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WP2 Climate Change Impact on the Nutrient Run-off in Drainage Basin

Viesturs Jansons, Department of Environmental Engineering and Water Management of Latvia University of Agriculture

Main tasks:

Latvia University

1. Evaluation of the available hydrological models
2. Calibration of model for 5-6 typical river basins, including river Berze
3. Simulation of the impact of climate changes on nutrient

Institute of aquatic ecology

Water quality analyses

Latvia University of Agriculture

1. Assessment of nutrient concentrations, loads and retention (Soil- field drainage- small catchment)
2. Nutrient concentration and run-off data, nutrient retention data for Berze river, information about agricultural practices (GIS format data hydrographic network , land use, etc.)
3. Calibration of the hydrological water quality models (river Berze catchment).
4. Simulation of consequences of climate change with regard on water quality (nutrients)

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Measurements of the concentration, loads and retention - agricultural run-off monitoring programme

3 non-point source **monitoring stations**: Bērze (1994), Mellupīte (1995), Vienziemīte (1994)

3 non-point source **monitoring points**: Auce (2004), Bauska (1995), Skrīveri (2001)

3 point source **monitoring points** – large animal farms: Bauska (1995), Ogre (1995), Auce (1995),

M. station - measurements in several scales plots, field, catchment, Hydraulic structures, data loggers, automatic sampling.

M. point – grab sampling site

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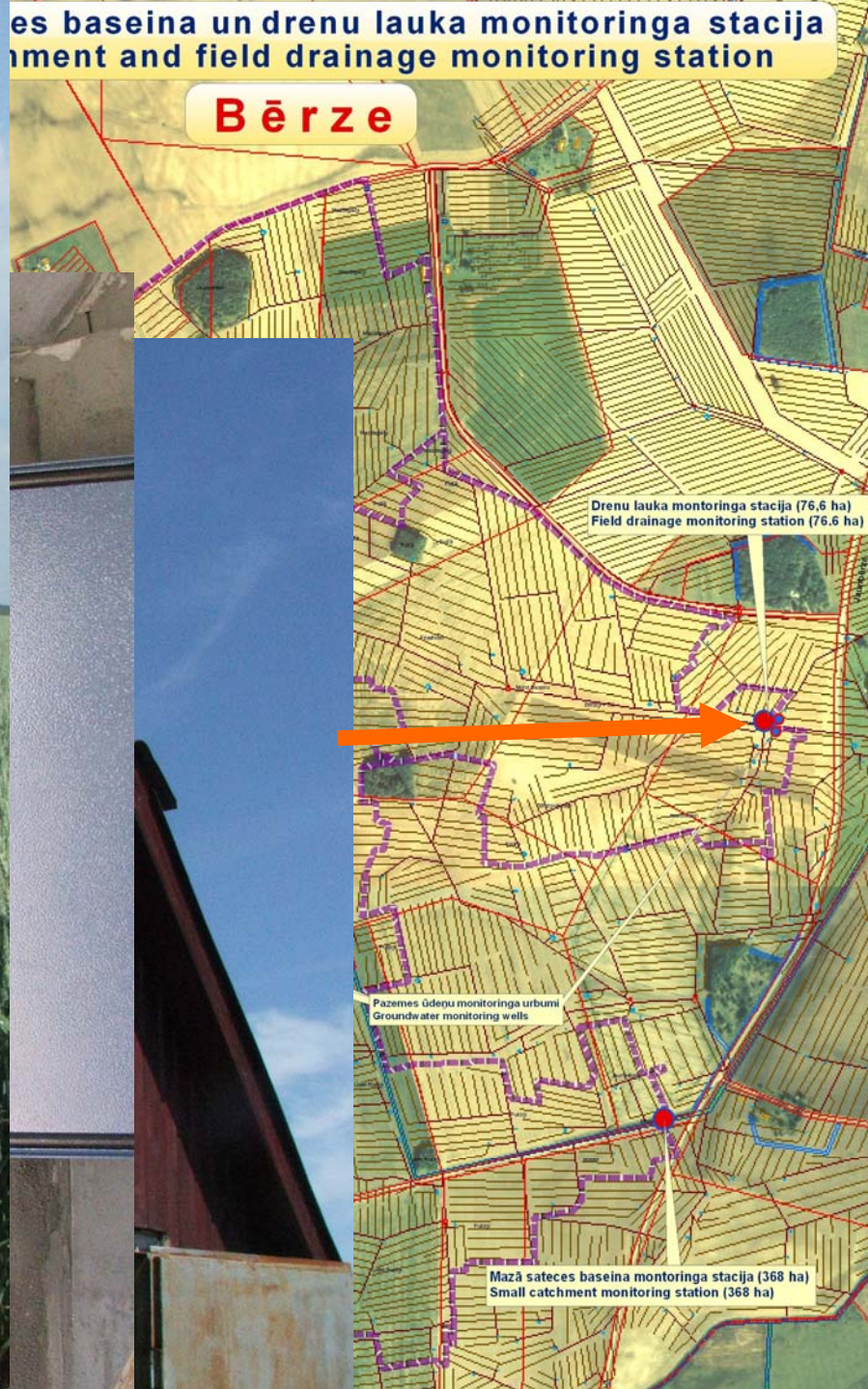
Balti

