Implementation- and investment plans – Case area Karjalaiskylä / Gammelbacka brook

Water Protection Association of the River Kokemäenjoki

Drainage Center of Southern Finland

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1 Preface

The main drainage channel of Storänsbäcken ditch / Gammelbacka brook is a typical case, not renovated during decades. The problems consist of small difference of field surfaces and channel water level. By drainage planning norms this difference should be at least 80 cm. This problem was caused by erosion and vegetation which resulted silt and mud accumulation to the channel and also depression of the soil. Humidity and floods have during the years compressed and weakened soil structure and farming capacity, and also increased depression.

Holistic drainage management pays attention to development potential of agricultural production and environmental protection as multidimensionally as possible. On agricultural fields the holistic drainage approach means functionality of basic and local drainage including also control of surface flows and taking into consideration biodiversity and fishery. Downstream section is a habitat of sea trout and local Water protection association has made the habitat restoration. On the fields a functional basic drainage enables functionality of local drainage and actions for soil structure improvement. When the soil structure and growing potential are in good condition, this ensures effective crop growing and at the same nutrient outflow and loading to natural water systems can be decreased.

Initiative of the reconstruction came from the local farmers. The bad condition of the main channel complicated the works of many a farmers, because foods and wetness delayed sowings, hampered harvesting, deceased the crop yields and ruined the soil structure. Quite often the farmers recognize the problems, but cannot spontaneously find their resolutions. Most of the drainage corporate bodies are not active and drainage stewards have not been nominated. This causes delay of renovation and separate stakeholder find the restart difficult, because they do not know, to whom they should contact. This is why the stakeholders try to renovate short proportions of the channel, which is on their property, and the results are not desirable.

1.1 The position of drainage corporate bodies in the current water governance scheme

The drainage corporation is formed by those landowners in a drainage area, who benefit from the upkeep of a ditch. In Finland, the number of corporations is estimated to be between 15 000- 25 000 and can include any number of landowners with the minimum of three. The establishment of drainage corporations started in 1883 by the government. The government also provided project planning until the 1990s, but now drainage corporations order their plans from planning agencies.

The formation, responsibilities and rights of the corporation are regulated by the Water Act (587/11). The local government authority (Centre for Economic Development, Transport and the Environment, ELY) confirms the formation of the corporation, the water management plan, and any significant changes to the plan later. In some cases, the water management practices require a permit. In these cases, the corporation applies for the permit from the Regional State Administrative Agency (AVI).

The corporation is responsible regulated by the Water Act for the maintenance of the ditch, as specified in the drainage plan. The expenses of the maintenance are covered by the drainage corporation, which divides the expenses between its members in proportion to received benefit. The government can issue subsidies for a restoration project of a ditch, but not for maintenance.

Currently, many of the existing drainage corporations are inactive, and there are insufficient resources in governance to activate or supervise them. In addition, some of the ditches in Finland don’t belong to any drainage corporation.

Kuvat 24-26. Purokunnostus oli hyvin esillä paikallisissa sanomalehdissä, mikä auttoi tuomaan runsaasti väkeä talkoisiin ja herättämään yhteishengen puron ja asuinympäristön puolesta.

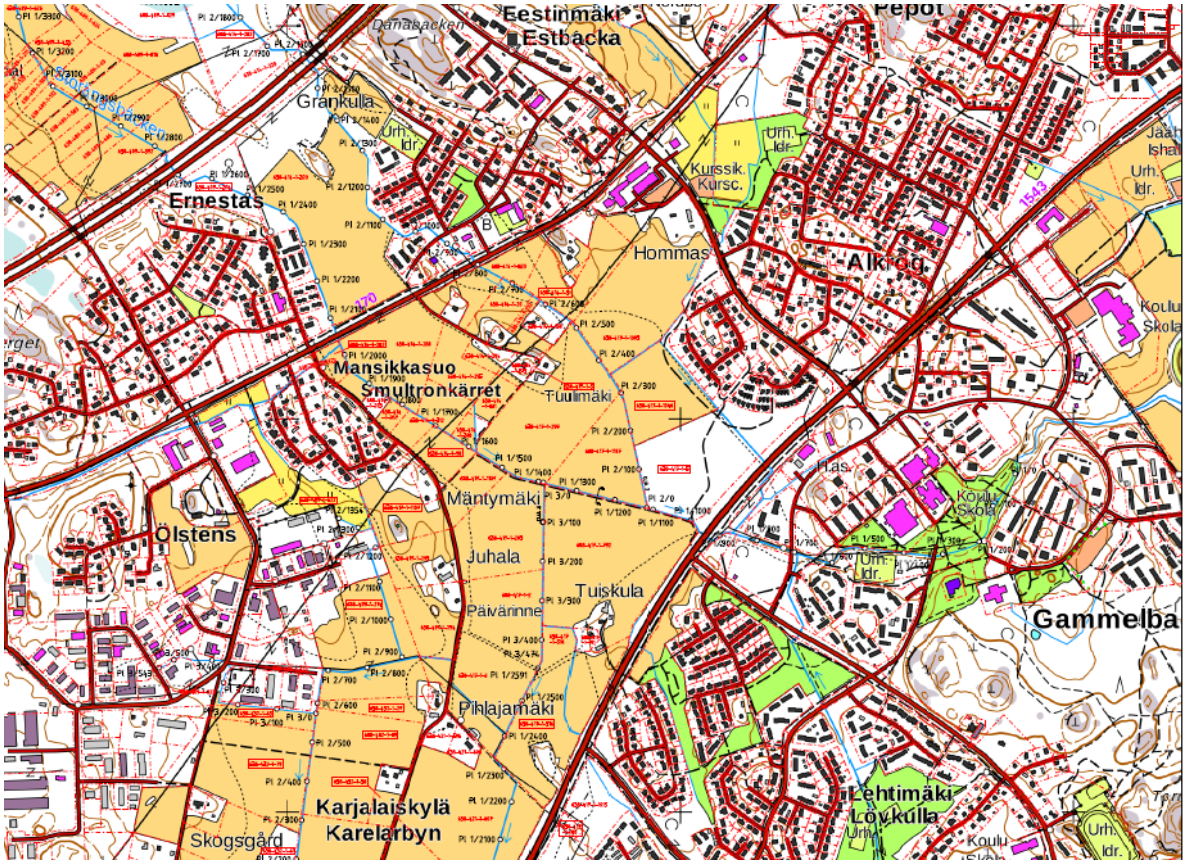
Kuva 18. Mustijoeen syksyllä 2012 noussut meritaimen.

