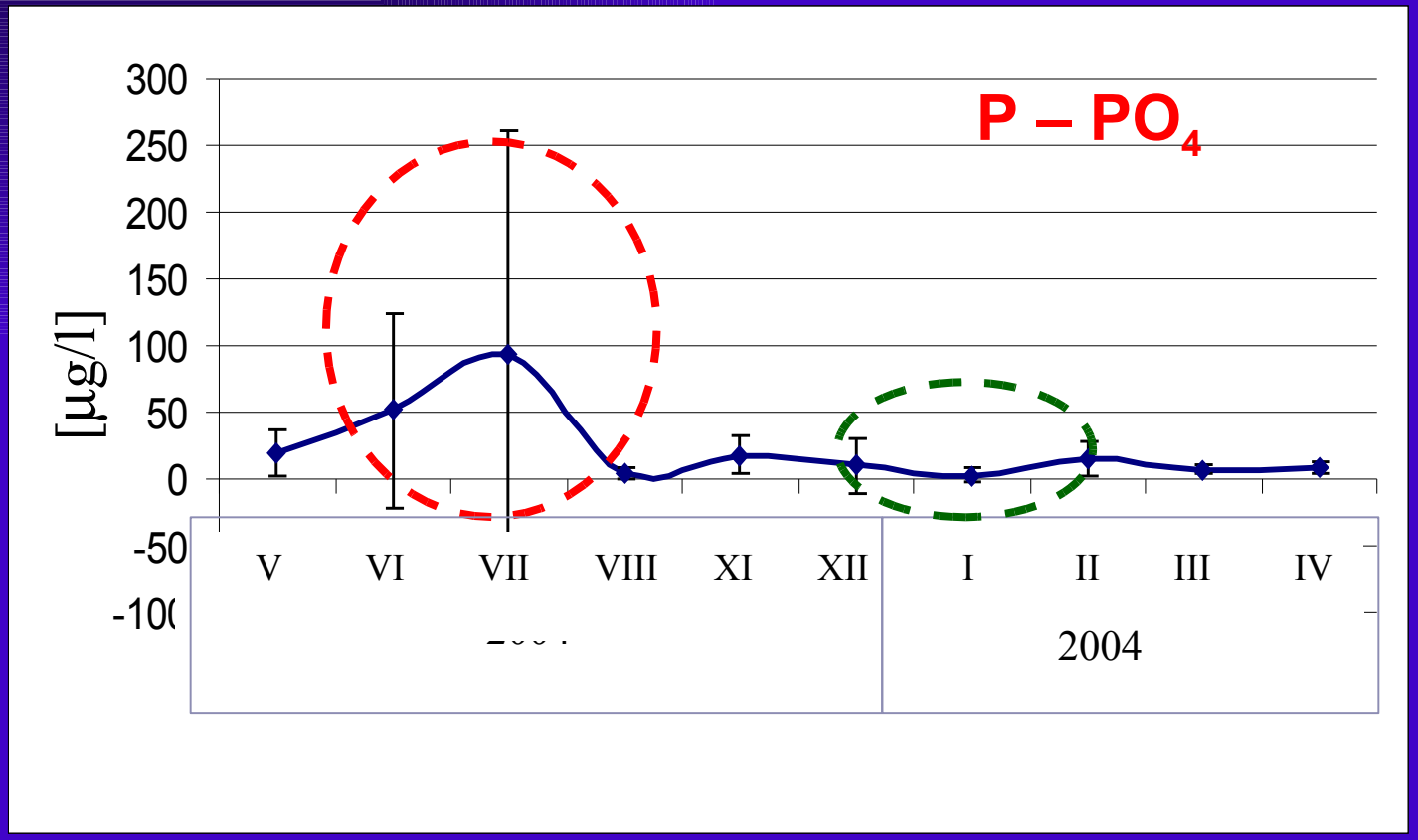
Conductivity is average 1,57 times greater on the research station with higher content organic matter (excluding IX, XII, XIII)

Highest concentration of N – NH^{4+} and N – $NO_{2/3}^{-}$ by the lowest graundwater level



Mean concentration of N – NH_4 is average 1,39 times higher on the research station with the *Salix viminalis* plantation than on the research with meadow plant station

