

Holistic Water management in Agricultural Areas



16.04.2016

NUTRINFLOW River Loviisa - Project



02.05.2017

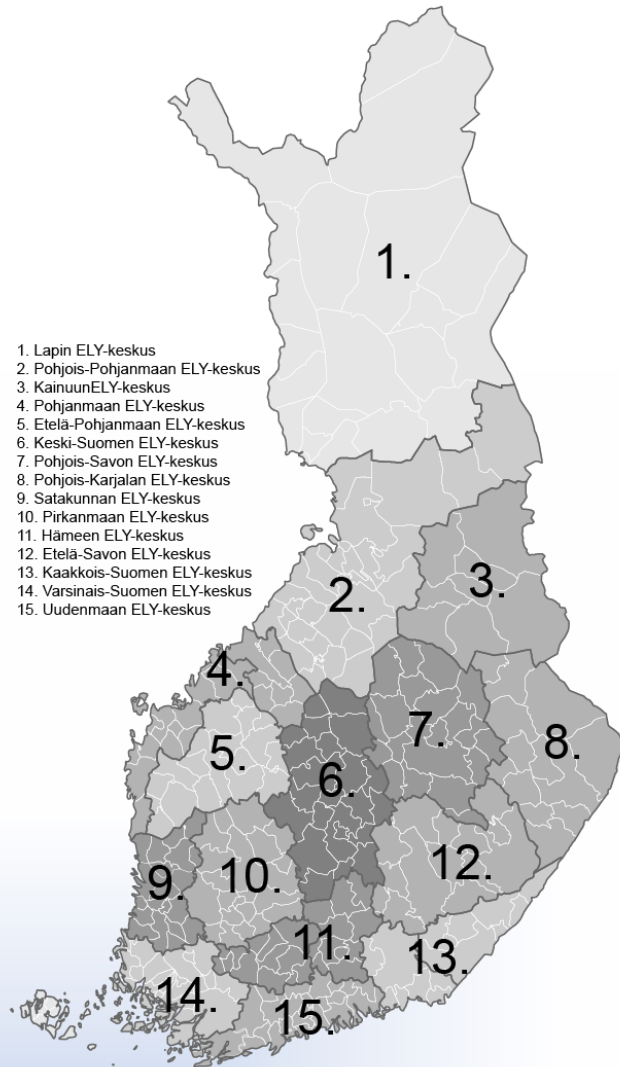
Mikko Ortamala, 15.05.2018
Drainage Center of Southern Finland



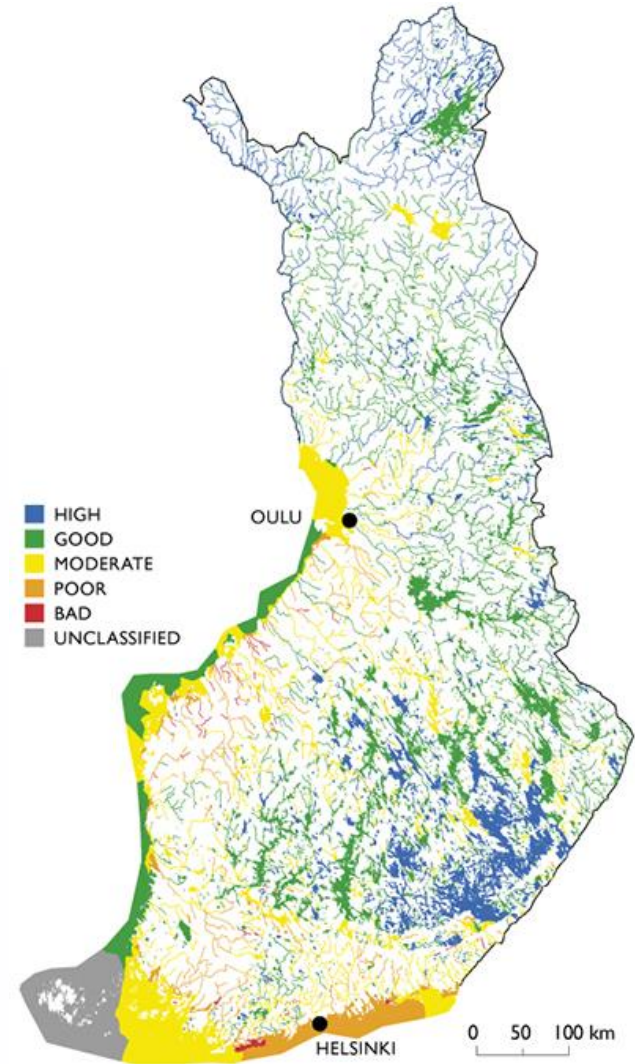
Productive agriculture, clear water and clean environment



Drainage corporate bodies are organizations which consist of those land owners which get benefit or profit of the drainage. Drainage corporate bodies have been established since 1883 for maintenance of the ditches.



Elinkeino, liikenne ja ympäristökeskus



Suomen ympäristökeskus, SYKE

The number of drainage corporate bodies and drainage areas is not accurate, but it is estimated to be tens of thousands. Each year 70 to 100 projects will be funded for basic drainage in Finland. The need for maintenance for basic drainage can be remarkable.

Wetness and flooding in agricultural areas

The most of drainage corporate bodies are not active and maintenance of the ditches has been delayed. In many cases a drainage corporate body has not been active in 50 years. Farmers are trying to excavate small shots of the ditch in their own lands with locally-based contractors and the quality of outputs is in average weak.