Wet fields / trout habitat restoration on Storänsbäcken ditch / Gammelbacka brook

Holistic approach takes into account not only drainage but also landscape and recreational values as well as biodiversity

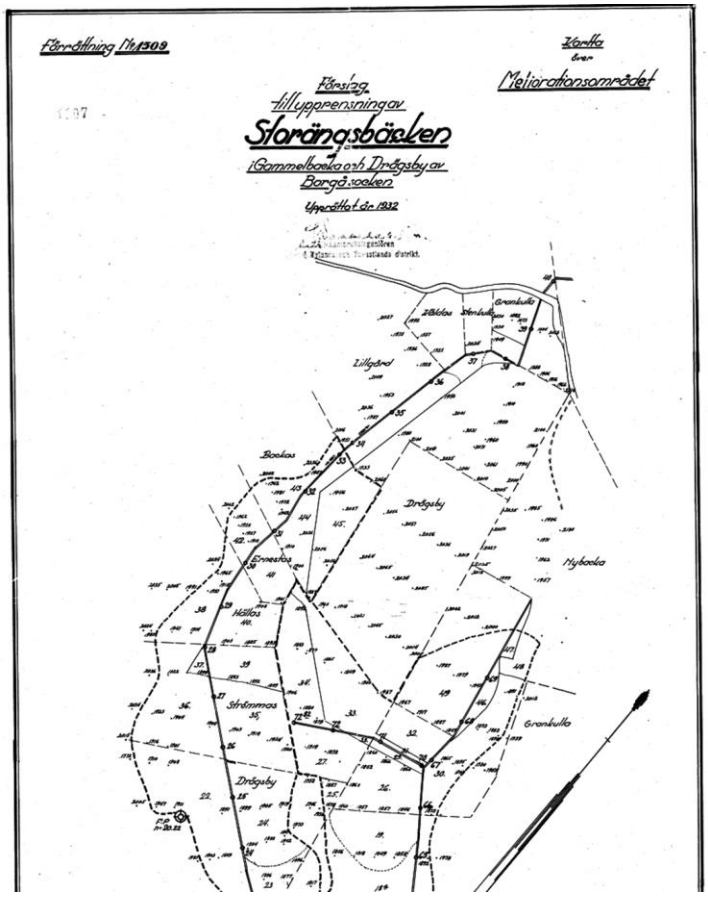
2 Drawings

The target area serves an example of methods of holistic agri-environmental water management. Example areas improve cooperation with different parties (municipalities, authorities, ministries, water protection associations, planners, researchers, contractors, farmers) and holistic catchment area restorations (the production of agriculture, fisheries and biodiversity, urban runoff and recreational values).

