SWAT 2015
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Soil & Water Assessment Tool | SWAT

Large scale water quality modeling in Lithuania: parameterization, calibration and validation using PAIC-SWAT tool

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aplinkos apsaugos agentūra

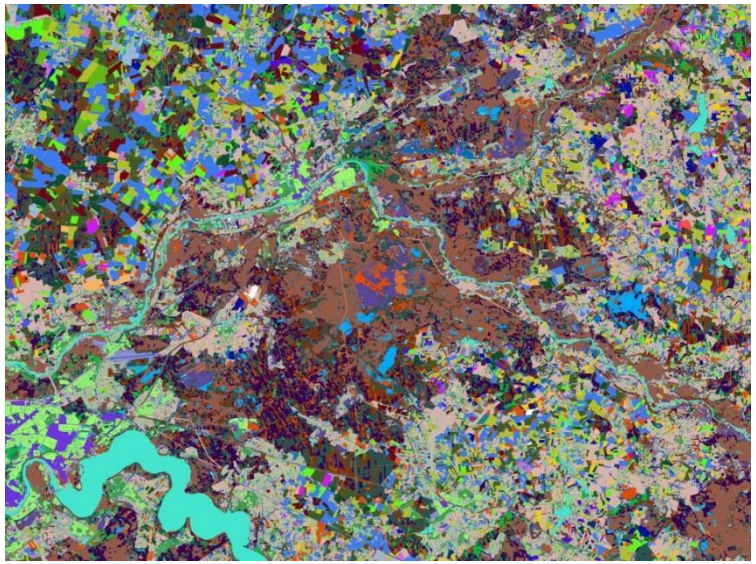
PAIC

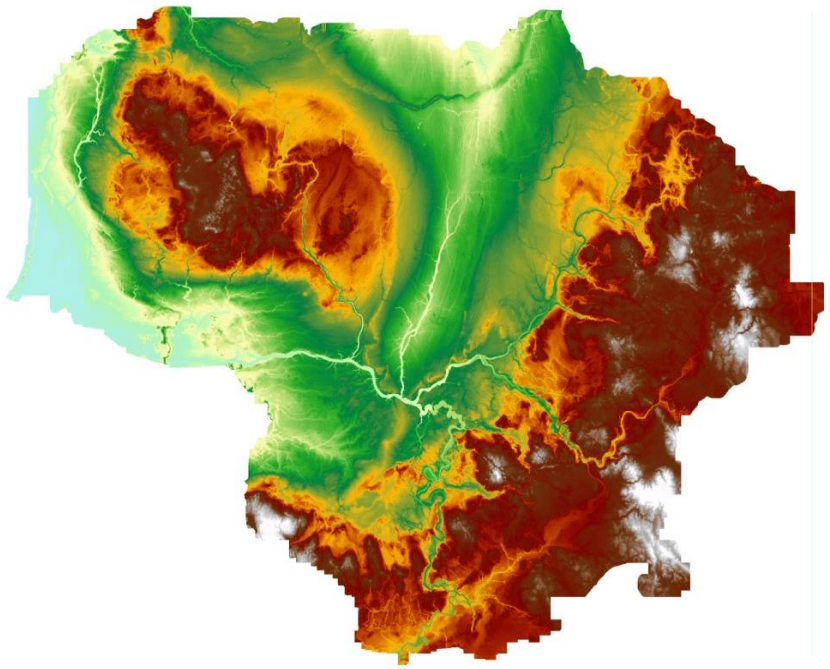
Table of contents

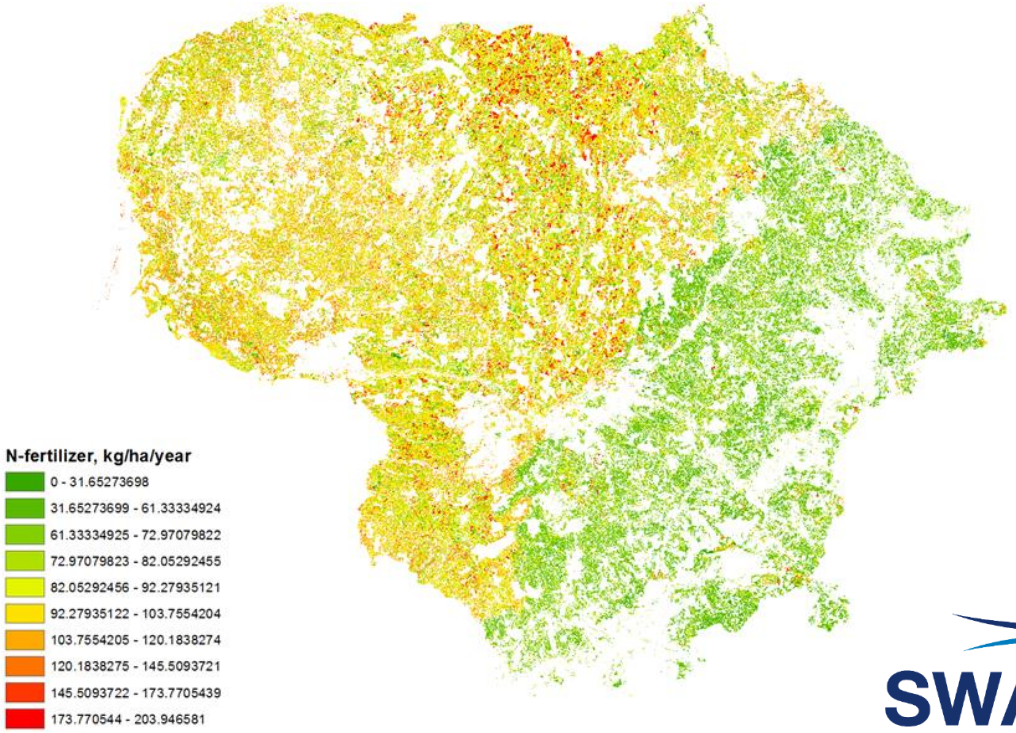
Problem statement

- All members states need to implement the Water Framework Directive to get good status in all water bodies
