Urban surface runoff pollutants and their impact on aquatic environment

Summer school: Risk assessment of contaminated sites
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Urbanization effects on surrounding ecosystems

- Enhancing environmental load from fall-out, traffic, building and industrial activity, animal waste
- Urban ecosystems do not hold nutrients and other compounds effectively, therefore they leak out potential pollutants
- Surface runoff is a major way by which urban-born pollutants are leaving the city and contaminating surroundings

Urban surface runoff

- Excess of water from precipitation, snowmelt, irrigation or other urban sources which does not infiltrate the soil
- Surface runoff from urban areas is usually directed to the adjacent water bodies
- Runoff is often nutrient-rich, which enhances eutrophication and contains metals and organic pollutants

Present situation

- Lahti urban area has about 100 000 inhabitants and its surface runoff is directed straight to adjacent Lake Vesijärvi
- Finnish law does not demand cleaning of the surface runoff and there are no limits set on its purity
- Therefore, study on the runoff quality and fate is necessary in order to estimate how it impacts surrounding aquatic habitat

Research objectives

- To measure which pollutants are present in surface runoff from the middle-sized Finnish city
- To clarify the fate of pollutants carried along the human-built channels to the environment
- To follow quality of the surface runoff in different seasons
- To clarify the impact of the surface runoff on the quality of water bodies and sediments, situated next to urban areas

Studied pollutant groups

- Polyaromatic hydrocarbons (PAH-compounds)
- Hydrocarbons (general concentration of oil-born compounds)
- Polychlorinated biphenyls and polybrominated diphenylethers (PCB- and PBDE-compounds)

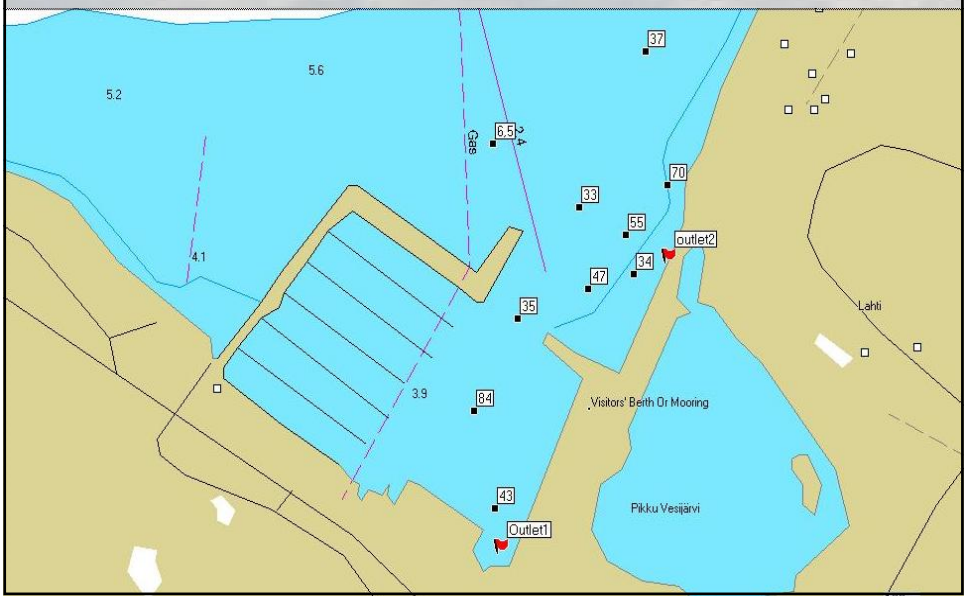
Implementation and methods

- Gradient sampling methodology was implemented in order to trace the changes in pollutants' concentrations in the Lake Vesijärvi
- Grab sediment samples were taken in the vicinity of stormwater drainage system outlets from urbanized areas
- Concentrations of PAH-, PBDE- and PCB-compounds were determined with GC-MS

Preliminary results

- Both PAH and PCB concentrations in sediments tend to be elevated near the urban shores, which might be due to the surface runoff
- PAH concentrations found to be up to 70mg/kg of organic matter
- PCB concentrations found to be up to 0,4mg/kg of organic matter
- Concentrations of PBDE-compounds appear to be under detection limit of GC-MS

***Example of PAH concentrations gradient*,**
mg/kg of organic matter



Conclusions

- PAH and PCB analyzes should be continued, using the same methods
- Sediment samples should be taken in the vicinity of less urbanized stormwater outlets in order to compare results
- Alternative methods of PBDE-analysis should be implemented

Next steps

- Determination of oil-born compounds concentration
- Storm drainage water monitoring in different seasons
- Possibly ecotoxicological tests and risk assessment, dependent on the results obtained

Collaboration

- LV Lahti Aqua Oy (Lahti water treatment facility)
- STORMWATER-project (Urban runoff-waters: indicators of urban ecosystem functioning and their effective management)
- River Porvoonjoki research (“Endocrine disrupters in river receiving treated waste waters ”)


Thank you!!!
Tak!!!
Kiitos!!!