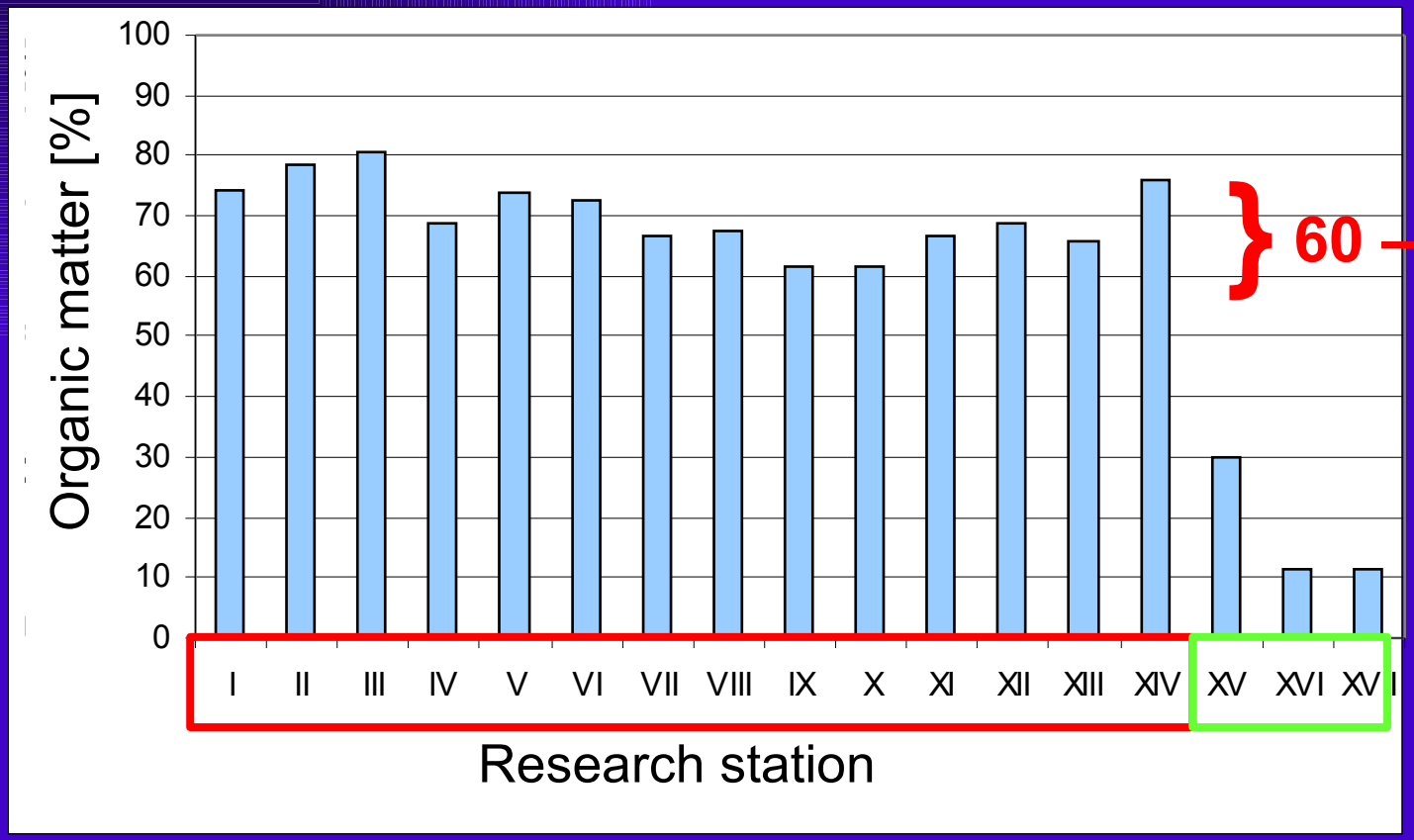
Seasonal changes of mean concentration of $P - PO_4$