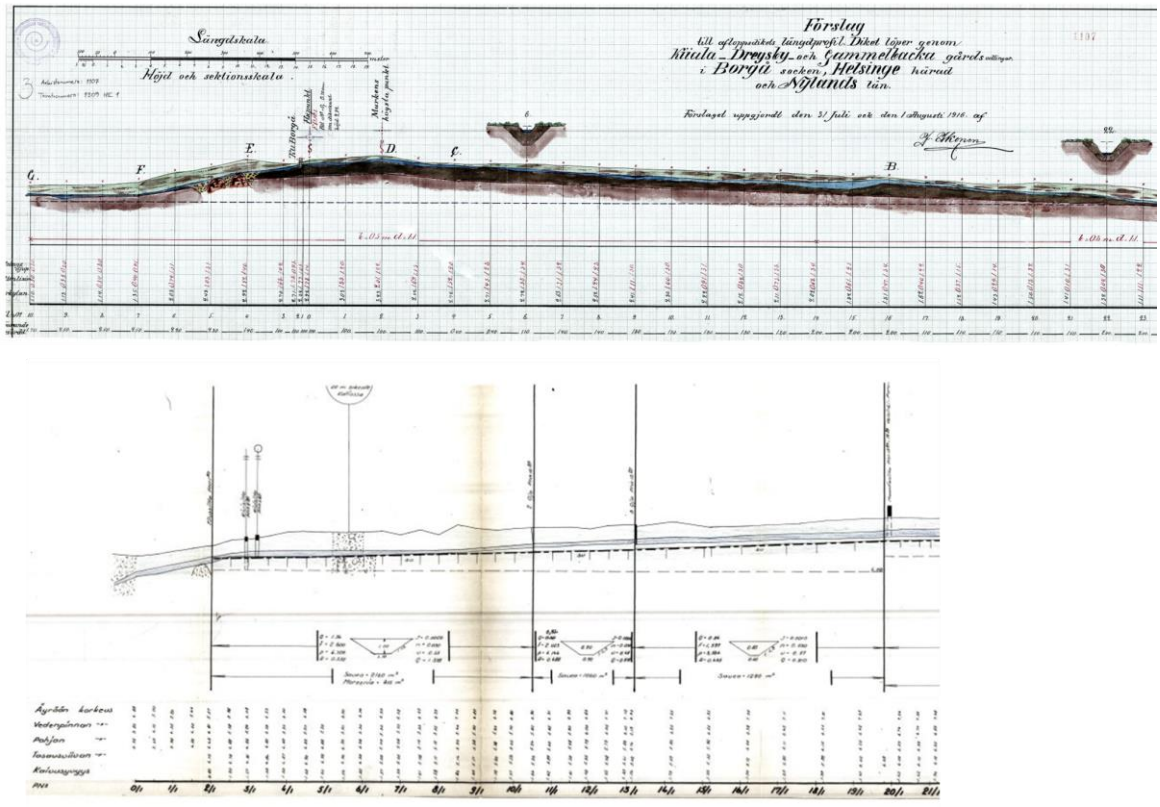


Surface maps (2020, Drainage Center of Southern Finland)

Drainage corporate bodies were established in Finland by the state agricultural engineers from 1883 to the 1990s to be responsible for the implementation and maintenance of basic drainage projects. The design in the case area is still based on old plans.

