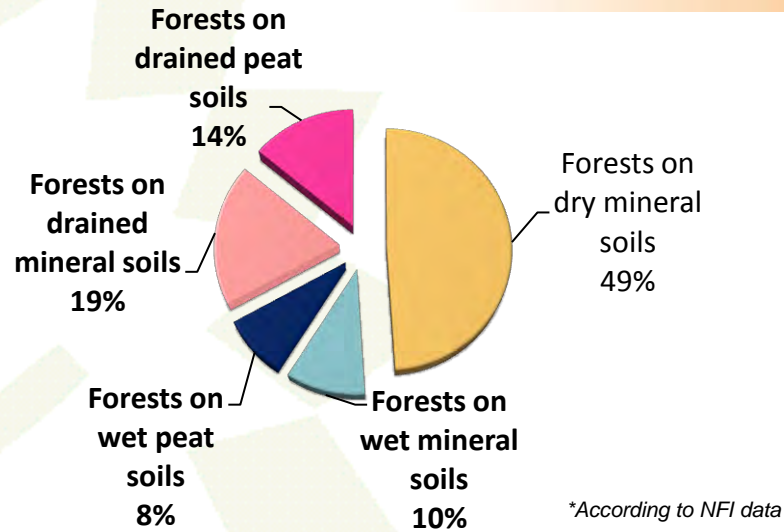


Evaluation of the effectiveness of mitigation measures related to water quality in forest drainage system renovation

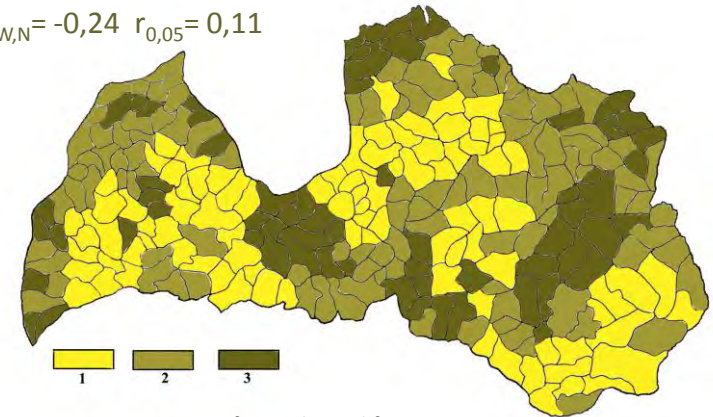
Zane Lībiete-Zālīte, zane.libiete@silava.lv

Regional workshop “Integration of natural water retention measures into river basin management in the Baltic Sea Region”,
Riga, January 30-31, 2014

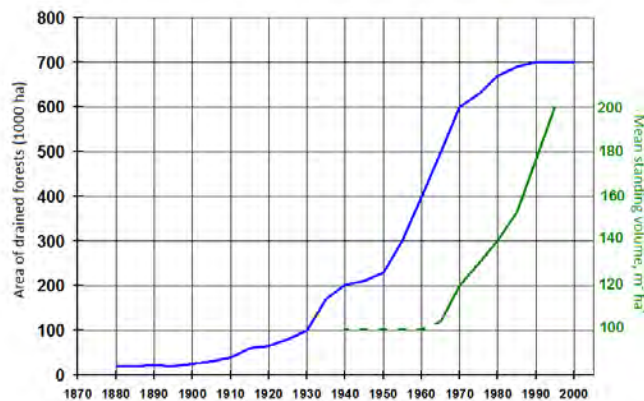
Forests and water in Latvia



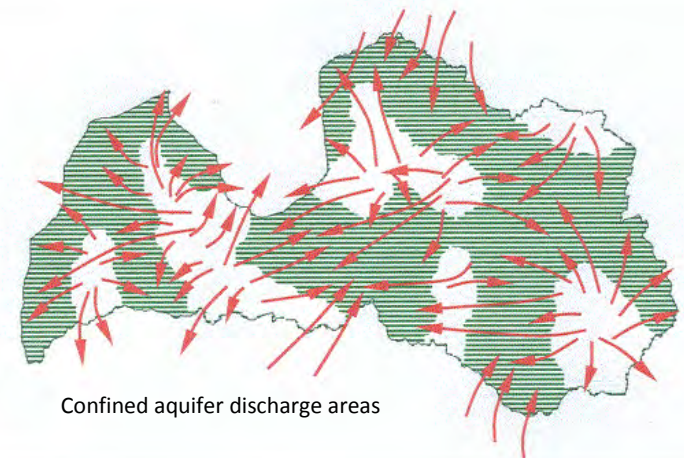
600 mm < N < 950 mm
 5% < W < 95%
 $r_{W,N} = -0,24$ $r_{0,05} = 0,11$