- Lithuanian Environmental Protection Agency (AAA) has to elaborate river basin districts management plans and programs of measures for all catchments in Lithuania.
- Models should be open source, reproducible and flexible (at any moment changes/adaptations can be done without redoing the whole work)

Input data

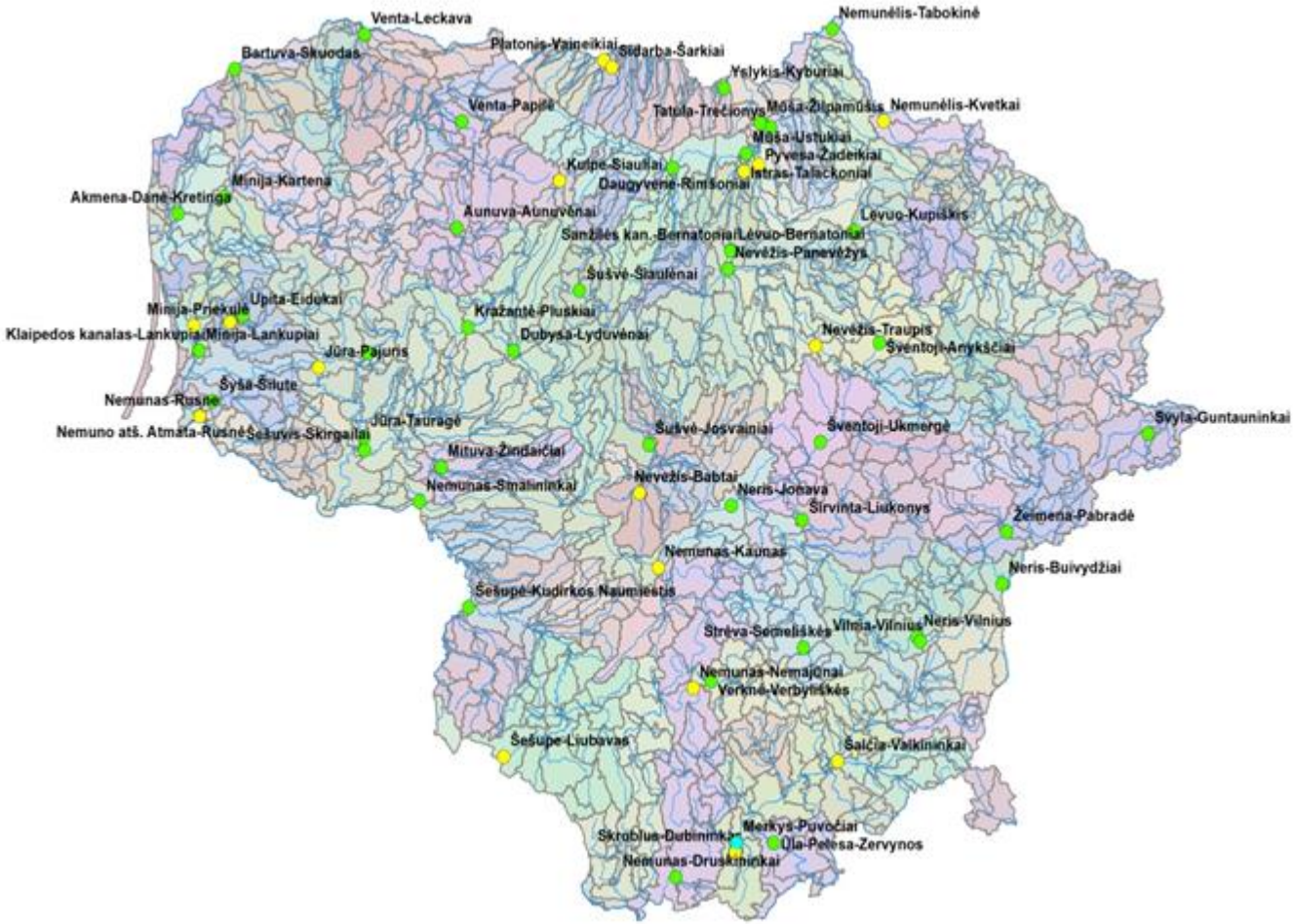





N-fertilizer, kg/ha/year
0 - 31.65273698
31.65273699 - 61.33334924
61.33334925 - 72.97079822
72.97079823 - 82.05292455
82.05292456 - 92.27935121
92.27935122 - 103.7554204
103.7554205 - 120.1838274
120.1838275 - 145.5093721
145.5093722 - 173.7705439
173.770544 - 203.946581