Problems in the catchment area consist of:

- Erosion
- Outflow and sedimentation of solid matter
- Increased drainage network on drainage basin – lower water retention
- Water capacity in the rivers and ditches
- Subsidence of soil

Floods → Effects on agricultural production
(crop, soil, working efficiency, land value) → GDP



Important observations of RaHa-project water research on agricultural areas

“Measurements showed the significance of vegetation cover for decreasing the outflow of solids and phosphorous. An important notice was also that a substantial proportion of the load could be formed from very small areas and during a very short period. The problems of these risk areas were thought to be culminated in **poor soil structure, drainage problems and lack of vegetation cover.**”

“Nutrient load is not born evenly from all the field plots. Focusing the actions to problematic areas gives relatively large decrease also to total load.” (RaHa-project, Pasi Valkama, The Water Protection Association of the River Vantaa and Helsinki Region)



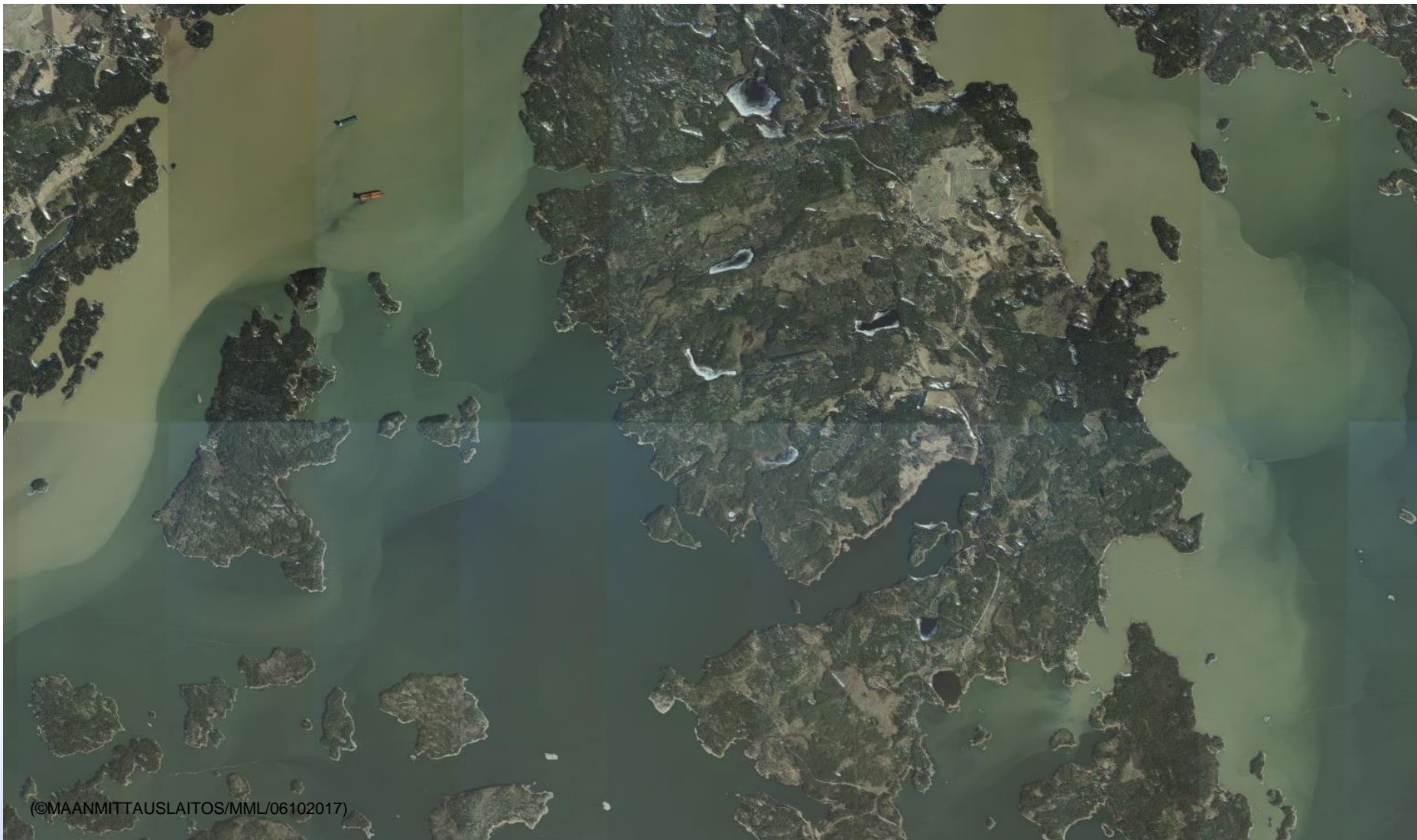
Pasi Valkama, The Water Protection Association of the River Vantaa and Helsinki Region

Nutrient load is not born evenly from all the field plots



Pasi Valkama, The Water Protection Association of the River Vantaa and Helsinki Region





Floods → Outflow of solid matter and nutrients →
Effects to rives, lakes and Baltic sea

Floods → Effects to value and upkeep of the infrastructure



Loviisan sanomat, Arto Henriksson



Holistic water management

- Holistic water management consist of the actions on the fields, ditches and the rivers, lakes and sea.
- Basic drainage, local drainage and environmental water management
- Our priority is to prevent flooding and surface flow and outflow of solid matter and nutrients.
- Good soil structure and workable water management are basic requirements for productive agriculture and on the other hand to reduce the outflow.