Mazā sateces baseina un drenu lauka monitoringa stacija
Small catchment and field drainage monitoring station
Bērze
Drenu lauka montoringa stacija (76,6 ha)
Field drainage monitoring station (76.6 ha)
Pazemes ūdeņu monitoringa urbumi
Groundwater monitoring wells
Mazā sateces baseina montoringa stacija (368 ha)
Small catchment monitoring station (368 ha)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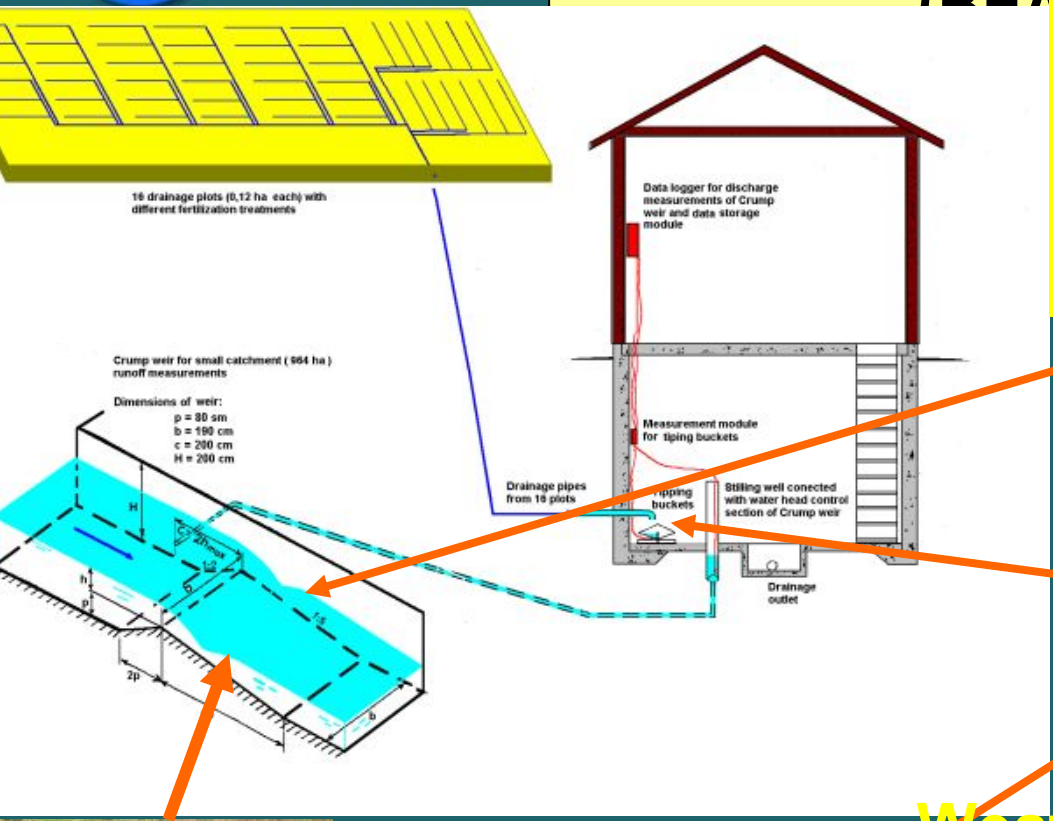
Mellupīte monitoring station (REABOR project 1005)



Small catchment station with inlets from plots and hydraulic structure (river).

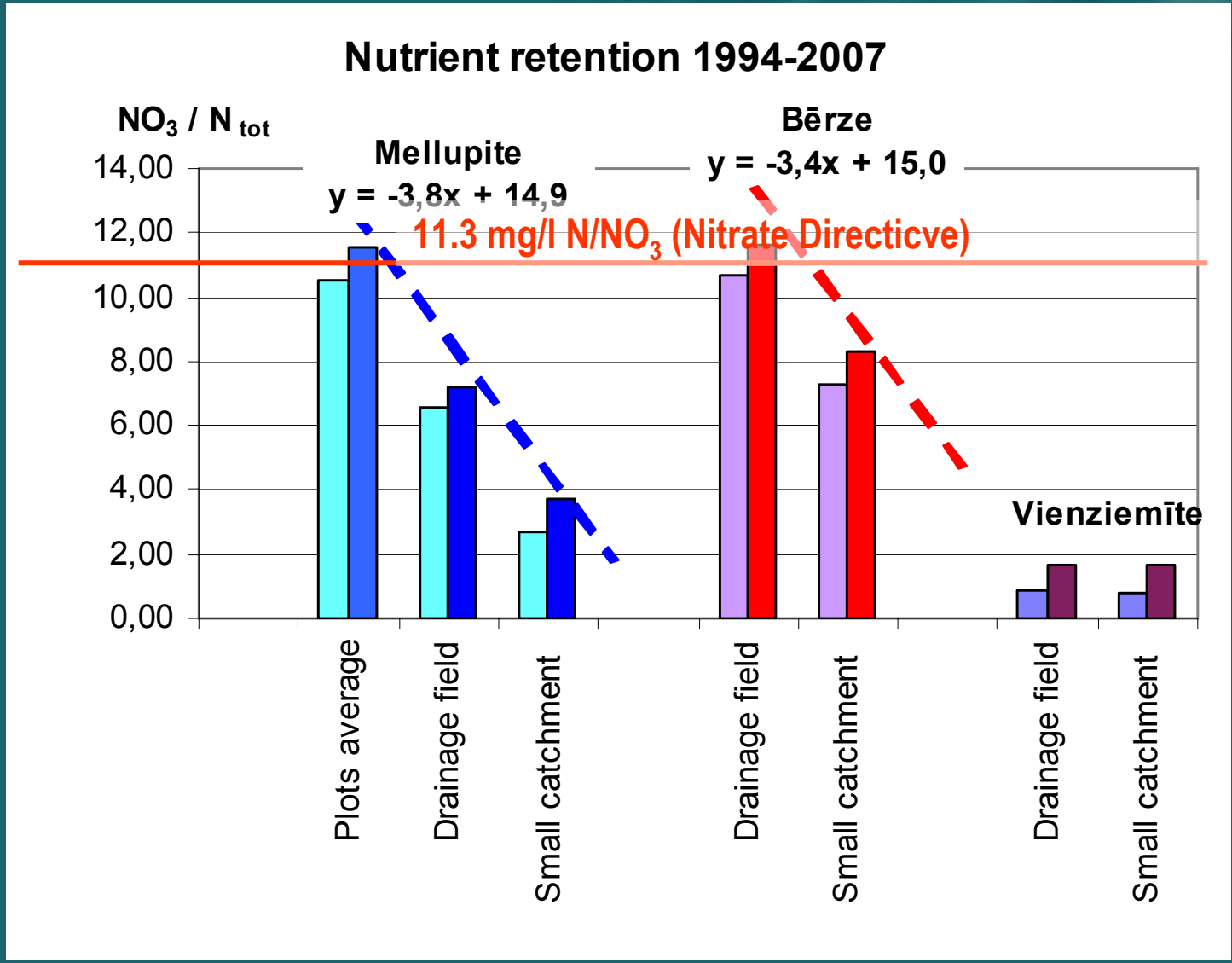
H. structure – Crump weir

Tipping buckets for drainage plot measurements

Surface run-off plot

Weather station

Average concentrations and retention of the nitrogen (plot – field – catchments') in run-off