Percentage of waterlogged forests:
 1 – 5-30%; 2 – 31-50%; 3 – 51-95%



Drainage and forest productivity



Confined aquifer discharge areas

Drainage system renovation



There are several methods to decrease risk to water quality, aiming to prevent erosion by reducing stream velocity and to stop transport of particles, e.g.:

Barriers;

Sedimentation ponds;

Overland flow areas;

Buffer areas.

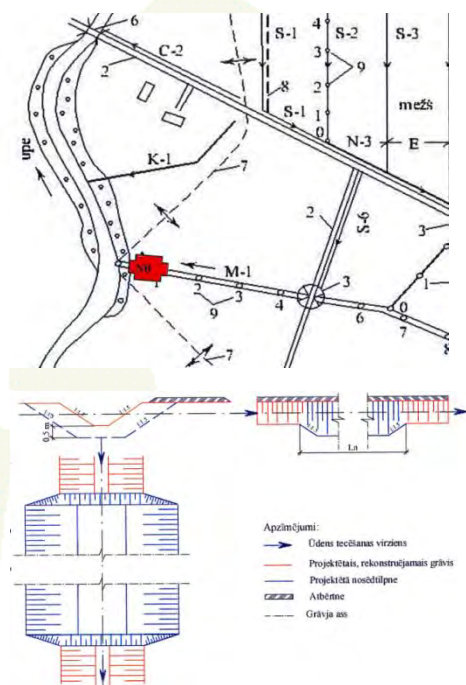


One of the most common methods is the establishment of **sedimentation ponds** before the inflow of the main ditch in the water course.



Status of the implementation

- Construction of sedimentation ponds is a mandatory measure when renovating drainage systems.



Drainage system and standard drawing of sedimentation pond ("Latvian State Forests" technical regulations of forest infrastructure)

- The drainage system or ditch to be renovated must be at least 0.8 km long;
- Sedimentation pond must be established as close as possible to the water course or water body and in a shallow section of the ditch;
- If the length of the drainage system or ditch to be renovated is 0.8 to 2.5 km, length of the sedimentation pond is 30 m and depth – 0.5 m;
- If the length of the drainage system or ditch to be renovated exceeds 2.5 km, length of the sedimentation pond is 50 m and depth – 0.5 m;
- If more than 200 m long section of the ditch just before the water course or water body is not cleaned sedimentation pond is not necessary.

Aims, objects and measurements

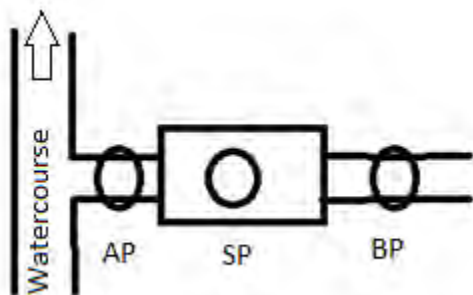


Aims:

1. Quantification of the amount of TSS and nutrients leaving forest ecosystem by drainage channels after drainage system renovation.
2. Evaluation of effectiveness of standard sedimentation ponds, as related to water quality.