Practical actions for holistic water management

Actions in outflow area

- Basic and local drainage
- Management of the soil structure
- Suitable land use (plants, cultivation, fertilization)
- Constructions for control of the water levels at summertime



Environmental water management

- Artificial wetlands, sedimentation ponds
- Bottom thresholds and dams
- Two-stage drainage ditches
- Flood protection (embankments, pumping, flood ledges)
- Buffer zones
- Water management on farm areas (wastewater, washing waters, waters coming from stables and cowsheds)



Actions in rivers, lakes and the sea

- Reed cuttings, oxidizations, fishery restorations, excavations, control of water the level, (chemical restorations)



Possible actions in drainage basin

Basic drainage

- Maintenance of the ditches
- Reorganizations of drainage corporate bodies
- Constructions for control of the water levels at summertime
- Two-stage drainage ditches

Local drainage

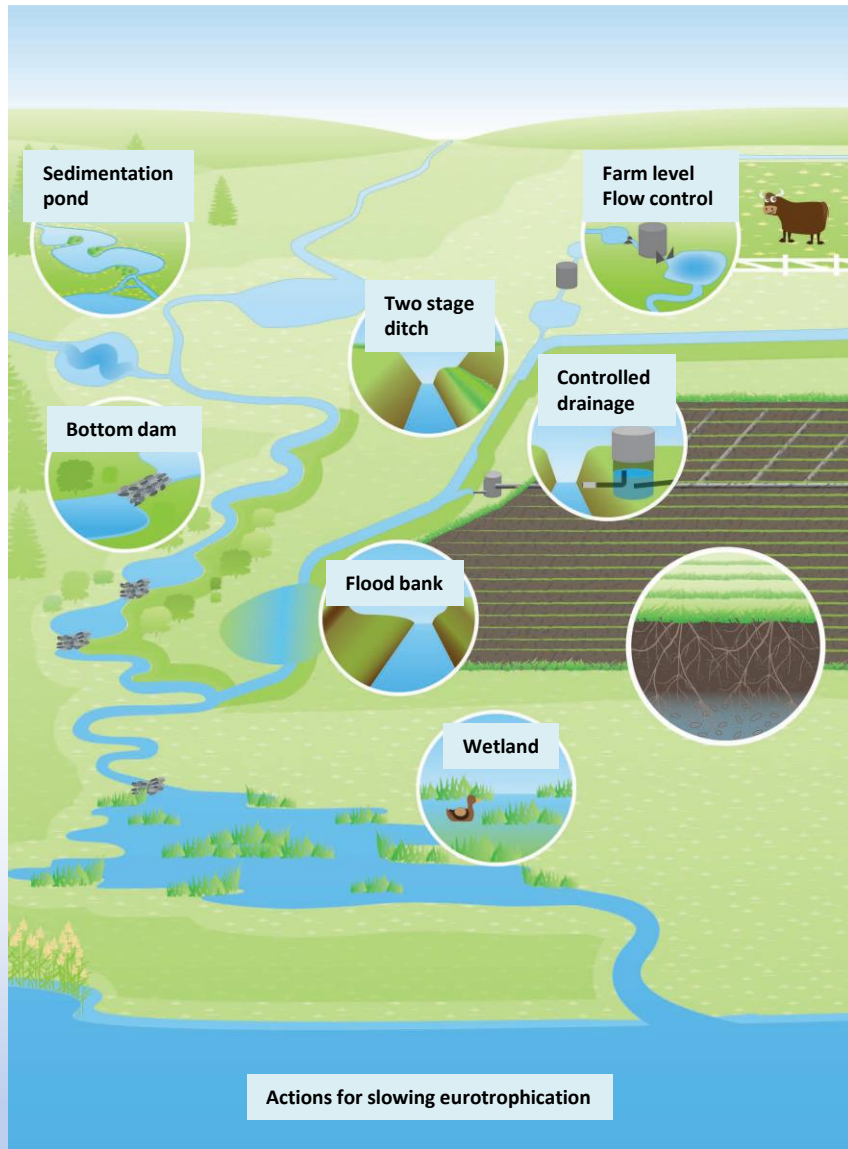
- Subsoil drainage systems
- Improved management of surface flow (lime filtration drainage)
- Drainage flow management, controlled drainage (control wells)
- Possibilities to sub surface irrigation (water reservoirs, ponds, pumping of additional water)
- Service and maintenance of underground drainage (flushing)
- Field levelling
- Soil structure improvement (mechanical, substrate additions)
- Farm level flow control of production premises (storage sites, outdoor paddocks, washing sites, etc.)

Environmental water management

- Artificial wetlands, sedimentation ponds (On field measurements and mapping, feasibility studies)
- Bottom thresholds, dams and adjustable dam constructions for controlled adjustment of summertime water level
- Flood protection (embankments, pumping, flood ledges)