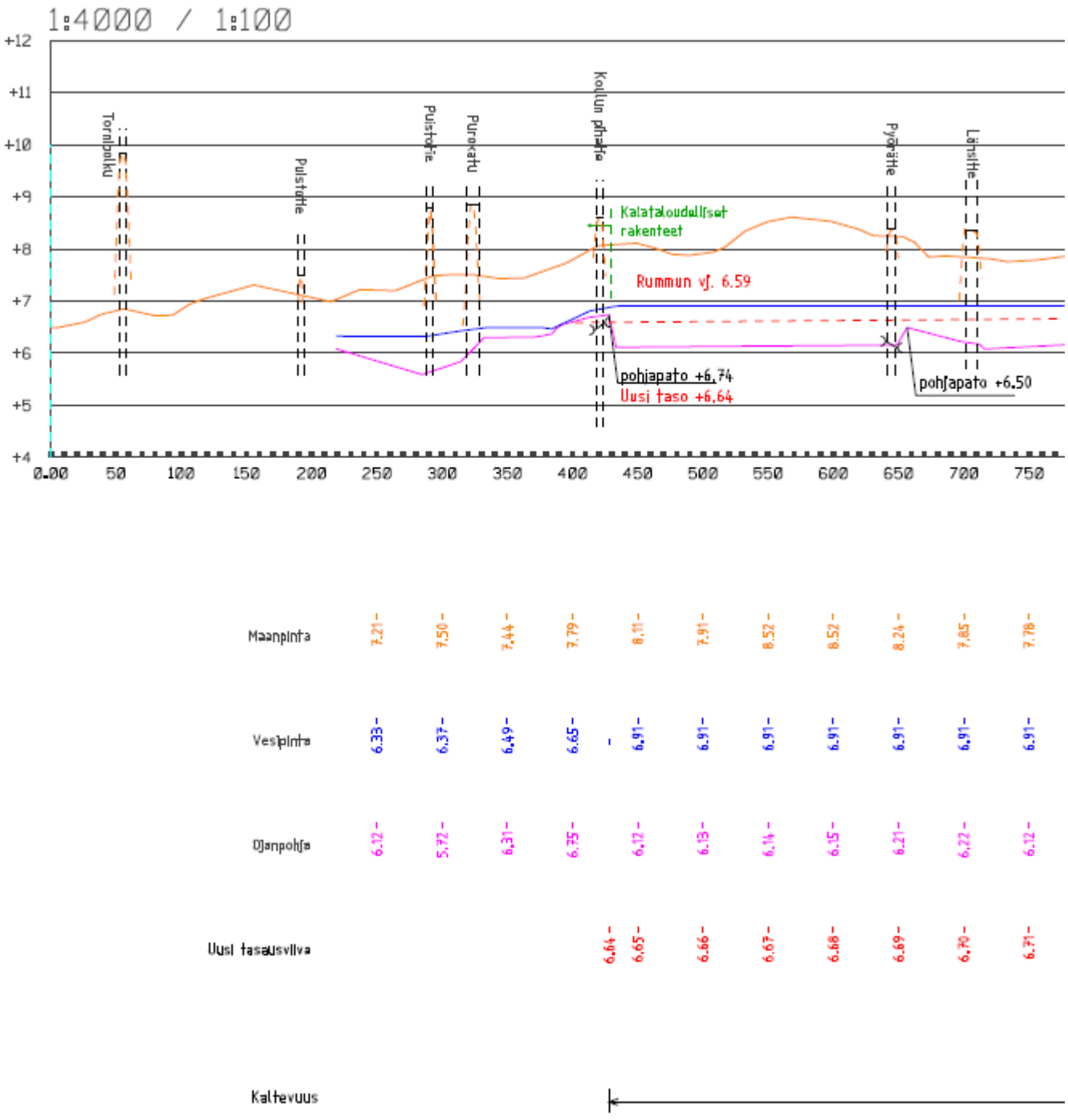


Old surface map from the year 1932

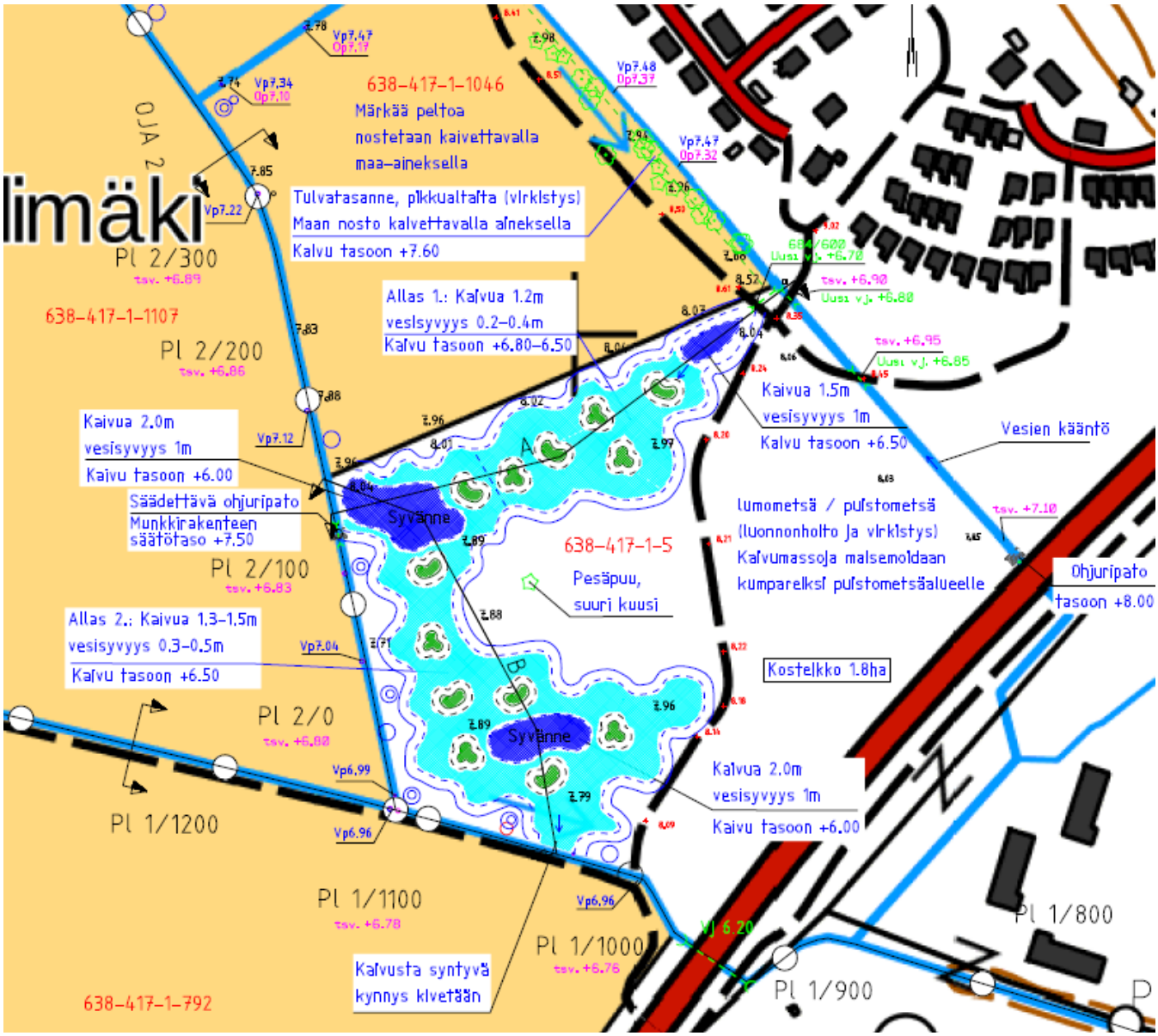


Old slittings from the year 1916 and 1932

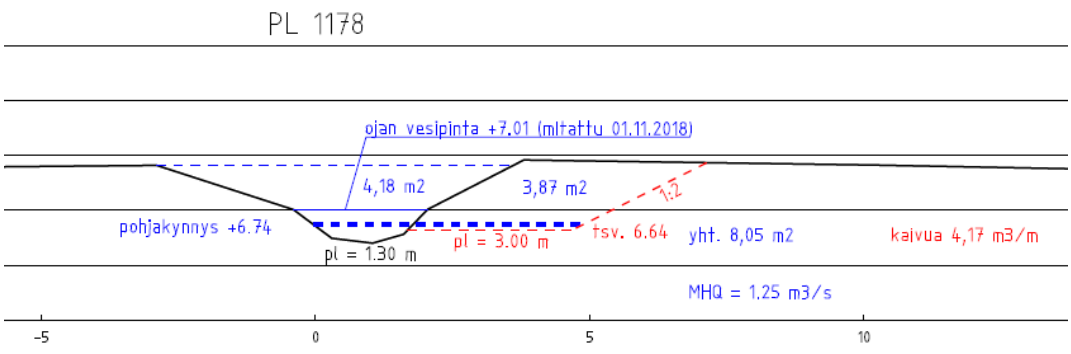
The plan includes drawings for main channel renovation, two stage ditches and artificial wetland taking into account the needs of agriculture, biodiversity, fisheries, recreation and reducing urban runoff.