Objects:

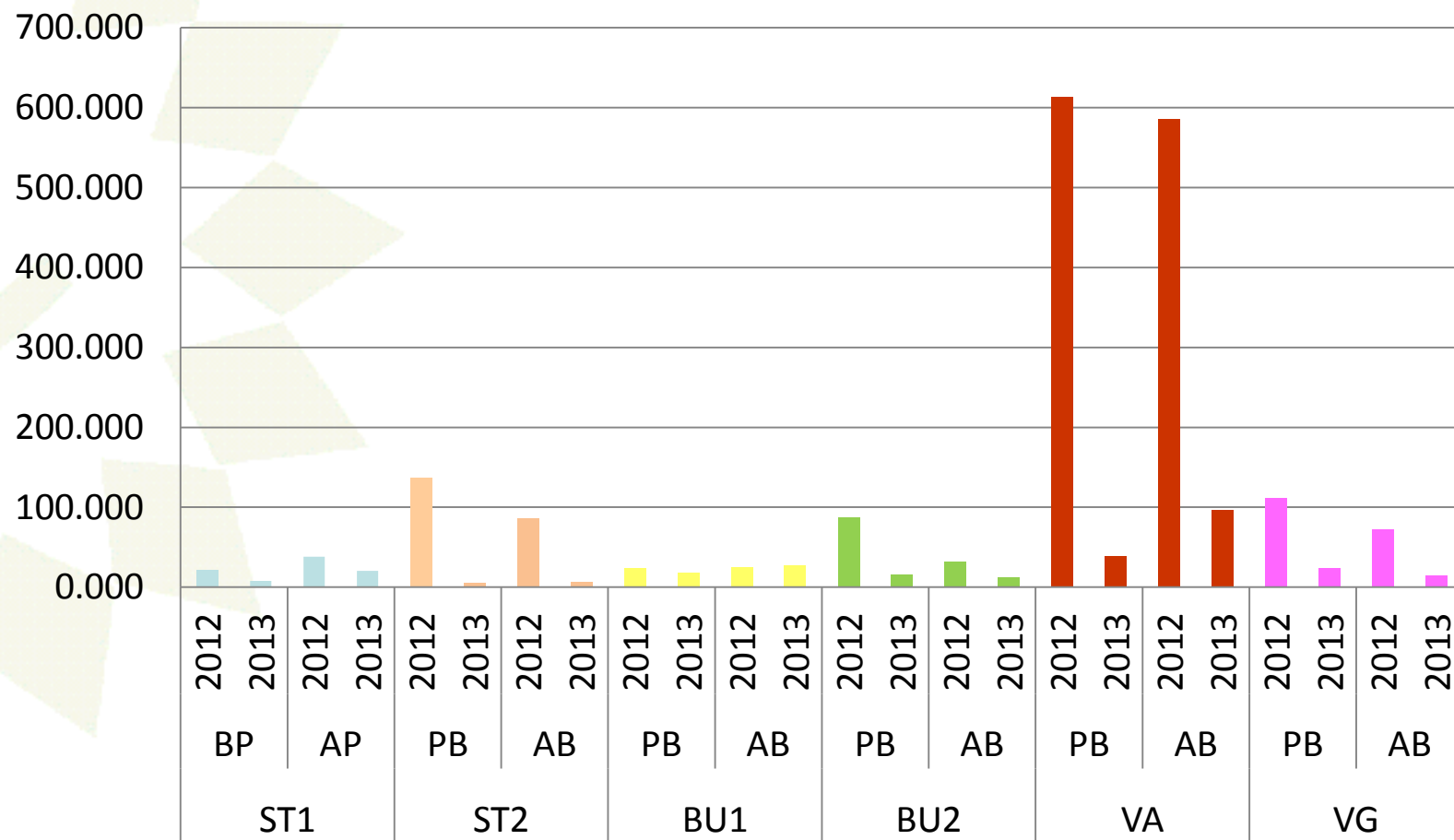
7 drainage systems renovated in spring/summer 2012. Water samples before and after sedimentation pond



Measurements:

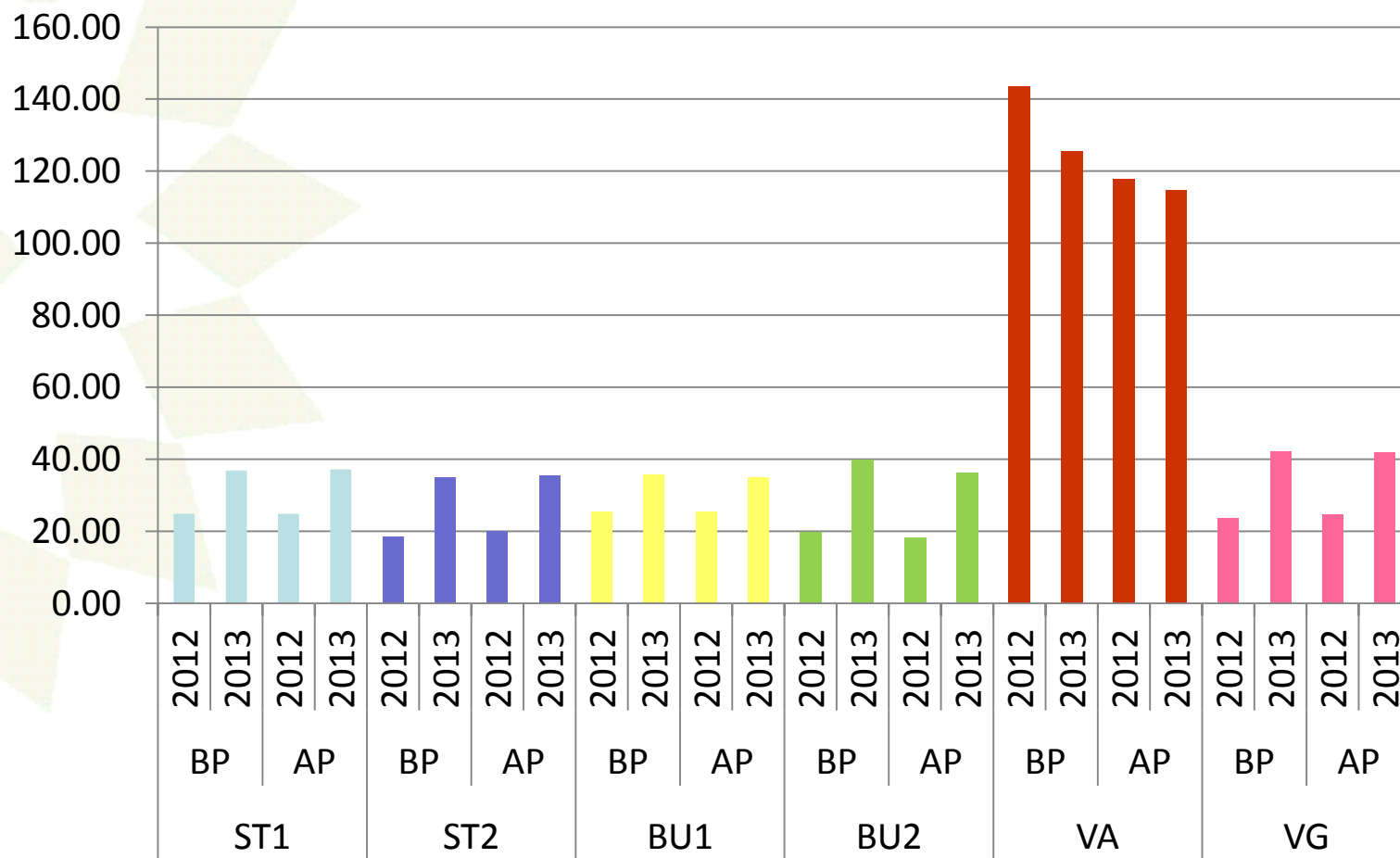
Water samples taken and water profile measurements carried out twice a month in 2012 – first year after renovation and in 2013 – second year after renovation (N_{total} , P_{total} , K^+ , Ca^{2+} , Mg^{2+} , pH, DOC, TSS).