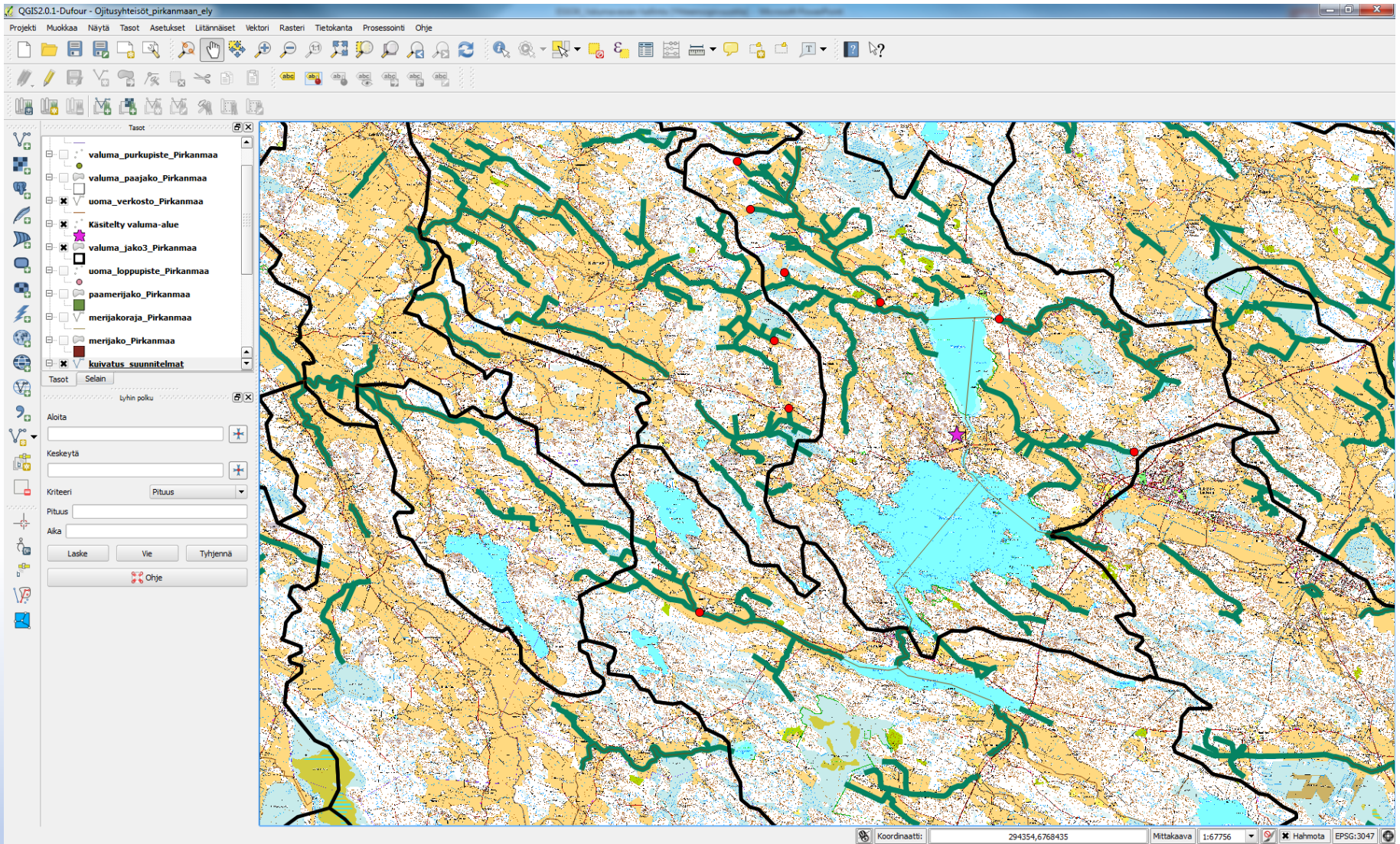
Drainage basin activity model



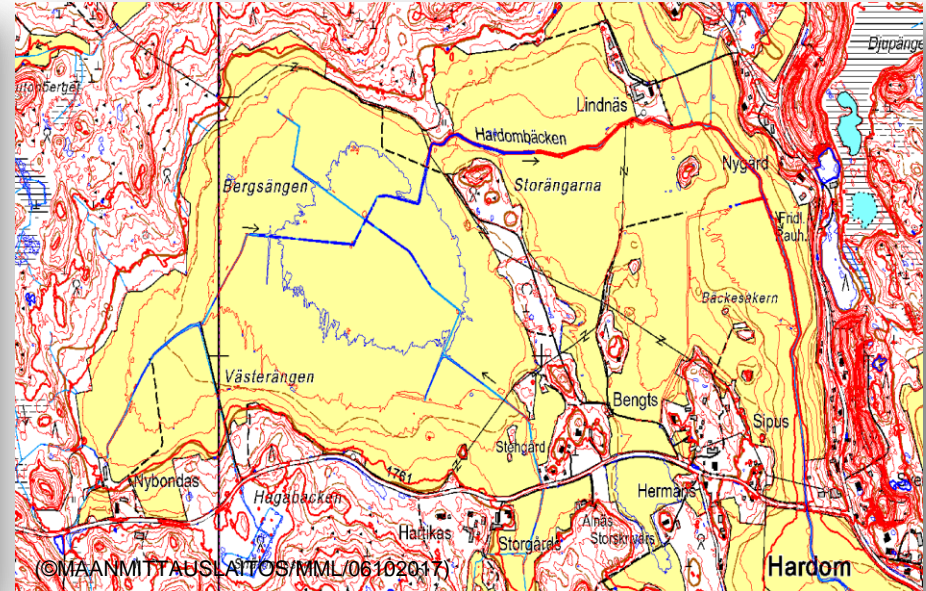
How to prevent the floods and outflow of solid matter and nutrients in drainage basin:

- Reorganizations of drainage corporate bodies
- Risk and flood areas analysis and measurements
- Information system to farmers → Focus the actions to problematic areas
- Holistic actions from field level to ditches, the rivers, lakes and sea systematically → Basic drainage, local drainage and environmental water management
- Cooperation with authorities, municipalities, foundations, associations, designers, contractors, researchers, advisers, farmers and landowners.