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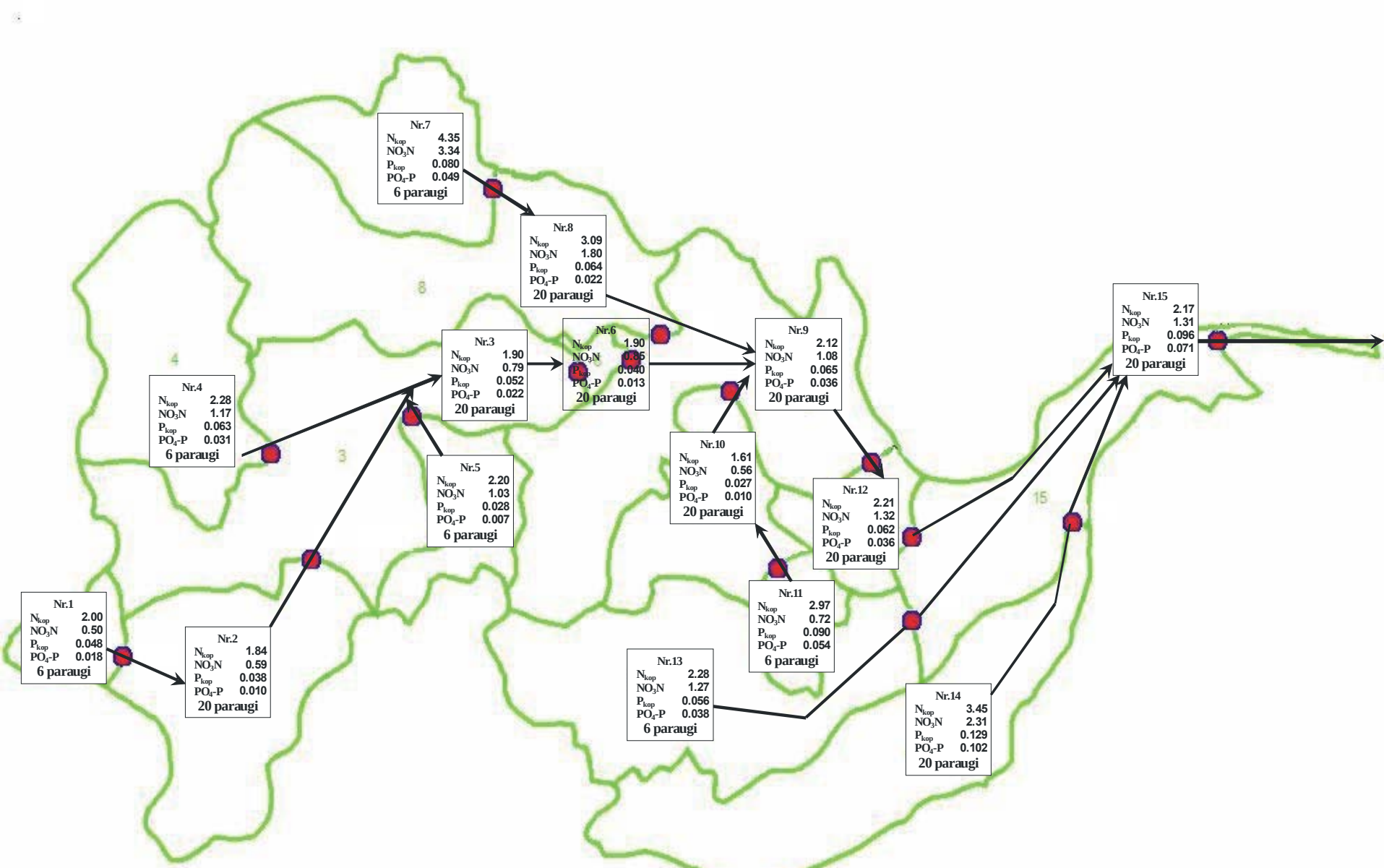
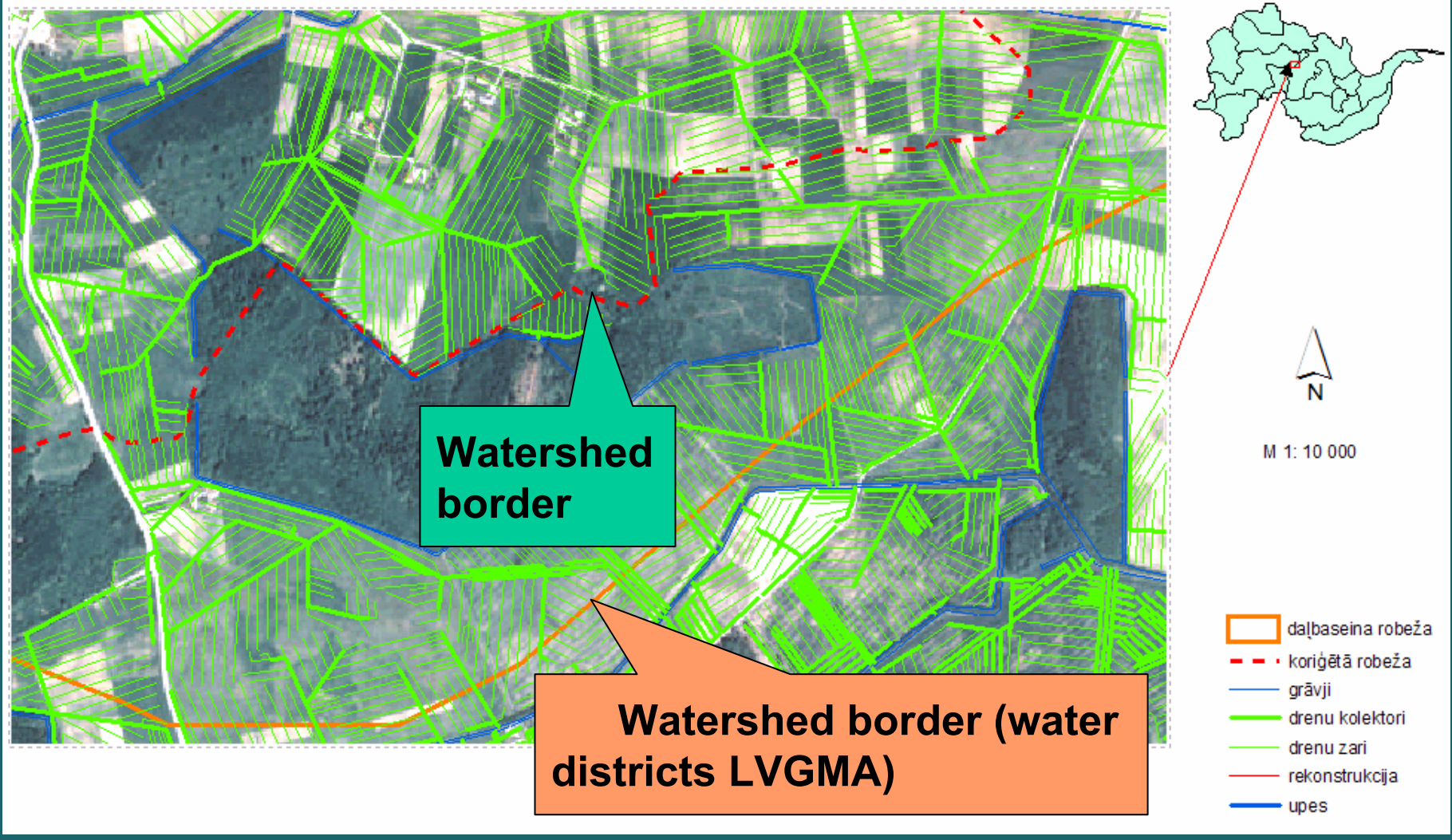
Water quality monitoring programme in the 15 sub-catchments of river Berze (2005-2007)