PAIC-SWAT model

- **Soil and Water Assessment Tool (SWAT)**
- **a Python workflow by the Center of Processes Analysis and Research (PAIC).**



>1000 sub-basin

HRU originally 1 400 000, after elimination <5ha – 200 000

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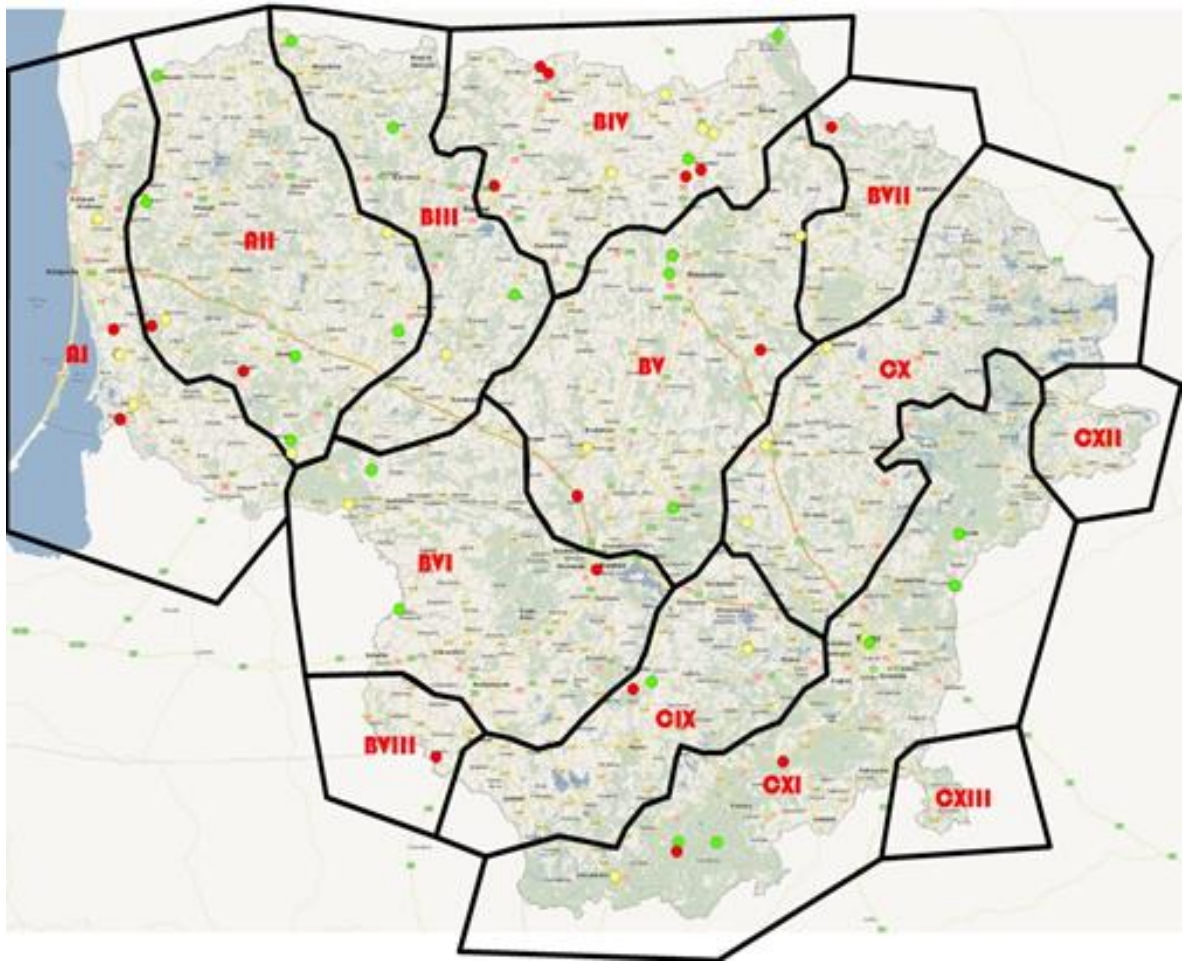
Calibration strategy



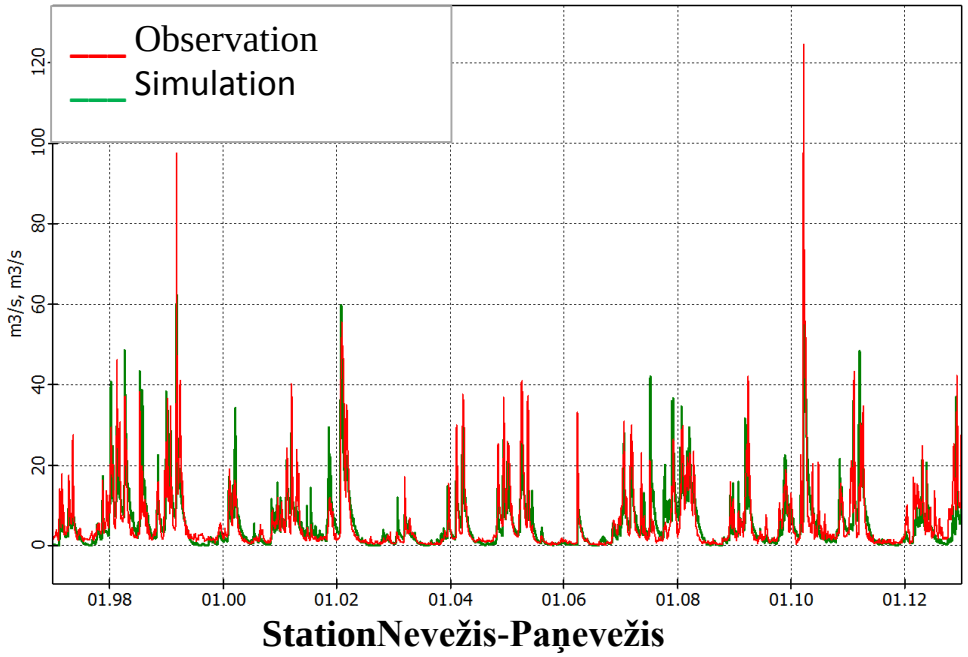
- Daily Flow data:
  - 62 stations
  - 1997-2012.