Spatial Information of drainage corporate bodies

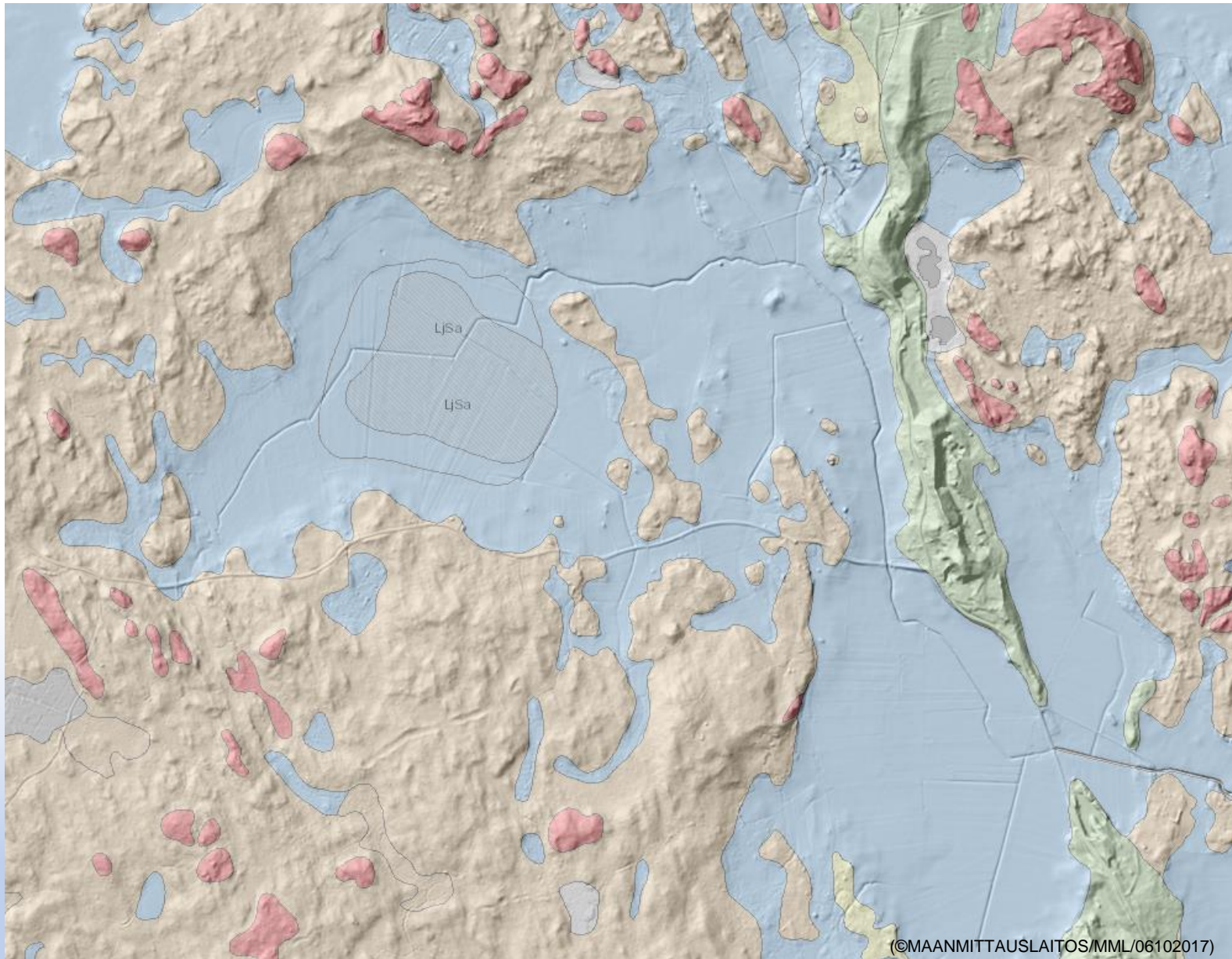


Preliminary studies / local problems on drainage basin



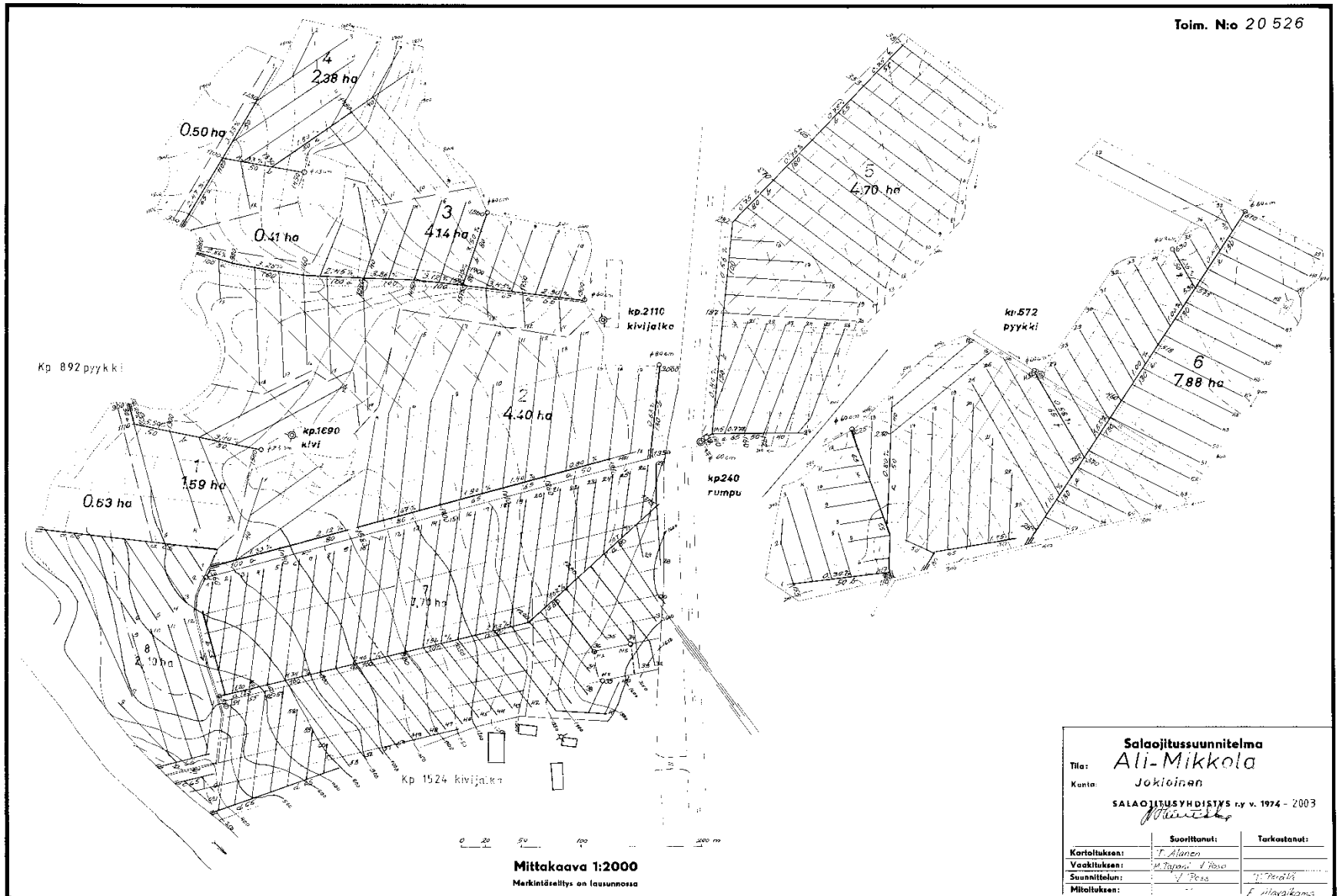
With aviaphotos and altitude models we can see the problem areas!

Soil type maps and altitude models



Old Drainage Maps

Toim. N:o 20 526



Salaajitussuunnitelma		