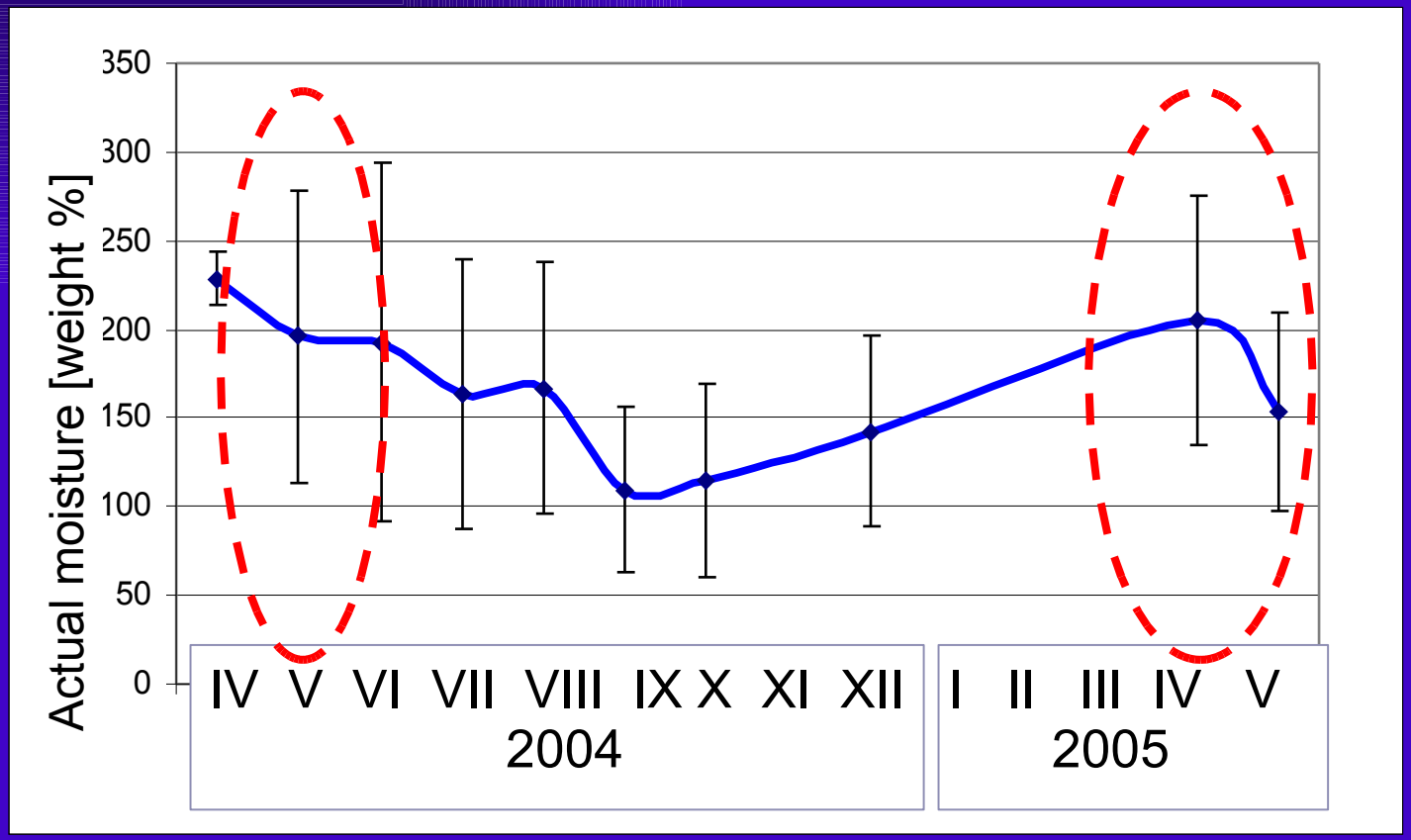
PRELIMINARY RESULTS

The soil samples analysis

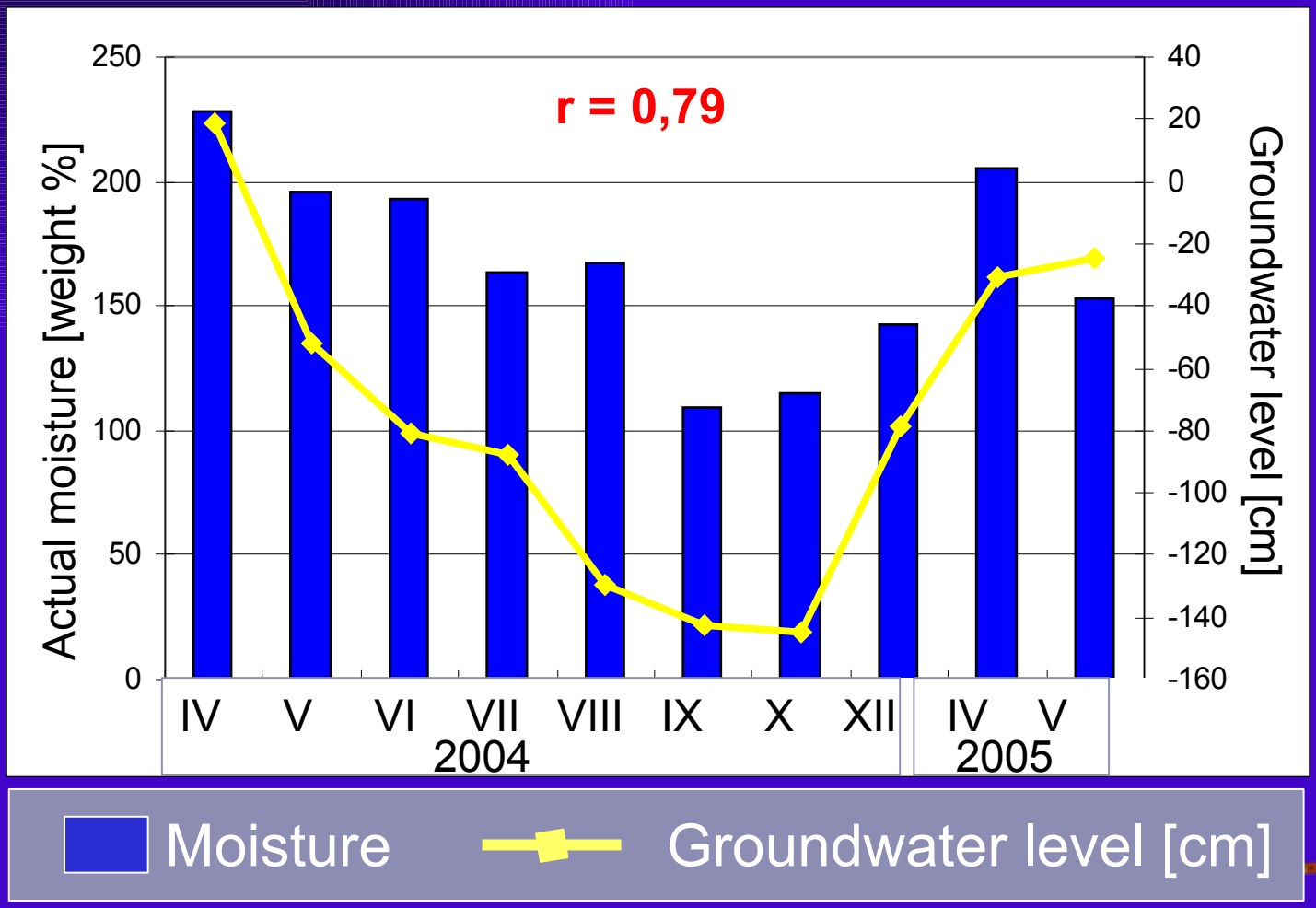
Organic matter distribution on the research station



Small retention ability of soil – rapid decrease of moisture after intensive rain and spring thaw in April