- Water quality data
  - 500 stations
  - 135 data-rich
  - 1997-2012.

- A regionalization strategy for 13 hydrological regions.
- Automated and manual calibration for selected catchment
- Dividing data to 3parts first and last 1/3 for calibration and 1/3 in the middle for validation
- Transfer to other catchments in hydrolo region

Evaluation criteria for hydrology

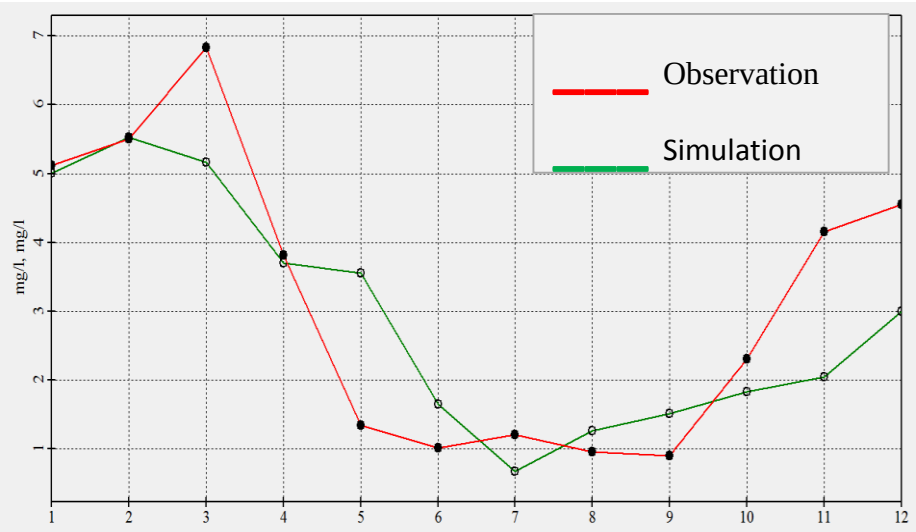
Action	NSE threshold	PBIAS threshold
Calibration	NSE > 0.5	PBIAS < 20%
Validation	NSE > 0.4	PBIAS < 25%
Extrapolation (transfer)	NSE > 0.3	PBIAS < 30%



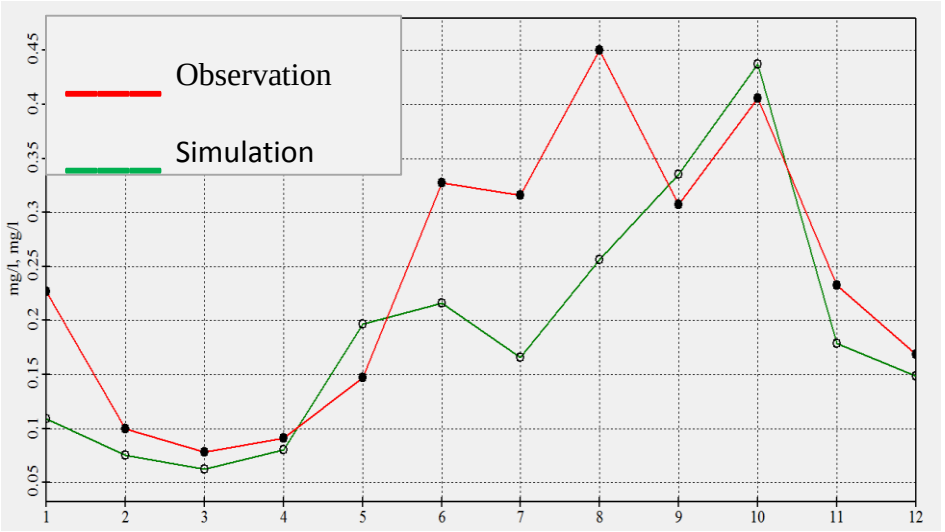
Moriasi et al., 2007

Evaluation criteria for water quality

Action	R^2 threshold, N-NO3, N-tot	PBIAS threshold, all parameters
Calibration	$R^2 > 0.5$	PBIAS < 40%
Validation	$R^2 > 0.4$	PBIAS < 70%
Extrapolation (transfer)	$R^2 > 0.3$	PBIAS < 70%