Establishment of the correct watershed borders for sub-catchments, area of the agricultural land etc.



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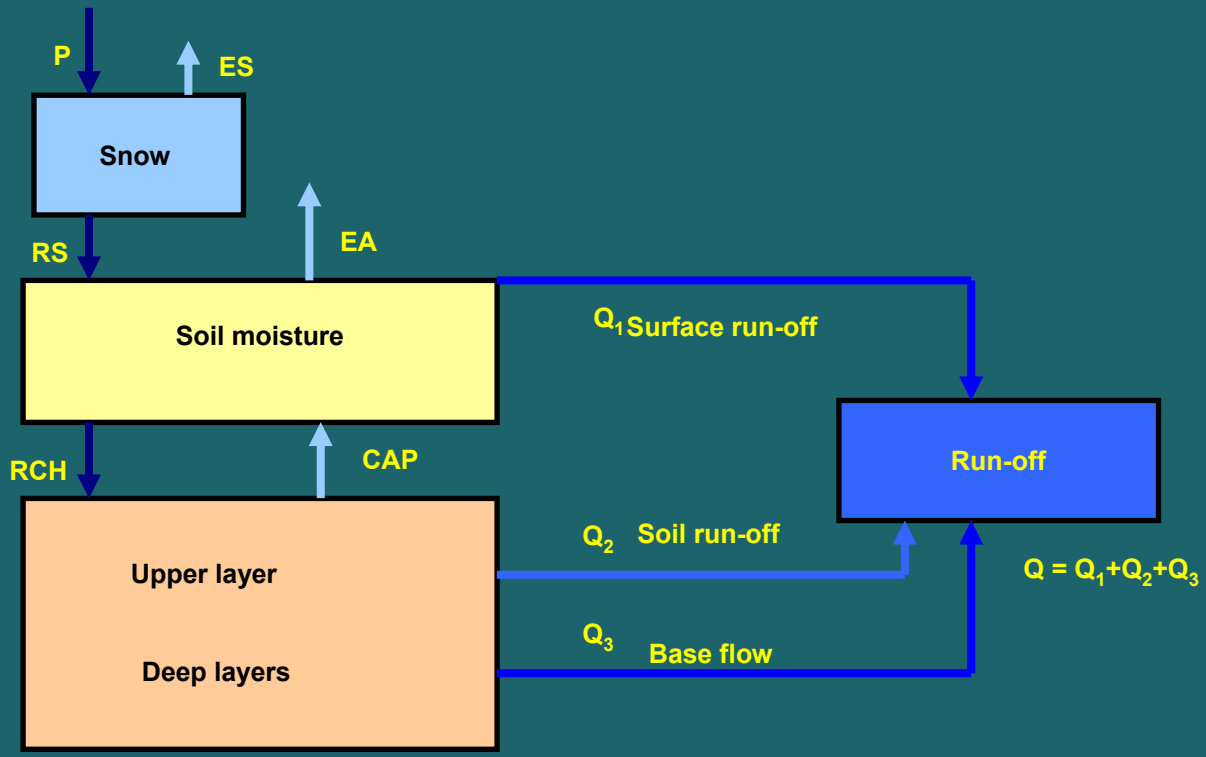
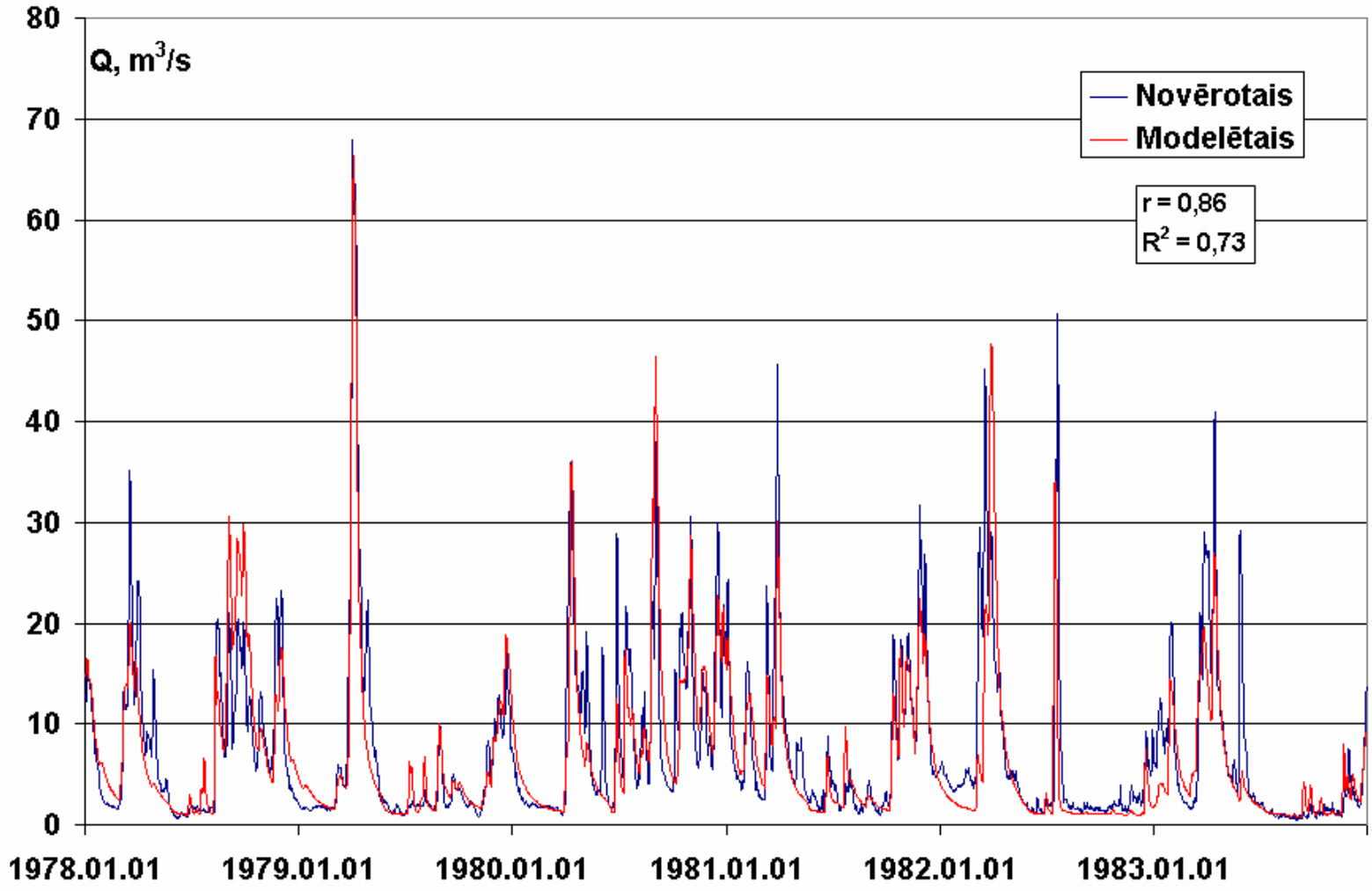
Hydrological modeling