Results – TSS, mg L⁻¹



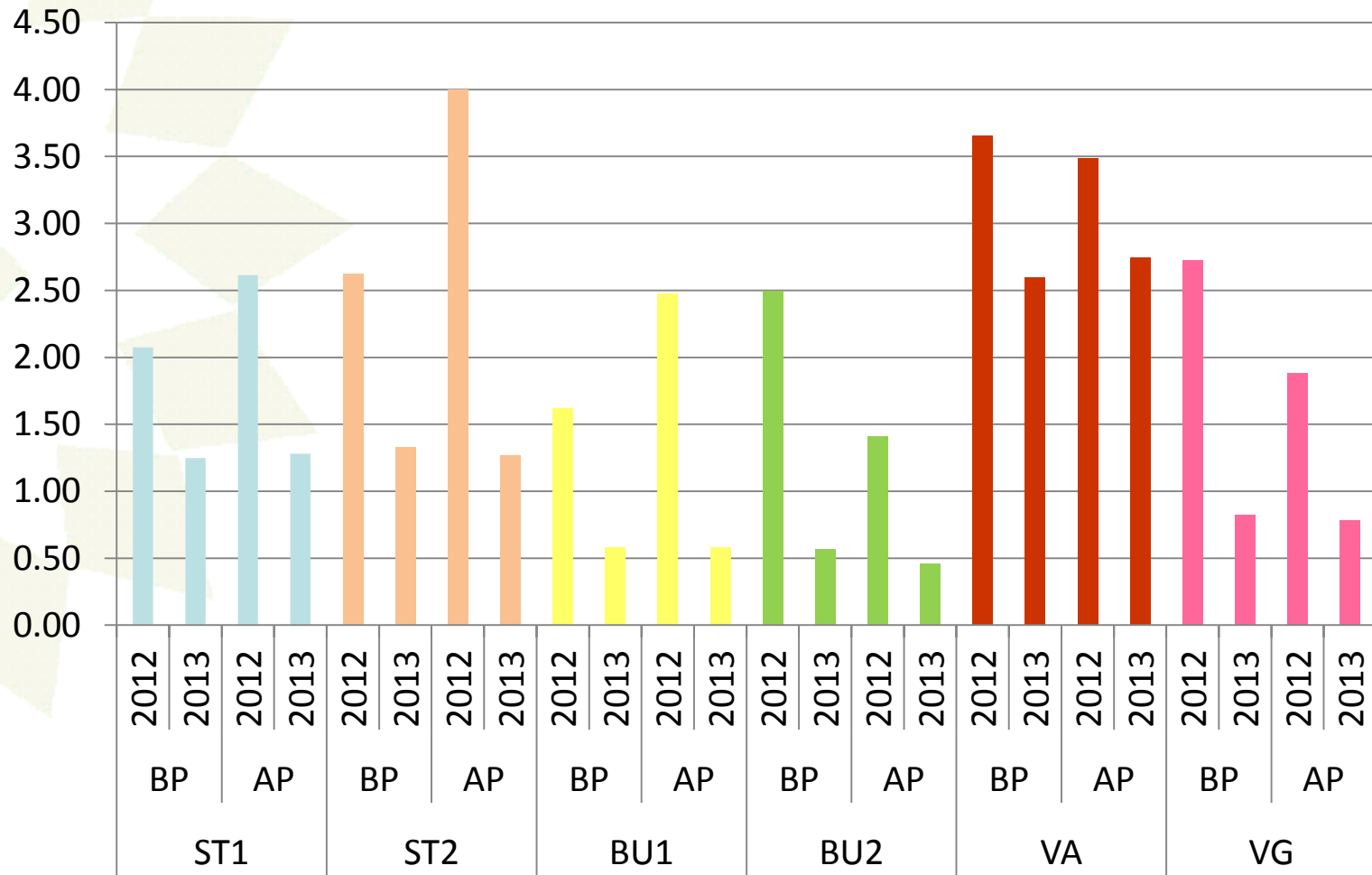
BP – before sedimentation pond; AP – after sedimentation pond