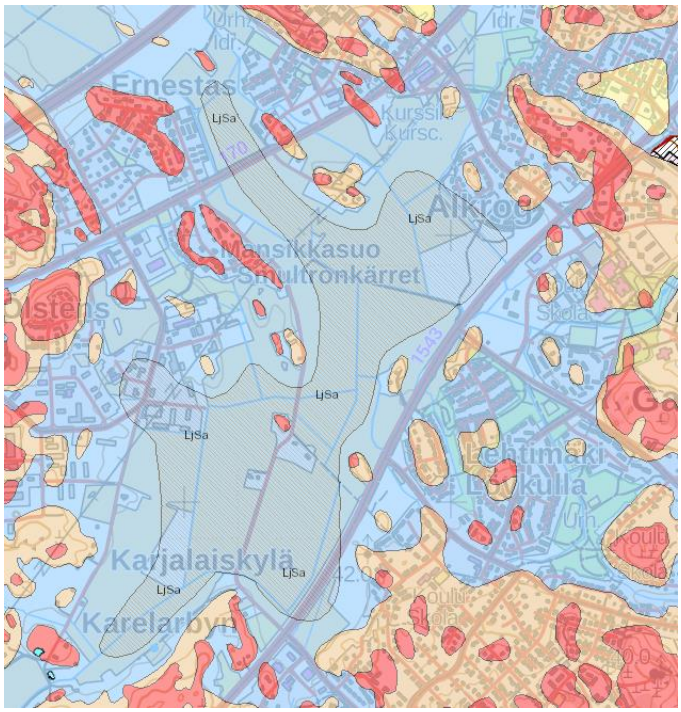
New slittings (2020, Drainage Center of Southern Finland)



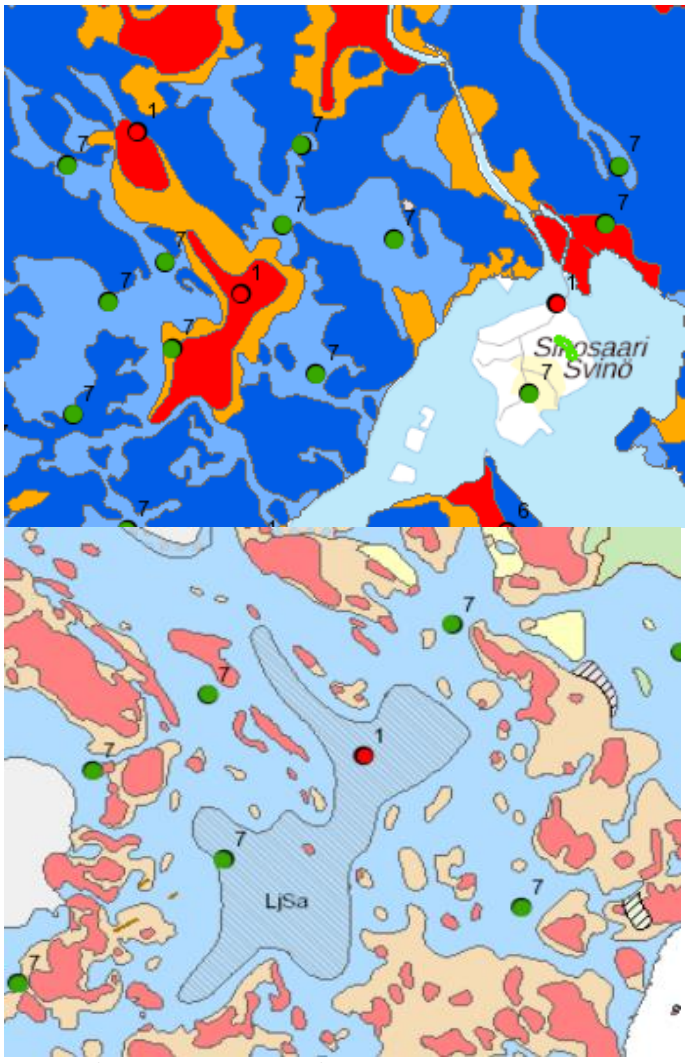
Surface map of Gammelbacka brooks artificial wetland (2020, Drainage Center of Southern Finland)



Draft plan of the two stage ditch (2020, Drainage Center of Southern Finland)



(© MMML / Soil type and topography map / Maanmittauslaitos / 24.08.2020)



(© GTK / Acid sulphate soils / 24.08.2020)

Kuivatuskunta	Kunta, Kylä, Tila, Rnro	Osittelukuvion nro	tiluslaji	ha	Tilan hyöty-alueen pinta-ala ha	Suhdeluvut		Muunnettu pinta-ala (mha) osittelukuvio ha	tila ha	Osuus %	€
K1	Porvoo, Gammelbacka Tuiskula 1 638-417-1-792										
		8	Pe	0,62		0,85	0,05	0,026			
		9a	Pe	3,61		0,85	0,15	0,460			
		9b	To	0,05		1,00	0,15	0,008			
		10	Pe	2,41		0,85	0,25	0,512			
		11	Pe	1,15	**7,84**	0,85	0,50	0,489	**1,495**	**7,05**	
K1	Porvoo, Gammelbacka Pyrylä 638-417-1-791										
		12	To	0,08	**0,08**	1,00	0,10	0,008	**0,008**	**0,04**	
K1	Porvoo, Gammelbacka Lövkulla 638-417-1-516										
		13	Pe	0,73	**0,73**	0,85	0,50	0,310	**0,310**	**1,46**	
K1	Porvoo, Gammelbacka Pihlajamäki 1 638-417-1-2										
		14	Pe	2,78		0,85	0,50	1,182			
		15	Pe	0,63		0,85	0,30	0,161			
		16	Pe	0,05	**3,46**	0,85	0,15	0,006	**1,349**	**6,36**	

Costs sharing (2020, Drainage Center of Southern Finland)