Decrease of soil moisture during the decrease of groundwater level

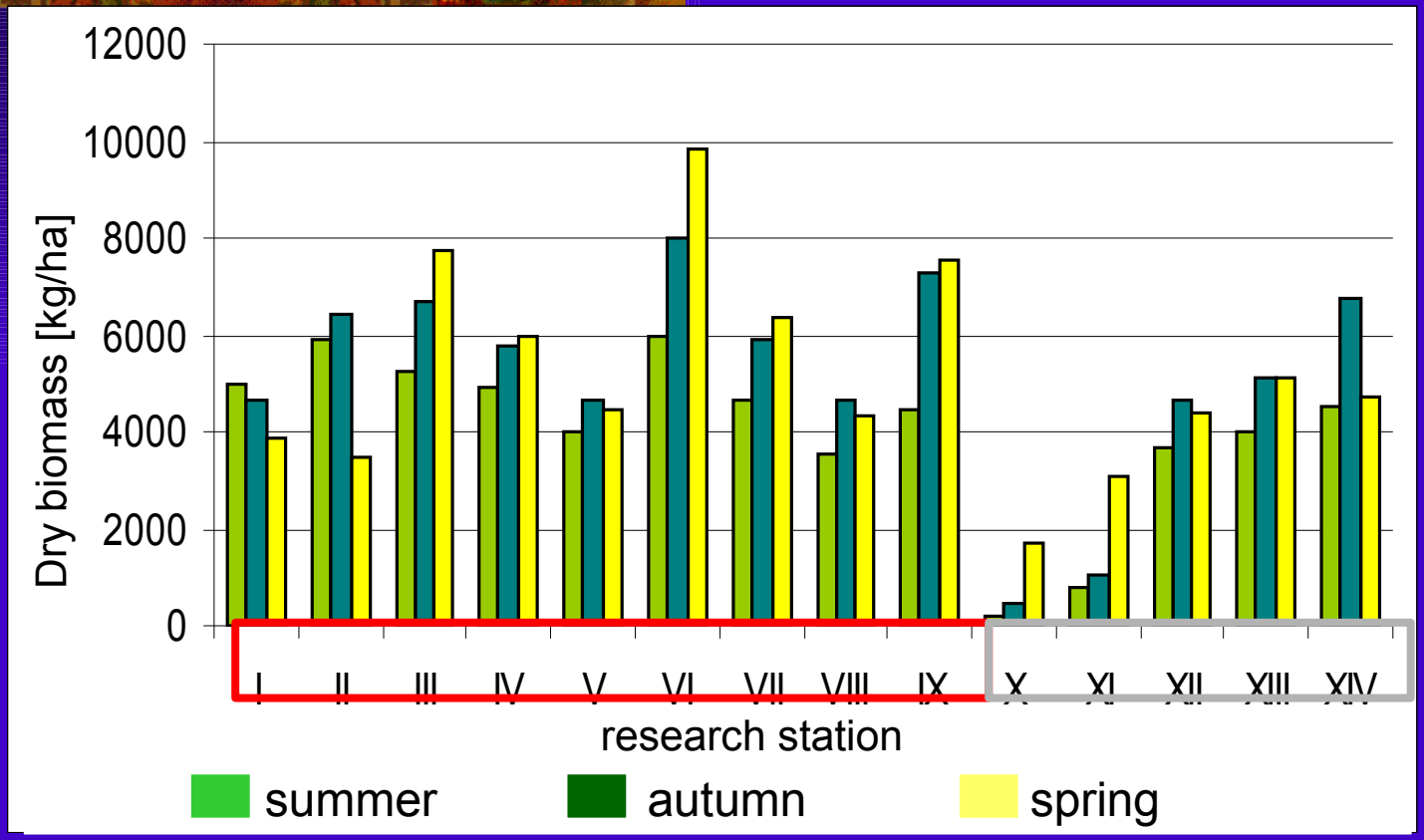


PRELIMINARY RESULTS

The plants material analysis

Meadow plant biomass

Seasonal changes plants biomass on the research station



1,7

Caricetum gracilis (I – VIII)
Alopecuretum pratensis (IX)