Results – DOC, mg L⁻¹



BP – before sedimentation pond; AP – after sedimentation pond

Results – N_{total}

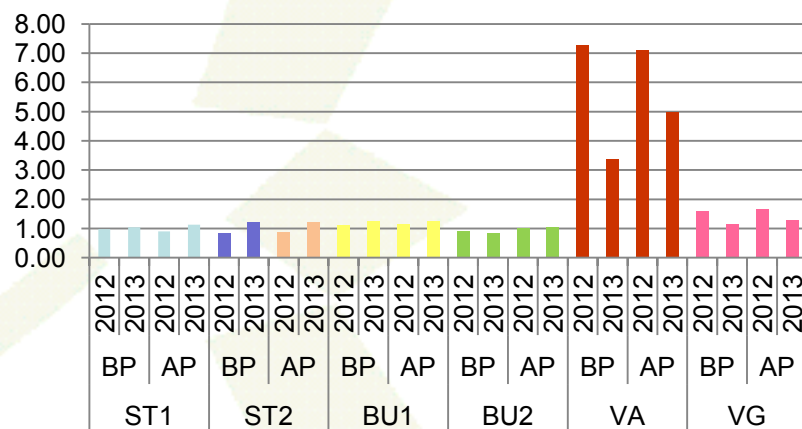


BP – before sedimentation pond; AP – after sedimentation pond

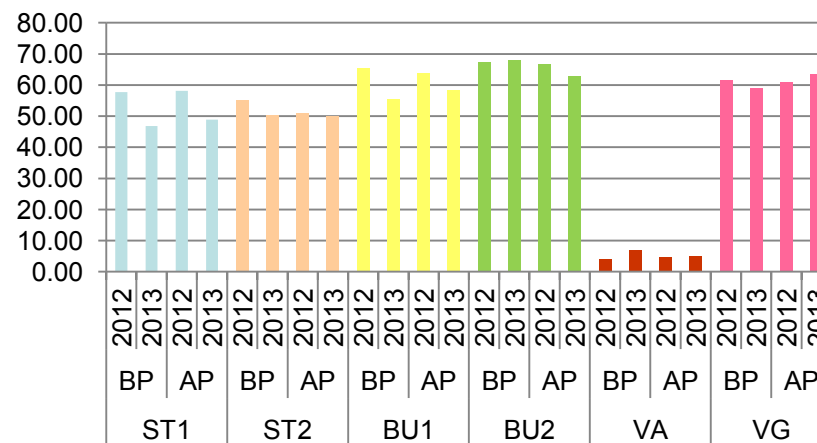
Results – K⁺, Ca²⁺, Mg²⁺



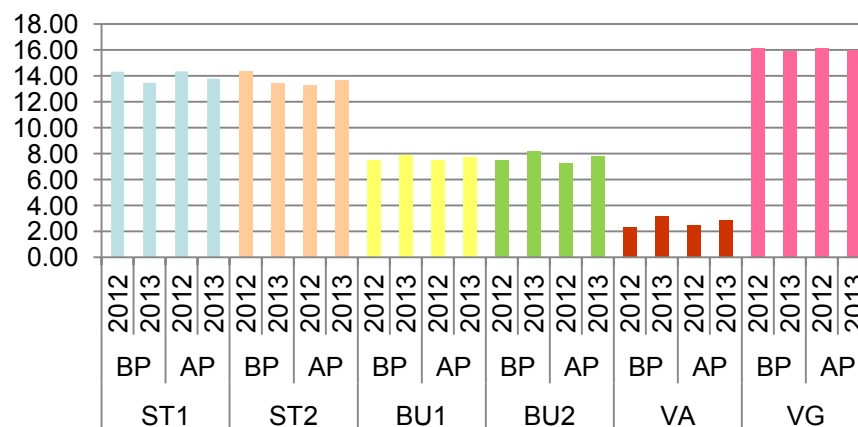
K⁺, mg L⁻¹



Ca²⁺, mg L⁻¹



Mg²⁺, mg L⁻¹



BP – before sedimentation pond; AP – after sedimentation pond

Are we happy with our sedimentation ponds?

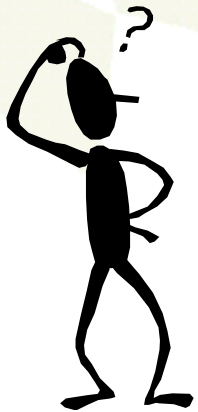


- Not really. Even though concentrations and export loads are lower than reported, e.g., for Finland, in some cases concentration of TSS and nutrients remains high also on the second year after drainage system renovation.
- Functioning of SPs depends on the skill of the professionals who establish it.
- Combination with other measures: sedimentation pits, barriers, uncleaned sections....?



May 2, 2013 (renovation carried out in June 2012)

Land overflow areas?



Limitations for establishment

To dig or not to dig?

Acknowledgements



- This research was carried out in the frames of project L-KC-11-0004 “Methods and technologies to increase the capital value of forest”, in collaboration with Forest Sector Competence Centre and JSC “Latvijas valsts meži”
- We thank our colleagues in JSC “LVM” for their support and collaboration in the identification and establishment of research objects!

Thank you for your attention!