Tila: Ali-Mikkola		
Kunta: Jokioinen		
SALAOJITUSYHDISTYS ry v. 1974 - 2003		
<i>Ali-Mikkola</i>		
Kartoituksen:	Suorittanut:	Tarkostanut:
Voakituksen:	T. Alanen	
Suunnittelun:	M. Tapani / J. Posa	
Mitoituksen:	J. Posa	J. Posa
		F. Mäkelä



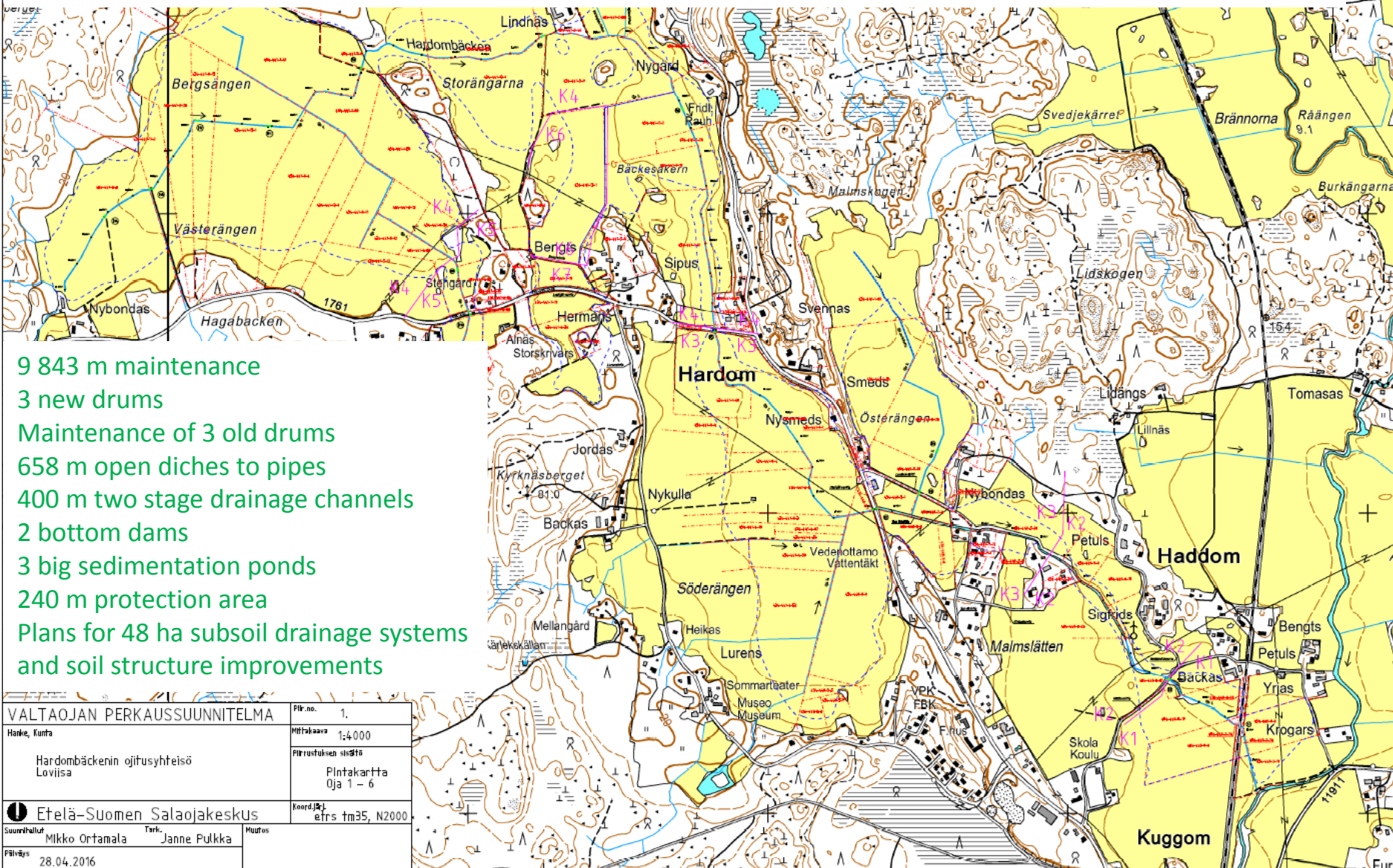
Field measurements identify the possibilities for implement the actions.