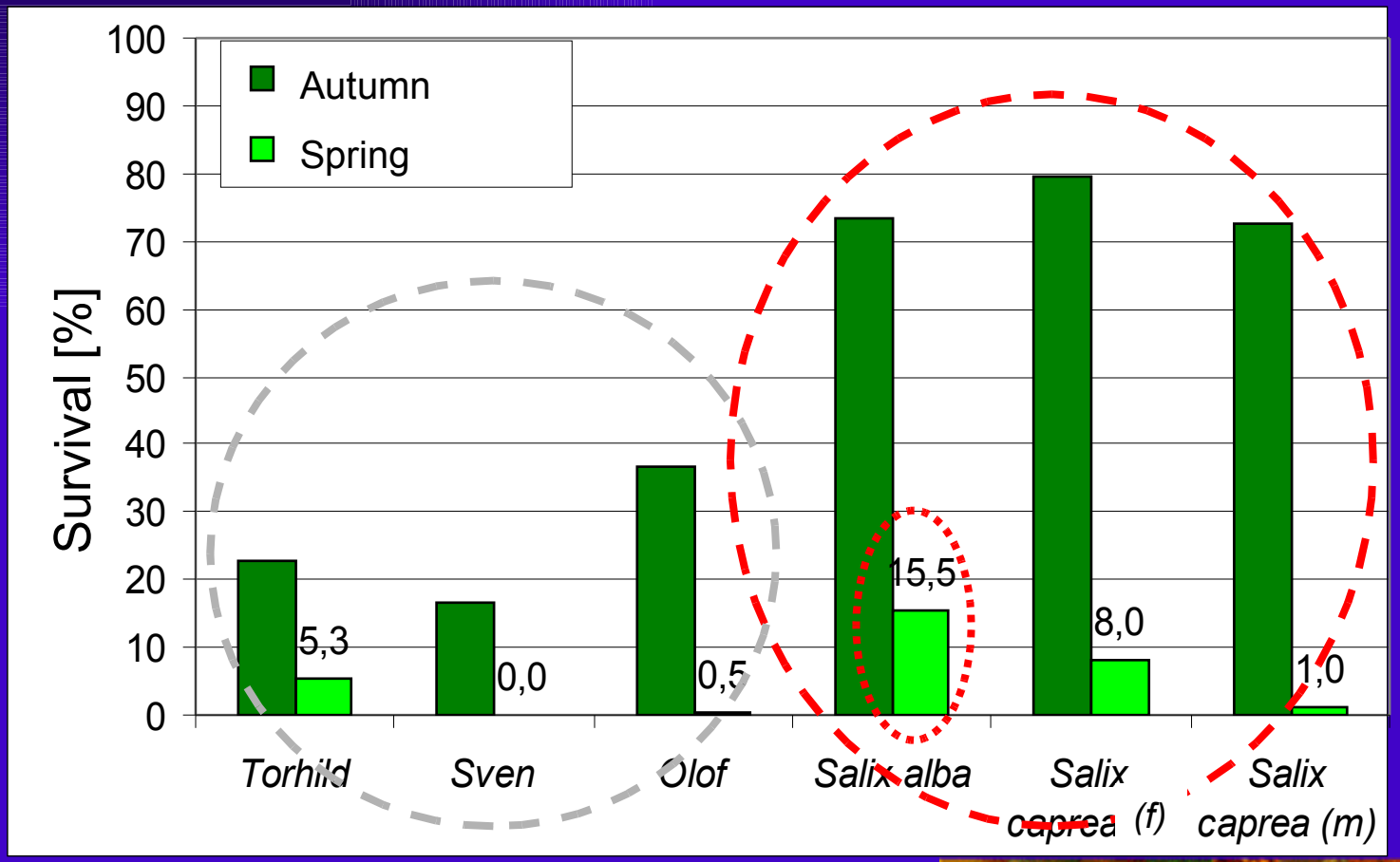
Plantation of Salix viminalis (X – XI)
Deschampsietum caespitosa (XII – XIV)