3 Costs of holistic main channel renovation

Case:		**Storansbäcken**						
Project.no:		**3 369**						
City:		**Porvoo**						
Author:		**Etelä-Suomen Salaojakeskus**				**22.5.2019**		
Inspector:		**Janne Pulkka**						
Type of cost				**Unit**	**Quantity**	**á / €**	**€**	**Total. €**
1. Preliminary work								
Marking measurements								
Oja 1		PL 1000 – 3700		m	2700	0,80	2160	
Oja 2		PL 0 – 1550		m	1550	0,80	1240	
Oja 3		PL 0 – 485		m	485	0,80	388	
		total.		**m**	**4735**		**3788**	
								3788
2. Excavations								
Oja 1		PL 20– 30		m	10	50,00	500	
Oja 1		PL 1000 – 3700		m	2700	5,50	14850	
Oja 2		PL 0 – 1550		m	1550	5,50	8525	
Oja 3		PL 0 – 485		m	485	4,00	1940	
		total.		**m**	**4745**		**25815**	
2.1. Spreading of excavated sediment								
Oja 1		PL 20– 30		m	10	10,00	100	
Oja 1		PL 1000 – 3700		m	2700	1,00	2700	
Oja 2		PL 0 – 1550		m	1550	1,00	1550	
Oja 3		PL 0 – 485		m	485	1,00	485	
		total.		**m**	**4745**		**5500**	
								31315
3. Two stage ditches (excavations and spreading of excavated sediment)								
Oja 1		PL 1114– 1375		m	261	12,00	3132	
Oja 1		PL 1580– 1700		m	120	12,00	1440	
Oja 1		PL 1955– 2024		m	69	12,00	828	
Oja 1		PL 3400– 3600		m	200	12,00	2400	
Oja 2		PL 162– 300		m	138	12,00	1656	
		total.		**m**	**788**			
								9456
4. Drum installations								
R4	PL 2760	peltoliittymä	ø1100	pc.	1	1400,00		
R5	PL 3040	peltoliittymä	ø1100	pc.	1	1400,00		
R6	PL 3310	peltoliittymä	ø1100	pc.	1	1400,00		
R7	PL 3480	peltoliittymä	ø600	pc.	1	800,00		
R12	PL 930	Hollituvantie	ø800	pc.				
		yht.			**4**	**5000**		

Kustannuslaji				Yksikkö	Määrä	á / €	€	Yht. €
4.1 Drum materials								
R4	PL 2760	peltoliittymä	ø1100	m	10	130,00	**1300**	
R5	PL 3040	peltoliittymä	ø1100	m	10	130,00	**1300**	
R6	PL 3310	peltoliittymä	ø1100	m	10	130,00	**1300**	
R7	PL 3480	peltoliittymä	ø600	m	10	65,00	**650**	
		yht.			**40**		**4 550**	
								9550
5. Repair of broken discharges								
(includes material and installation)								
Discharges				item	1		900	
Discharge wells				item	1		1500	
								2400
6. Landscaping and unforeseen costs								
								800
								57309,00
Overheads (planning, supervision and management)						**14,12**	**%**	**8091,00**
Total costs (ALV 0 %)								**65400,00**

4 Main results of the focus groups in case area (Farmers / land owners, Water protection association, Municipality of Porvoo)

Summary

Introduction of different drainage management measures to the farmers is easy, when the problems can be addressed. Most of the farmers have a strong motivation to renovate their fields or local waterbodies. Quite often the farmers recognize the problems, but cannot spontaneously find their resolutions. Most of the drainage corporate bodies are not active and drainage stewards have not been nominated. This causes delay of renovation and separate stakeholder find the restart difficult, because they do not know, to whom they should contact. This is why the stakeholders try to renovate short proportions of the channel on their property, and the results are not desirable. Renovation made by local part-time contractors together with the land owners give mainly bad quality results. One of the major bottlenecks is that farmers are unaware of the financial support possibilities, workable policies and methods and the benefits of a systematic planning approach.

Main tasks/goals of the focus groups

Provide information on workable policies and methods, financial support options and measures. Most important is that farmers are aware of how problems can and should be solved over the long term. It is essential that farmers realize the benefits of a systematic planning approach that takes into account both economic aspects and the environment. We have too little focus in information compared to expectations of implementing measures.

For practical implementation of the holistic drainage management an operational model is needed, where after study of problematic sites the solutions are found with assistance of landowners, drainage cooperatives and other local stakeholders on catchment wide perspective. Advisory and information is targeted to the local stakeholders and drainage cooperatives of the most critical sites. On agricultural fields actions begin from renovation of basic drainage and surface flow management and continues to local drainage and soil structure improvements. On every step biodiversity, recreational values and fishery should be noticed.

Catchment area based operational model can be divided to the next phases:

1) Nationwide study on the most difficult nutrient outflow and weakest productivity risk areas by modeling, measuring and basic data studying for every province.

2) Establish an info system for farmers, where they can obtain knowledge on subsidies and grants for the measures together with methods and operations of drainage management, laws and acts, benefits and opportunities of the measures.

3) Regionally choose the catchment areas and waterbodies to renovation, based on the results of the risk assessment. Dependent on the size of the waterbody do an

assessment if there should be established a cooperation group, negotiation committee or other combining organization, if there is not any. The organization should include authorities, local cooperatives, foundations, nature or water conservation NGOs, planners, contractors, scientists, advisors and local stakeholders. An organization coordinating the actions should be chosen, for example local water conservation association or other analogous. The objective is implementation of the renovation extensively and comprehensively, both on the catchment area and on the waterbody. Each member of the organization is responsible their operational part and financing for the actions and management will be applied together or separately.