METQ2007BDOPT model developed by A.Zīverts Latvia conditions was calibrated for Bērze river (15 sub-catchments), Salaca river, Imula river, Iecava and Vienziemīte rivers.



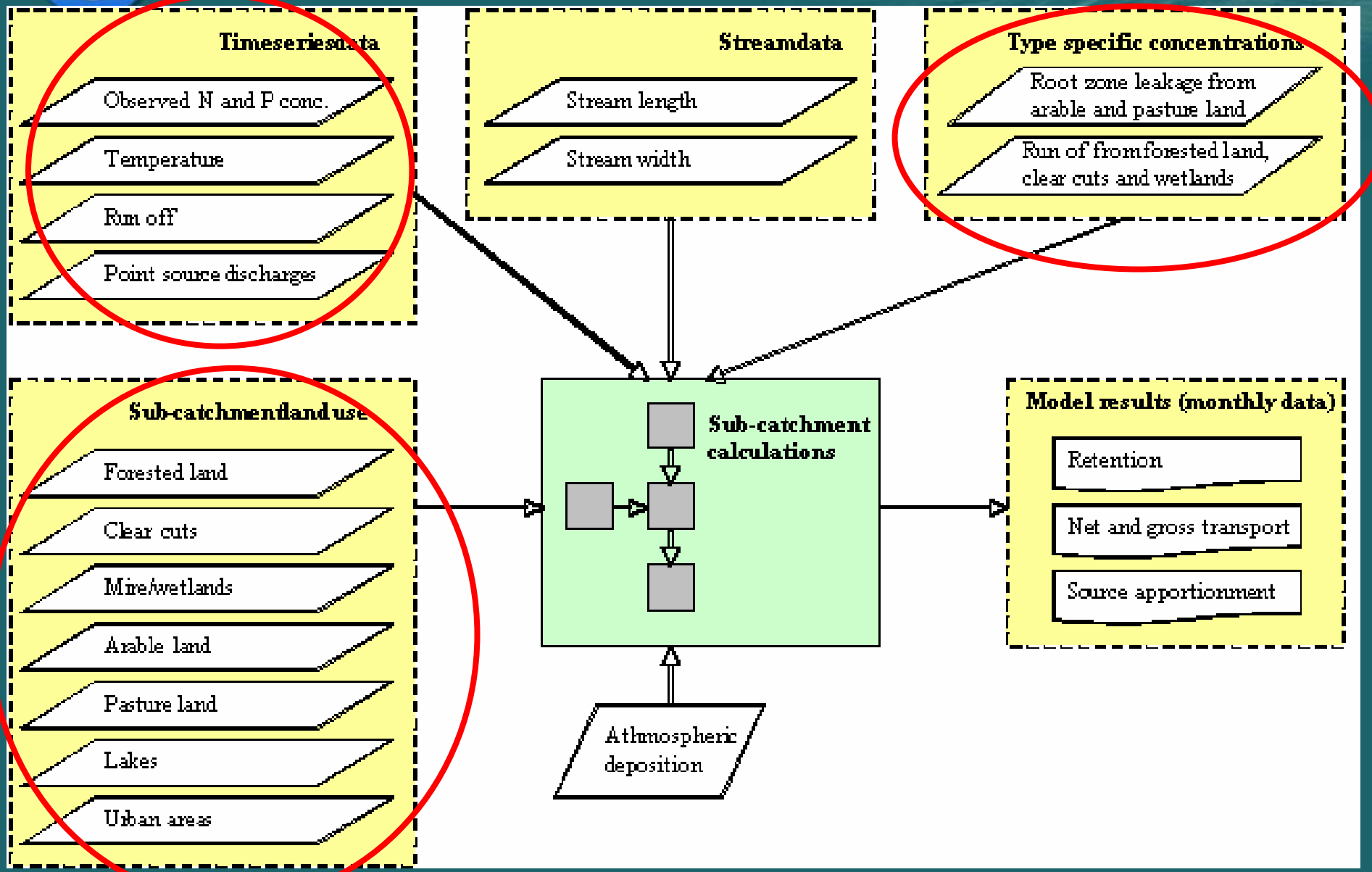
P – precipitation
ES –evaporation from snow
EA – evapotranspiration from root zone
RS – precipitation and snow melting
RCH –recharge to groundwater
CAP – capillary flow