Focusing the actions to problematic areas and informing these areas drainage corporate bodies we can implement the holistic water management actions nationally.

Hardombäcken ditch, Loviisa, Holistic water management pilot area

Catchment area 12.3 km²



- 9 843 m maintenance
- 3 new drums
- Maintenance of 3 old drums
- 658 m open ditches to pipes
- 400 m two stage drainage channels
- 2 bottom dams
- 3 big sedimentation ponds
- 240 m protection area
- Plans for 48 ha subsoil drainage systems and soil structure improvements

VALTAOJAN PERKAUSSUUNNITELMA		Piik.no.	1.
Hankke, kunta		Mittakaava	1:4 000
Hardombäckenin ojitusyhteisö Loviisa		Piirustuksen sisältö	Piintakaratta Oja 1 - 6
Etelä-Suomen Salaojakeskus		Koordinaatiot	etrs tm35, N2000
Suunnittelijat	Mikko Ortamala	Tarkk.	Janne Pulkka
Muutos			
Päiväys	28.04.2016		

300m two stage channel

drum

658m open ditch to pipes
Controller dam
Sedimentation pond

drum +
Controller dam

drum

drum

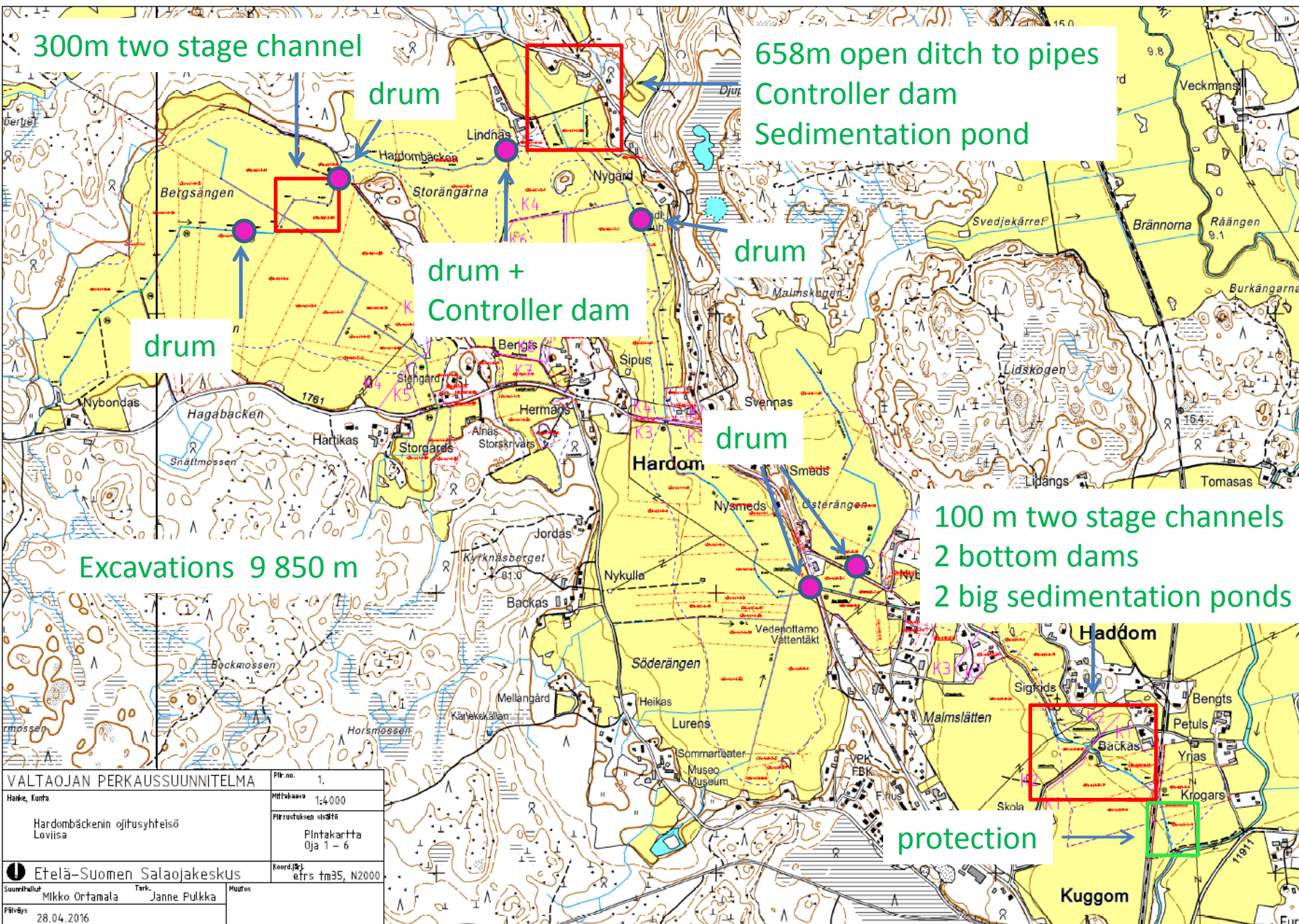
drum

Excavations 9 850 m

100 m two stage channels