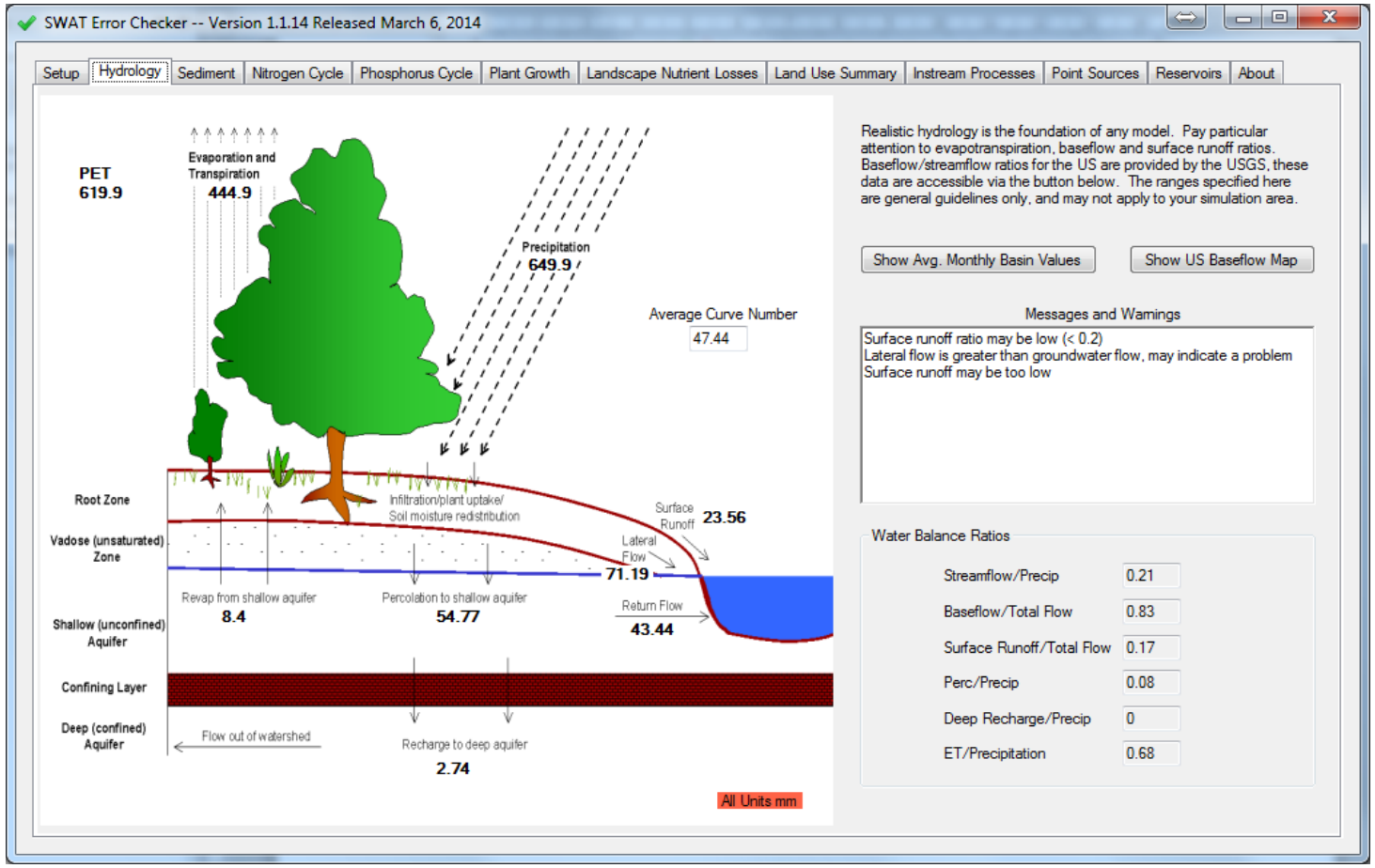


NO3-N: Šeimena - žemiau Vilkaviškio.