Results of the hydrological modeling (Berze river, 1961-1990)

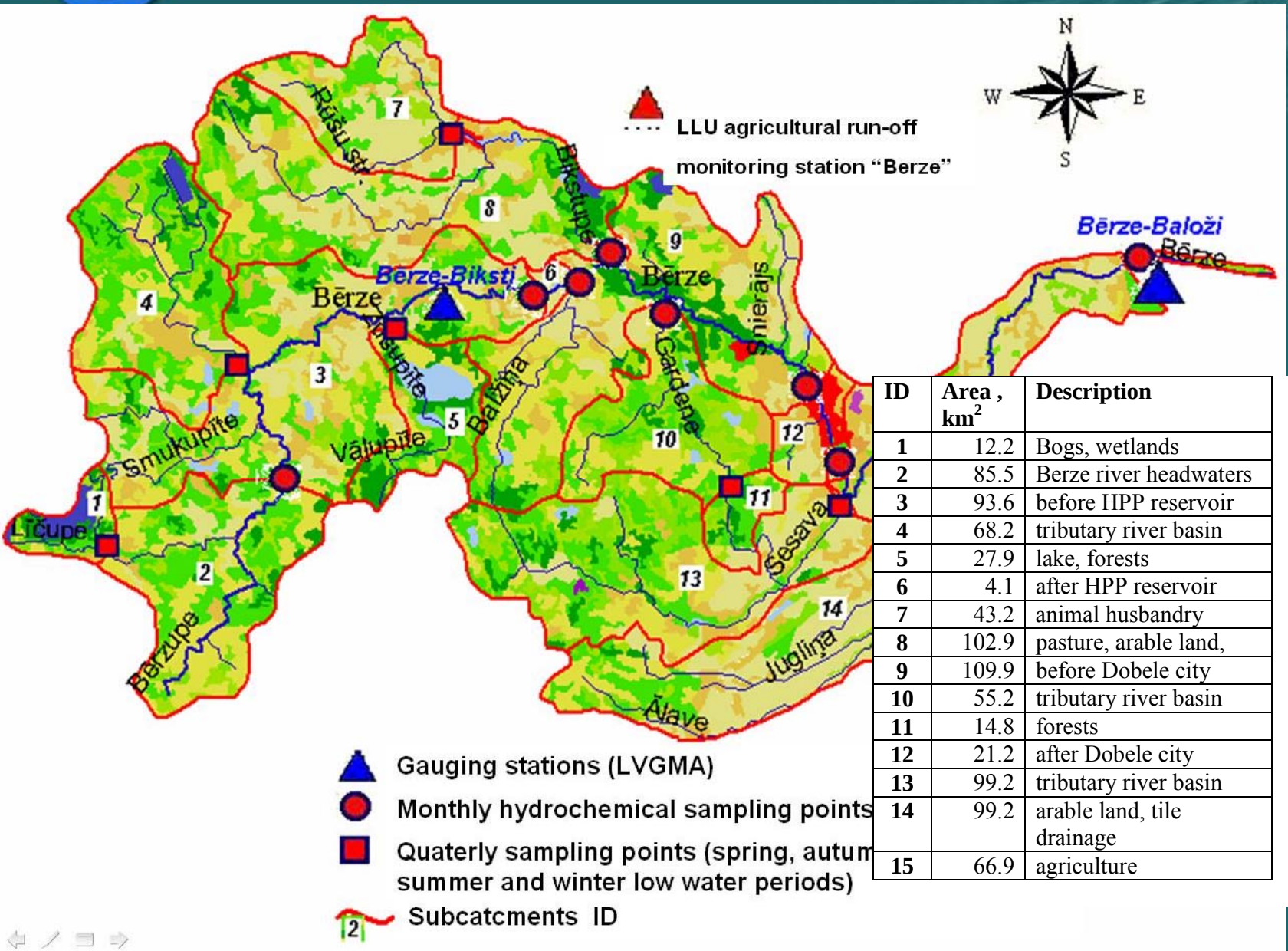


Bērze r – 0.86 R^2 (Nash) – 0.73

FYRIS model (SLU, Sweden) input data and outputs

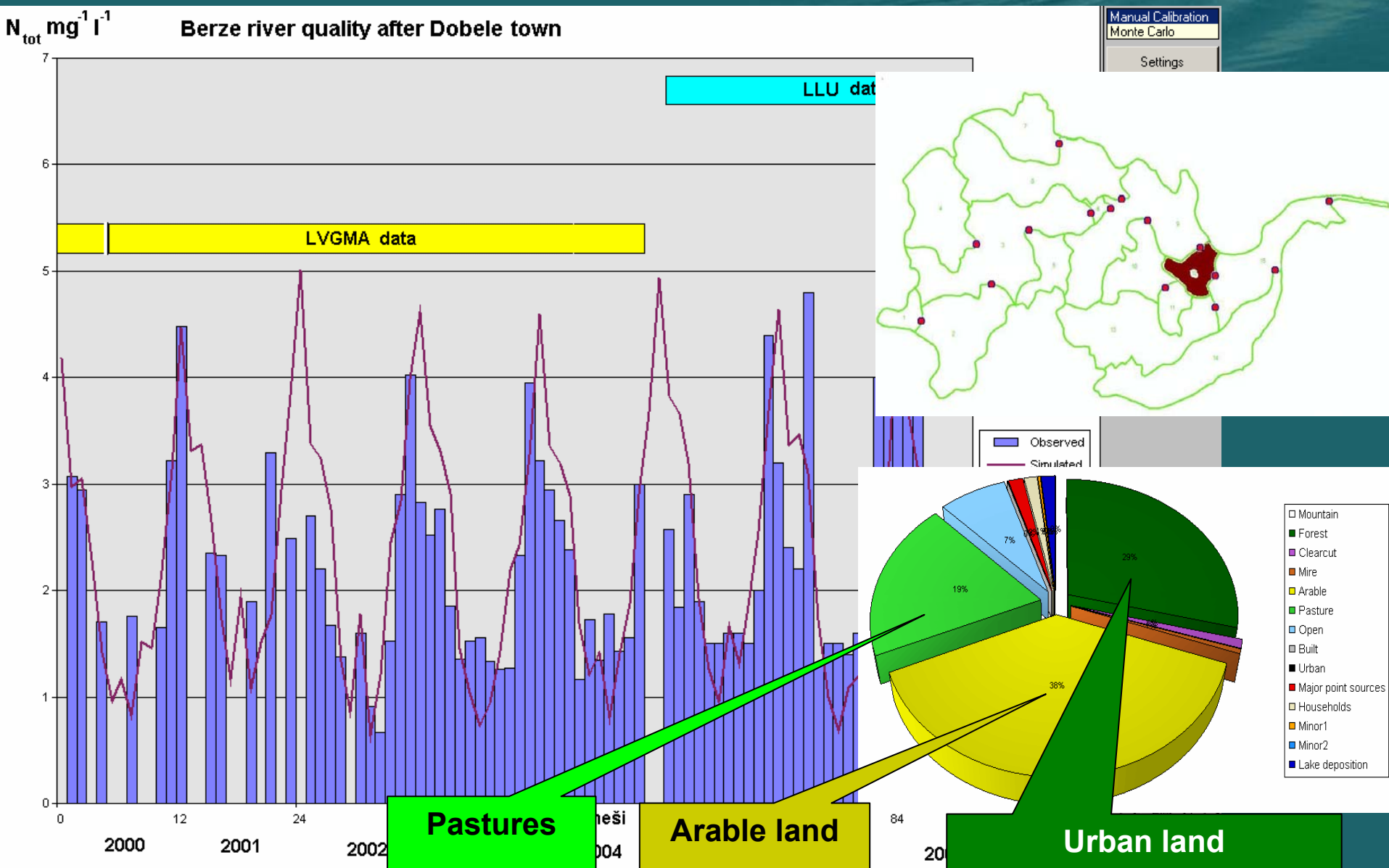


Berze river basin (900 km^3 , 15 sub catchments)

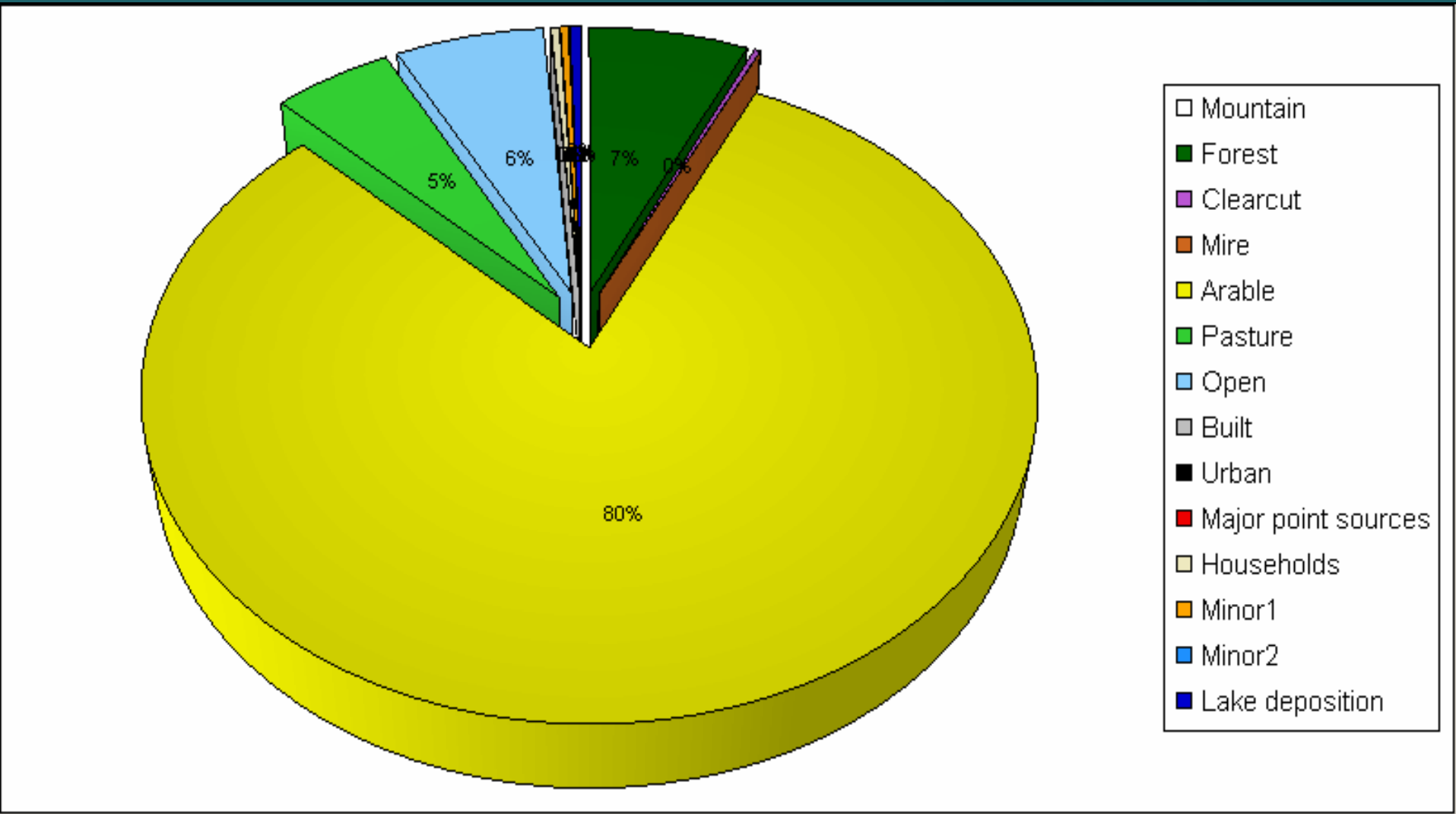


ID	Area , km^2	Description
1	12.2	Bogs, wetlands
2	85.5	Berze river headwaters
3	93.6	before HPP reservoir
4	68.2	tributary river basin
5	27.9	lake, forests
6	4.1	after HPP reservoir
7	43.2	animal husbandry
8	102.9	pasture, arable land,
9	109.9	before Dobele city
10	55.2	tributary river basin
11	14.8	forests
12	21.2	after Dobele city
13	99.2	tributary river basin
14	99.2	arable land, tile drainage
15	66.9	agriculture