2 bottom dams
2 big sedimentation ponds

protection

VALTAOJAN PERKAUSSUUNNITELMA		Piir.no.	1.
Hanki, Kunta		Mittakaava	1:4 000
Hardombäckenin ojitusyhteisö Loviisa		Piirustuksen sisältö	Pintakaratta Oja 1 - 6
Etelä-Suomen Salaojakeskus		Koordinaatiot	etrs tm35, N2000
Suunnittelija	Mikko Ortamala	Tarkk.	Janne Pulkka
Päiväys	28.04.2016		



02.05.2016



06.10.2016





3,5€/m VAT 0%

16.08.2017

Water level set down 1.2m (on average)
because the maintenance.



02.05.2016



12.10.2016



Two stage ditch 15€/m VAT 0%

Both sided two stage ditch 70 €/h VAT 0%

Water level set down 0.7m (on average)



Before



After



Constructions for control of the water levels at summertime

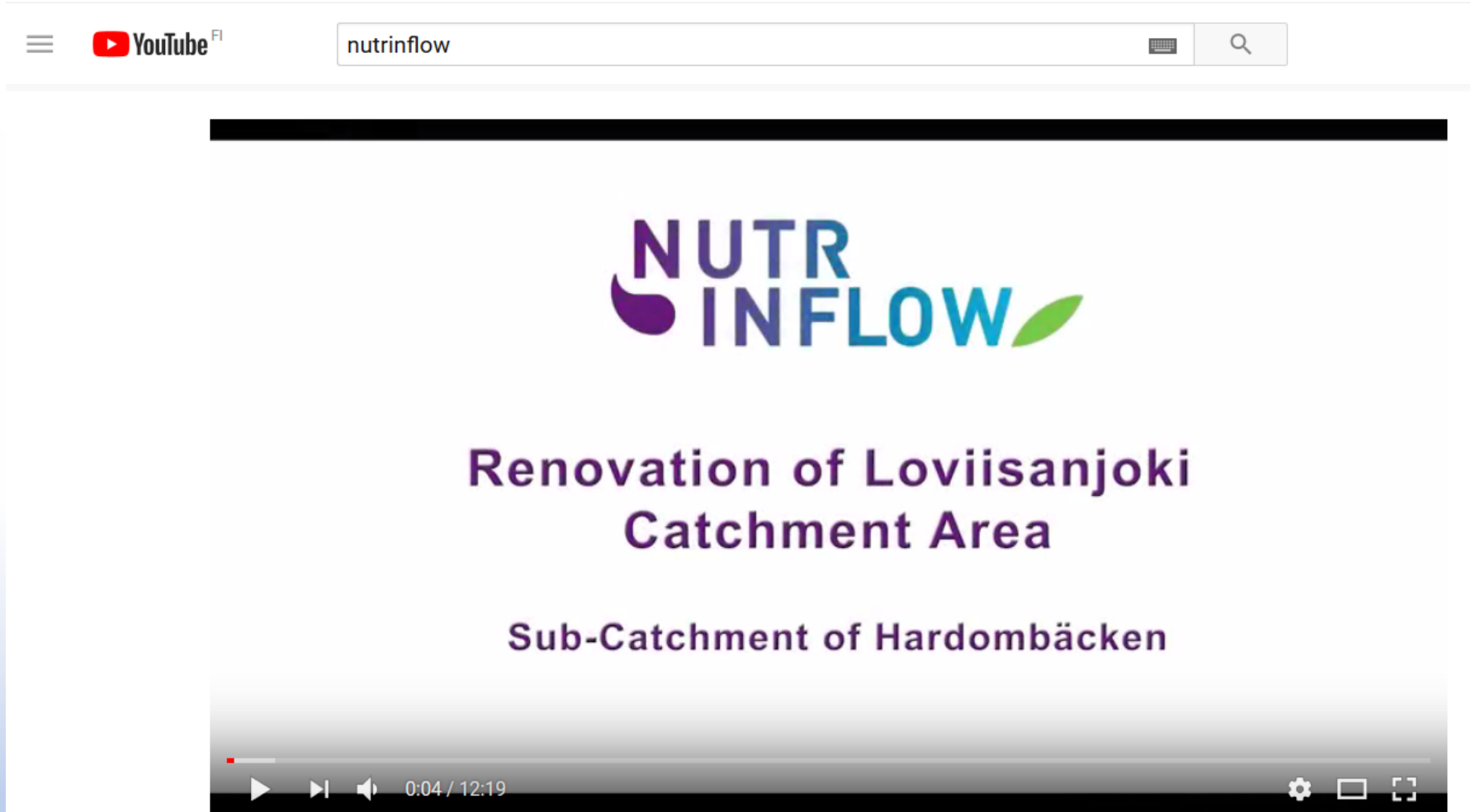
Fishery, landscape, recreational values, game management





13.05.2016

Check out our latest project video in Youtube!



Renovation of Loviisanjoki Catchment Area - Sub-Catchment of Hardombäcken (2017)

NUTR INFLOW



EUROOPAN UNIONI
Euroopan
aluekehitysrachasto



Etelä-Suomen Salaojakeskus



Thank you!