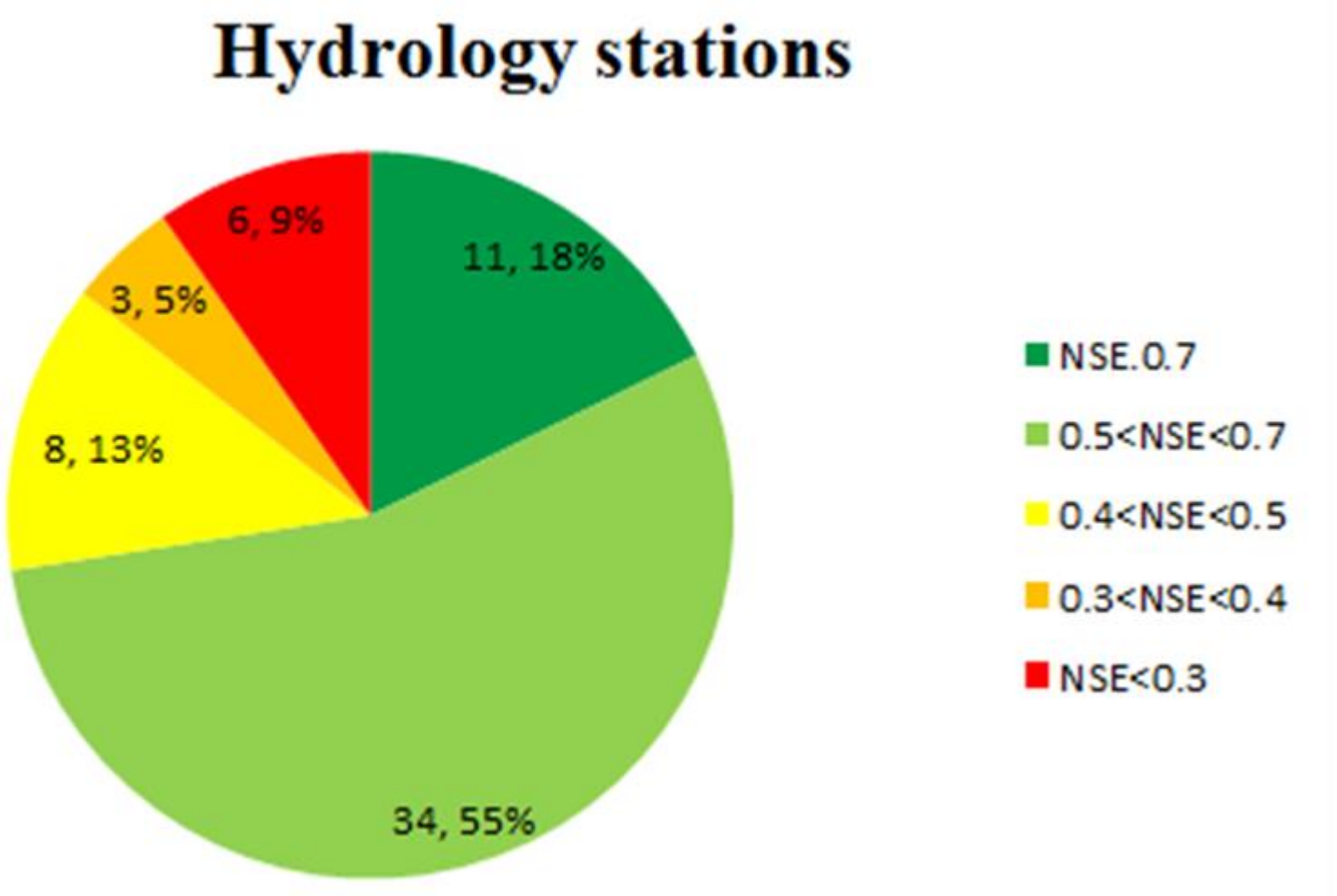


PO4-P: Šeimena - žemiau Vilkaviškio.