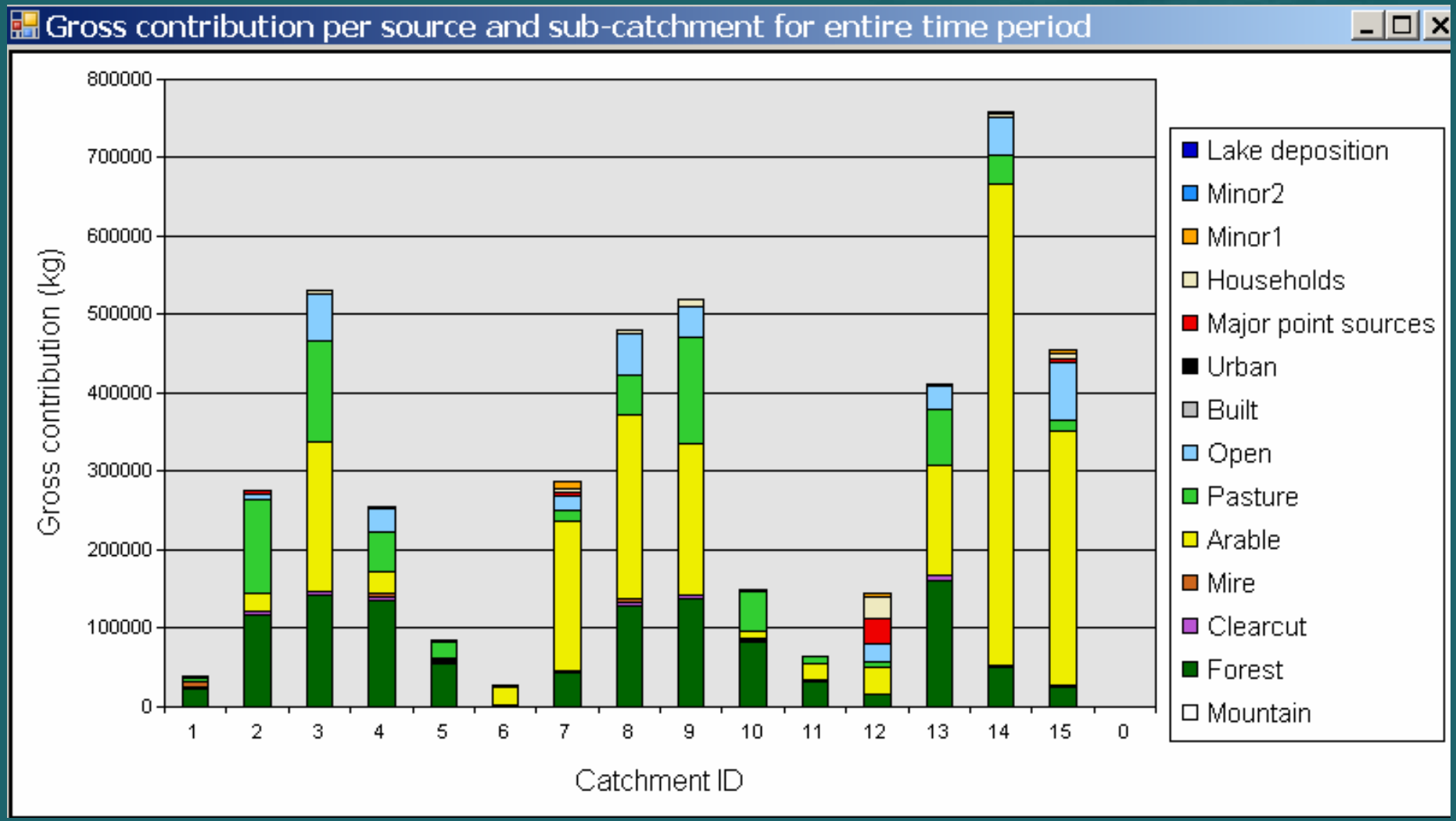
Example of modeling results, (Sub catchment 12 Dobele)



Example of modeling results
(Sub catchment 14 , Agricultural territory)



Example of modeling results (All sub-catchments)



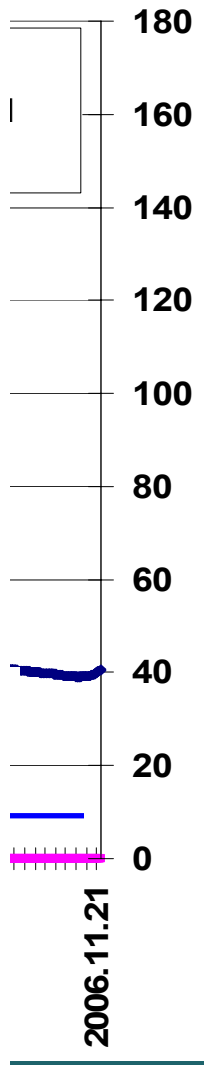
Quality of modeling results?

Gaps and week points:

- **Short time series of the water quality data**
- **Slow and time consuming data collection (GIS maps)**
- **Lack of the accurate agricultural statistics in national, regional, river catchments' level**
- **Impact of extreme weather events**

Impact extreme weather events (summer 2006)

Field	Soil layer (cm)	Content of the mineral nitrogen, mg kg^{-1} dry soil			
		2006.g. *autumn*		2007.g. *spring*	
		NO_3- N	NH_4-N	NO_3- N	NH_4-N
Silarāji	0 - 30	21.4	6.6	2.6	4.1
	30 - 60	6.8	3.3	6.1	3.1
	60 - 90	1.3	2.7	8.2	2.7
Dzelzarāji	0 - 30	2.3	3.6	2.2	3
	30 - 60	0.5	3.1	0.8	2.4
	60 - 90	0.5	2.9	0.6	2.3
Klaipiņi	0 - 30	16.6	4.1	7.1	2.9
	30 - 60	3.3	3.3	5.7	3.1
	60 - 90	0.9	3.4	5.1	2.6
Puķes	0 - 30	11.4	3.9	3.4	3.5
	30 - 60	1.7	3.1	3.1	3.2
	60 - 90	1.3	2.6	2.4	2.7
Vāverītes	0 - 30	14	4.1	3.5	3.2
	30 - 60	9.6	3.4	5.5	3.4
	60 - 90	1.9	3	4.9	3
Kāpas	0 - 30	34	3.7	5.9	3.7
	30 - 60	18.9	3.7	7.9	3.3
	60 - 90	7.1	3.2	11.3	3.1



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Thank you for attention