4) The members of the organization clarify together with the municipalities, advisory organizations and local stakeholders the landowners of the most difficult risk areas, for targeted information delivery. This can be utilizing the old data and mapping of beneficiary areas of drainage corporative bodies of ELY-centers or Province archives, and also property register of the National Land Survey.

5) Drainage planners compose the drainage needs assessment, study on basic situation and feasibility study of possible water protection constructions together with the land owners. This includes also other possible measures, such as improvements on fishery perspective, improvement of recreational values etc.

6) After needed basic studies, measurements and mappings should the local drainage corporative body be activated, in the case of actions targeted to agricultural areas. For decreasing of internal loading or other water management actions should be activated some other organization who is responsible, such as joint property management association (= “landowner cooperative for water management”) or water conservation NGO and decide the implementation of the actions, needed for the renovation.

7) Compose the final plans, complete the needed assessment for the authorities, get needed licenses, ensure financing and do the procurement of contractors.

8) Exact marks to the sites, such as marker poles.

9) Compose a wider regional action plan and maintenance plan to ensure the implementation and financing of possible needed additional actions, including also maintenance of the constructions in future.

The implementation is a joint activity of different stakeholders, based on commitment of the landowners. Drainage management of agriculture should be included to crop planning. This is a tool to introduce drainage management to farm level, as a part of normal crop production practices. Different projects can further on act with development of methods and practices, promotion of the approach and composing the regional risk assessments. Anyhow, the actual renovation work according to holistic drainage management should be implemented utilizing different and more sustainable subsidies and grants for agriculture and water protection.

4.1 Focus group meetings (Farmers / land owners)

– **The main purpose of the meetings**
  - Explain the need for actions in the case area and show the results of preliminary measurements / plans and together consider options for possible measures.

– **Participants**
  - Farmers / land owners, Municipality of Porvoo and Drainage Center of Southern Finland

– **Main inputs made for the future work in the case area**
  - It was decided to continue the planning process with the landowners and the city. It was also decided to update the old drainage plan and make decision on holistic solutions for environmental measures, fisheries and agricultural drainage. In addition, there will be considering for possible measures for urban runoff and recreational landscape solutions in the case area. Next main work is finish updating the drainage corporate body rules, cost allocation, shareholder list, drawings (surface map, slittings and cross-sections) and cost estimations. Later, a new meeting will be congregated to decide on contracting and implementation issues.

– **What we learned from the focus groups meetings**
  - **What worked great?**
  - The best results can be achieved by carefully pre-planning (surveying and measuring before the meeting) and giving the landowners concrete details of the problems, possibilities and possible measures, as well as costs. Farmers are interested in productivity and the economy, so measures must be beneficial for both a production economy and environment. Information and transparency are essential throughout the project. In the end farmers are making a decision for the implementation of the measures on their land, so the top-down approach does not work. The cooperation will bring the best results. Knowledge of the practices and requirements in agriculture and in the environmental sector are essential. Cooperation with stakeholders (drainage corporate bodies, authorities, fishery practitioners, foundations, associations, planners, contractors, scientists, advisers, farmers and land owners) is very important.

  - **What might be improved at the next meetings?**
  - Information is essential throughout the project and there is always something to improve.

  - **Special needs?**
  - All co-operation groups should have sufficient knowledge of the practices and requirements for both agriculture and environmental sector. It is important that different parties understand each other viewpoints so that a win-win solution can be made. Sometimes compromises may have to be made on both sides, but in the end there must be consensus and common interest.

4.2 Focus group meetings (Municipality of Porvoo)

– **The main purpose of the meetings**
  - Discuss about the needs for actions in the case area and show the results of preliminary measurements / plans and consider together of options for possible measures, discuss about the role of the city in the project and its objectives in the case area of agricultural water protection and urban runoff and its role as a member of the drainage corporate body.

– **Participants**
  - Municipality of Porvoo and Drainage Center of Southern Finland

– **Main inputs made for the future work in the case area**
  - A contact person of the city was appointed for the project. Cooperation will be flexible.

– **What we learned from the focus groups meetings**
  - Personal meetings and creating an operation model are very important for future projects. Knowledge of the goals and practices of different stakeholders and the exchange of ideas will essential. It is also important to get to know your colleagues and partners on a personal level.

  ○ **What might be improved at the next meetings?**
  - Discuss and seek alternative solutions to urban runoff measures and recreation values

  ○ **Special needs?**
  - All co-operation groups should have sufficient knowledge of the practices and requirements for both agriculture and environmental sector. It is important that different parties understand each other viewpoints so that a win-win solution can be made. Sometimes compromises may have to be made on both sides, but in the end there must be consensus and common interest.

4.3 Focus group meetings (Water protection association_ Itä-Uudenmaan ja Porvoonjoen vesien- ja ilmansuojeluyhdistys r.y.)

– **The main purpose of the meetings**
  - Discuss about the needs for actions in the case area and show the results of preliminary measurements / plans and consider together of options for possible measures, discuss about the role of the association in the project and its objectives in the case area of agricultural water protection and fishery.

- **Participants**
    - Water protection association and Drainage Center of Southern Finland

- **Main inputs made for the future work in the case area**
    - Discuss and seek alternative holistic solutions for environmental, fisheries and agricultural drainage.

- **What we learned from the focus groups meetings**
    - Personal meetings and creating an operation model are very important for future projects. Knowledge of the goals and practices of different stakeholders and the exchange of ideas will essential. It is also important to get to know your colleagues and partners on a personal level.

    - **What might be improved at the next meetings?**
    - Longer and closer cooperation will be planned across the entire operation area.