PRELIMINARY RESULTS

The survival rate and biomass of *Salix sp.*

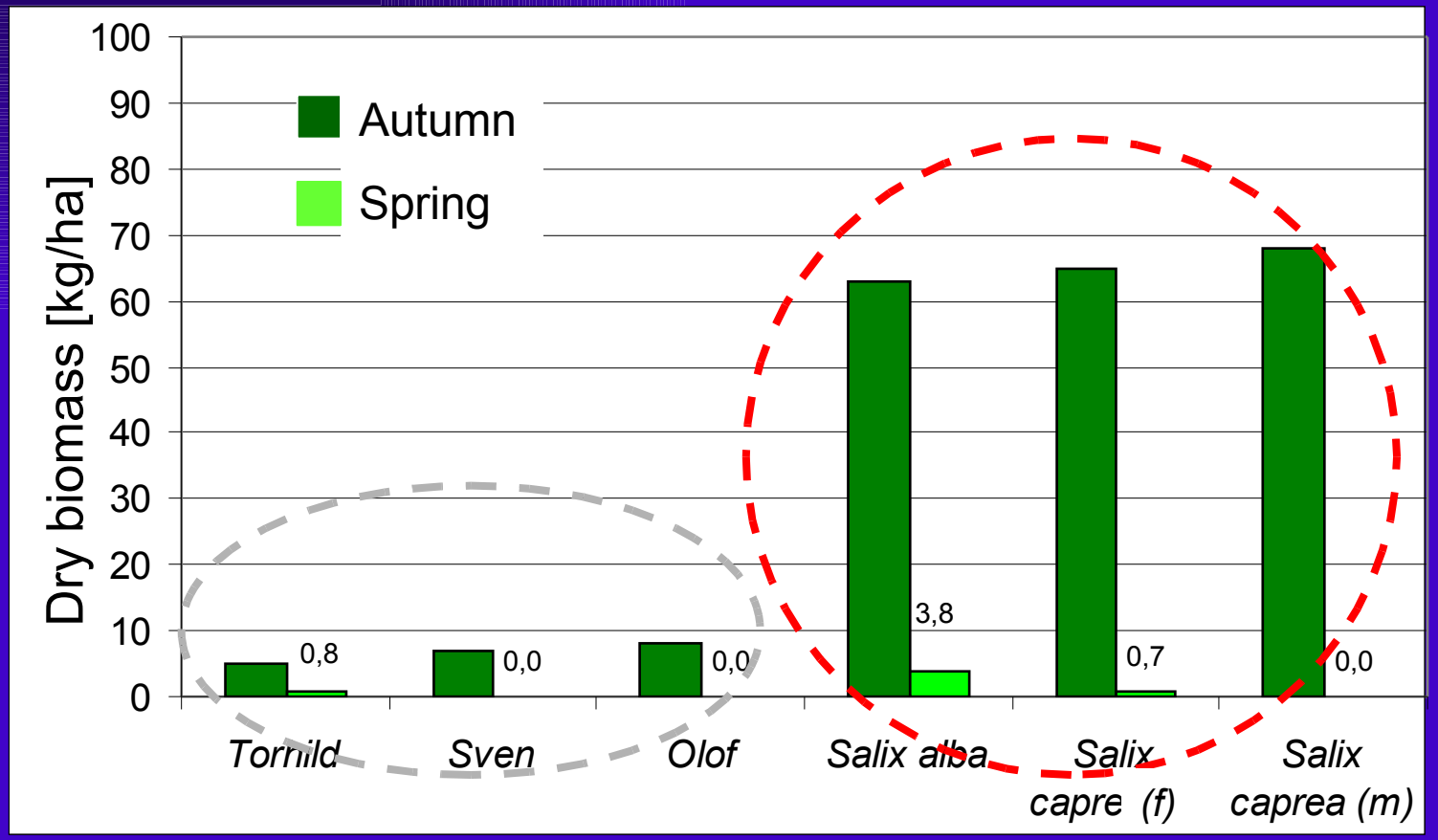
Observation surface

Higher survival native species than survival *Salix viminalis*



Role of wild animals during autumn and winter in the tree destruction

Possibility of increase the crop productivity of *Salix sp.* by use the native species