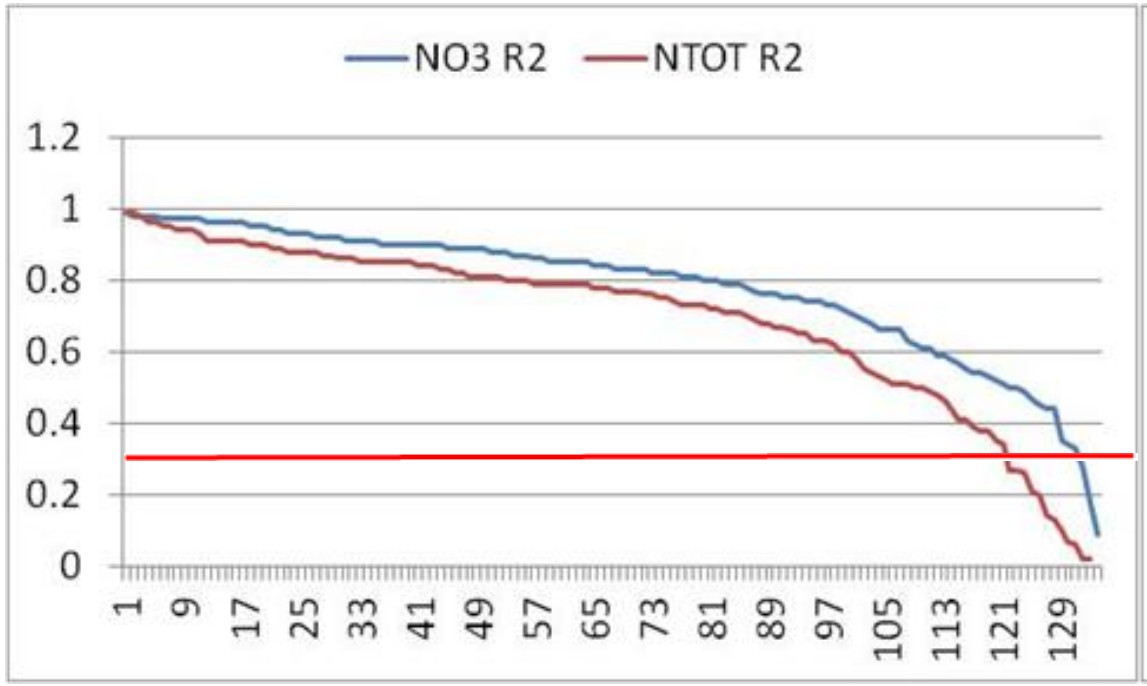
Evaluation of mass balance



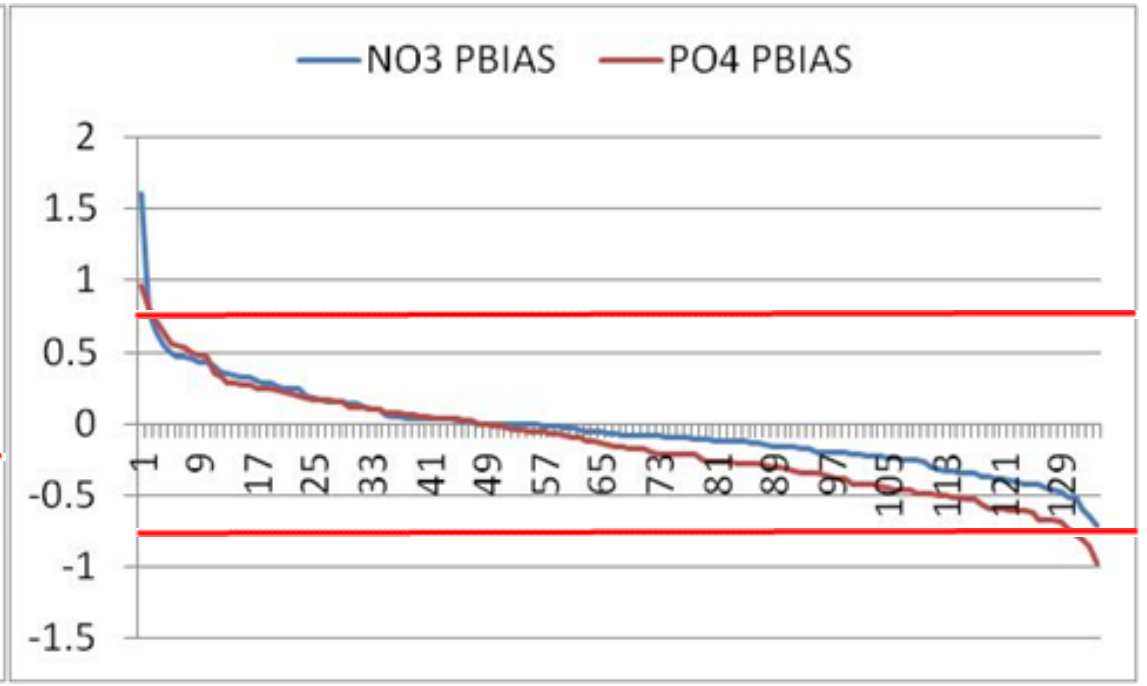
Results of hydrology



Results of water quality

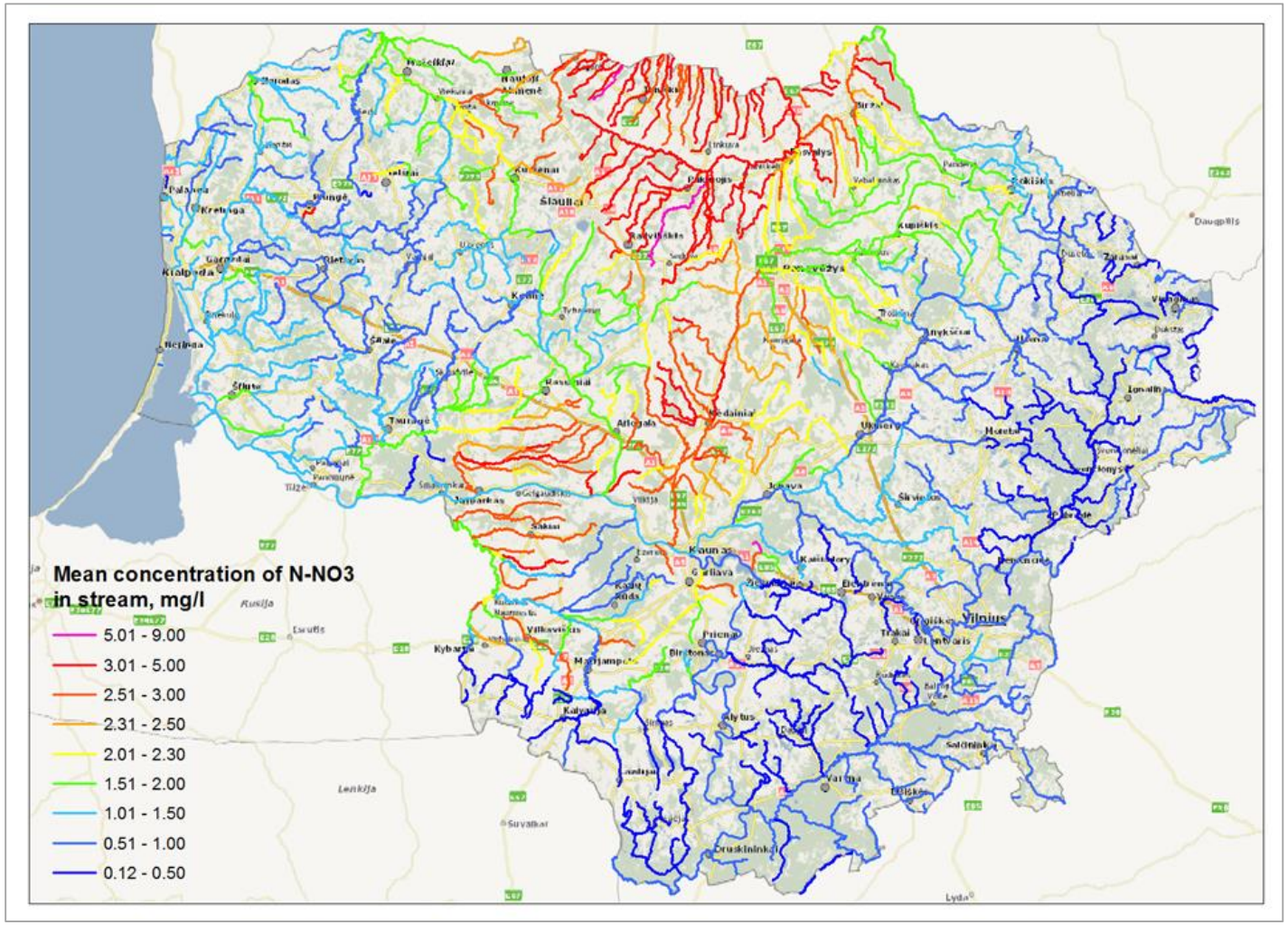


Number of station

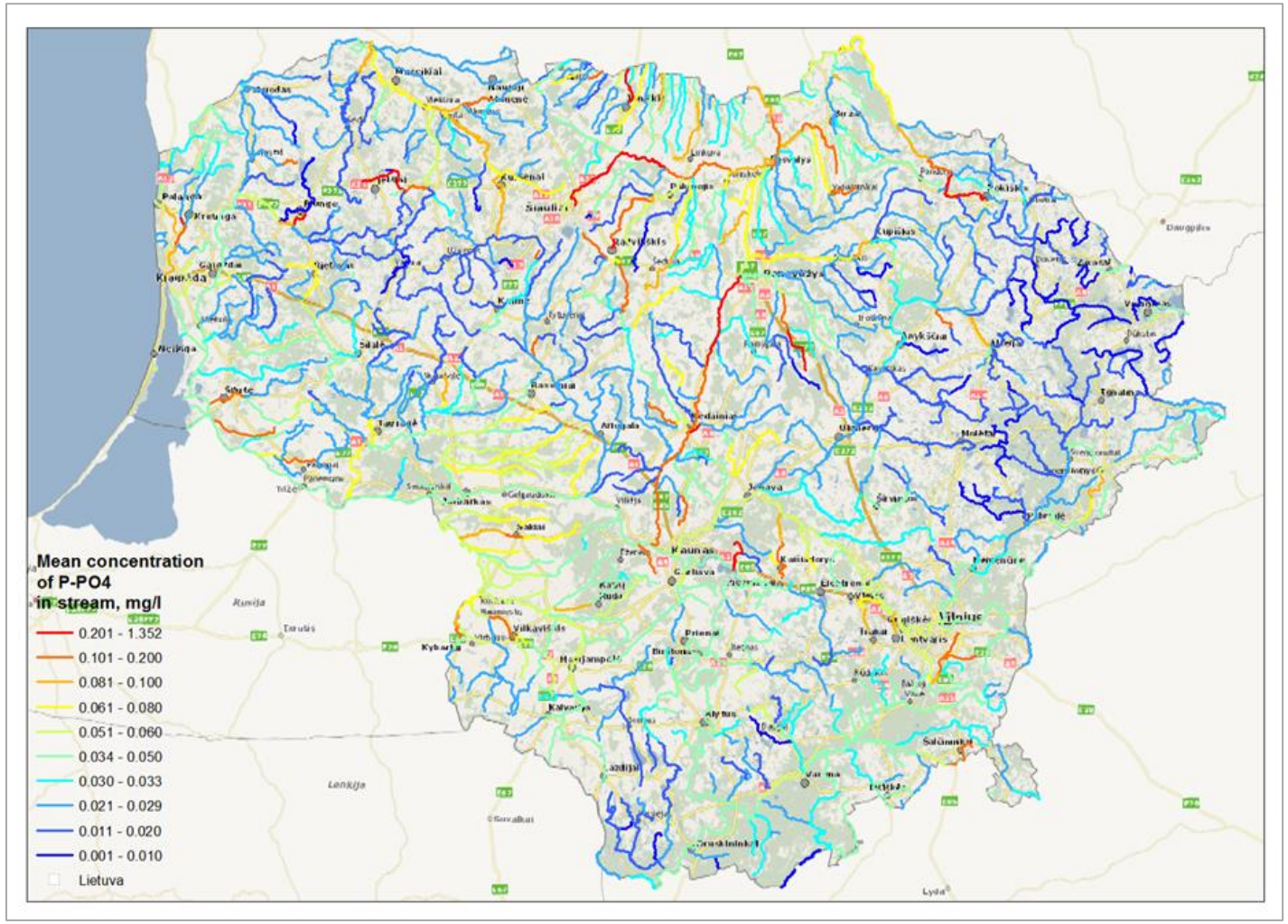


Number of station

Results of in-stream NO3-N



Results of in-stream PO4-P



Conclusion

- For hydrology: > 90% OK
- For water quality: >95% OK

- Data errors mainly cause of problems

- Parameterization, calibration, validation and extrapolation of flow and water quality parameters was successful.

Thanks for your attention

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