    - **Special needs?**
    - All co-operation groups should have sufficient knowledge of the practices and requirements for both agriculture and environmental sector. It is important that different parties understand each other viewpoints so that a win-win solution can be made. Sometimes compromises may have to be made on both sides, but in the end there must be consensus and common interest.

5 Results

There are a number of different agro-environmental measures whose synergies are most important in water protection. Holistic agro-environmental water management includes a combination of activities of basic and local drainage and runoff management (including constructed wetlands and urban runoff), taking into account biodiversity and fisheries needs. Holistic water management is aimed at eliminating floods and wetlands and improving soil structure and growth, and thereby reducing solids and nutrient loads. The integrated approach seeks to achieve simultaneous productivity growth and to secure water and nature management, and to reconcile productive and environmental management.

Possible measurements in holistic agro-environmental water management:

Basic drainage

- Maintenance of the ditches
- Enable local drainage
- Constructions for control of the water levels at summertime
- Two-stage ditches

Local drainage

- Subsurface 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, amelioration, soil reclamation)
- Farm level flow control of production premises (storage sites, outdoor paddocks, washing sites, etc.)

Environmental water management and runoff management

- Constructed wetlands, sedimentation ponds
- Bottom thresholds, dams and adjustable dam constructions for controlled adjustment of summertime water level
- Flood protection (embankments, pumping, flood ledges)
- River and lake restorations (fishery, benthos)
- Biodiversity

6 Conclusions

In large-scale holistic water management and maintenance demands a clear division of roles for different stakeholders. Planning has been relocated from authorities to private service providers and advisory together with guidance is transferring to advisory organizations. Juridical review remains to state authorities and province administration are taking over the financial subsidizing. There is a need of a clear “command chain” from the catchment area to water bodies. The links of this chain would be drainage cooperatives, authorities, fishery regions, land owner cooperatives, foundations, associations, planners, contractors, scientists, advisers, farmers and land owners. Catchment officer could offer a link between all of these stakeholders.

Responsibility of actions could not remain to separate actor of the chain, but we need an operative set. Everyone should have a clear approach, which leads the activities towards operational basic and local drainage including surface water management. As a result should be the good status of waterbodies according to the demands of Water Framework Directive. Catchment area wide cooperation groups, negotiation committees and foundations which coordinate the projects have been solutions adapting and combining the actors, enabling the formation of operative chain.

A systematic, phased implementation on a catchment-scale is more likely to secure better results concerning both sufficient drainage on agricultural lands as well as decreased nutrient load. In order to decrease the renovation debt, a more systematic and planned approach should be strived for in contrast to the current unsystematic and random operating model/activities.

Information about holistic water management should primarily be targeted to farmers, landowners and drainage corporate bodies in the risk areas. The regional authority (in Finland ELY-centre) would be a natural actor to coordinate the targeting of funds to the most critical areas. A regional coordinator could be funded by state subsidies either through a project or a new form of support or service.

7 Lessons learned

In large-scale, holistic water management planning and implementation, the role of each stakeholder needs to be clearly defined and understood. The planning and implementing of water management has largely been transferred to the private sector - consults and advisory services. Judicial review is still done by the state. There is a need for a clear chain of operation, from the catchment-area to the waterbody, that would include drainage corporate bodies, authorities, fishery regions, (participants') associations, foundations, planners, contractors, researchers, advisors, farmers and landowners. The responsibility of implementing measures cannot lay solely on individual stakeholders, but more comprehensive collaboration is needed. Every institution/organ should have a clear strategy that would steer their activity towards better water management, which subsequently would lead to the good ecological status of water bodies in accordance to the Water Framework Directive.

Restoration/renovation measures should be implemented holistically on a catchment scale in order to decrease the external nutrient load and to enable efficient cultivation. Planned measures should be listed and given an order of priority in order to implement the most acute measures first and thereby target the most critical sources of nutrient loading. This would require the state of the channel and waterbody networks to be comprehensively mapped, first through analyzing existing datasets (orthophotos, digital elevation models, soil data), and then more accurate surveying of specific sites prior to implementation of measures. The aim would be a comprehensive dataset describing agricultural areas suffering from poor drainage, waterlogging and recurrent flooding.

Denmark and Sweden have some experience of regional coordinators (catchment officers). The task of the coordinators would be to point out/suggest/propose options (technical, procedural, economical) to the stakeholders, and to implement measures in accordance to the authority's guidelines. Information about holistic water management should primarily be targeted to farmers, landowners and drainage corporate bodies in the risk areas. Activities should inspire the confidence of local actors. Advising (holistic approach taking into account the production economy and the environment) should be permanent and activate local actors and on a long-term basis. Catchment officer could be on a Link between governmental and local level. Practice has shown that the trust is different between local actors and authorities and advisory organization. The activity of Catchment officer cannot be created by one person or organization. Expert teams from different organizations should be resourced for improve holistic advising and catchment area renovations. The cooperation and team thinking could work across different sectors. Most of the funding should be secured by the state, some can be collected from the private sector like foundations. The aim is to take care of the needs of the production economy and water quality, as well as

fisheries, biodiversity, the capital value of the land and the maintenance of infrastructure with regional know – how of different stake holders.

Drainage and soil condition surveys are key factors in planning measures in an agricultural environment (professional advisor operates surveys). Measures should be based on the prevailing need and adapted to the local conditions (topography, soil types, flow, economy and ecology, etc.). Cost-effectiveness, channel dimensioning / mass calculations and soil growth status (chemical, physical and biological status of the soil) must be taken into account in the design of measures.

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