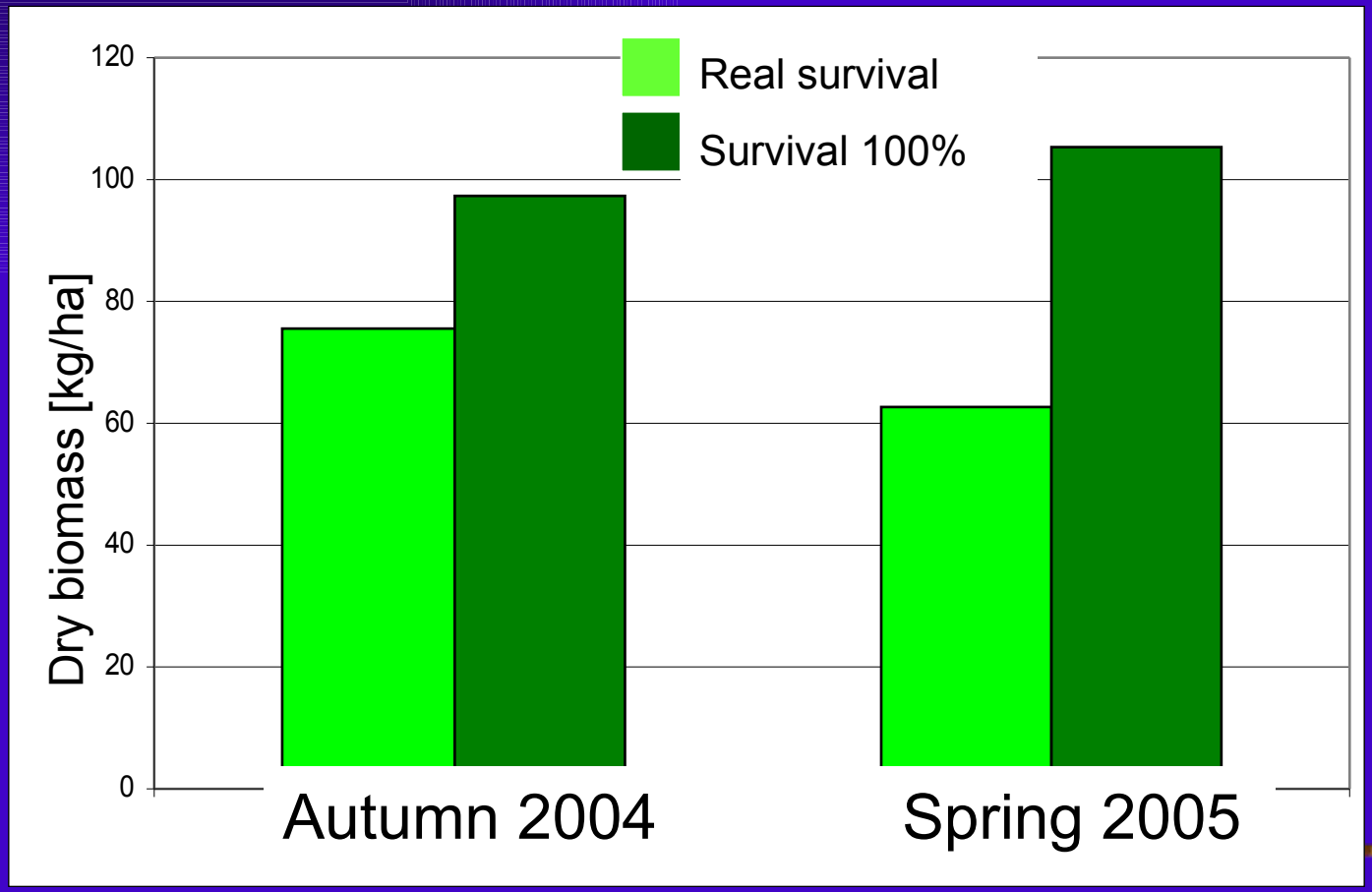


PRELIMINARY RESULTS

The survival rate and biomass of *Salix sp.*

Plantation *Salix viminalis*

Decrease of the crop productivity of *Salix sp* after winter, as a consequences decrease of survival rate in compare with theoretical value calculation for 100% survival



Conclusion and suggestions

First observation

- Small ability of soil to retention of water symptoms by rapid decrease of moisture it is basic the reason of small acclimatization of *Salix sp*.;
- Growth and survival of *Salix viminalis* on the studies area were smaller then *Salix alba* and *Salix caprea*. After vegetation period the survival of *Salix alba* was 15,5%. It is suggest that this species would occur here in the natural succession;
- Pressure of plant – eating animals can significantly decrease of the plant biomass;
- Mineralization is stimulated by low groundwater level, that was confirmed by the highest concentration of N – $NO_{2/3}^{-}$, N – NH_4^{+} and P – PO_4^{-3} during the lowest groundwater level and about 3,08 times smaller N – NH_4^{+} then N – $NO_{2/3}^{-}$ concentration
- Mineralized soils are characterized by small ability to water retention;
- Meadow give more advantages then planting of *Salix sp.* in ecological and economic points of view.

Thank You for attention