

## **Quantifying spatiotemporal patterns of interactions between lakes and watercourses in water chemistry**

The goal of this project is to quantify spatiotemporal patterns of interactions between lakes and watercourses in water chemistry. This will be done using geostatistical analysis techniques (spatial linear mixed models) on water chemistry and flow data from Emån River. Models are implemented using ArcGIS or R.

This "independent project/degree project" (= "Självständigt arbete") acquires two persons, working together but that writes two separated master thesis:

1) The STARS ArcGIS geoprocessing toolset (Peterson and Ver Hoef 2014), will be used to calculate spatial information for spatial statistical models using the R-based SSN package (Ver Hoef et al. 2014). The STARS toolset is designed for use with a landscape network (LSN), which is a topological data model produced by the FLoWS ArcGIS geoprocessing toolset (Theobald et al. 2006). FLoWS was used in earlier project that ended up in a publication (Lyon et al. 2011).

Level: Bachelor/Masters in GIS, Earth or Geo sciences, Environmental assessment or similar.

Requirement: basic knowledge in ArcGIS.

Supervisor: [Steve Lyon](#), Stockholm University, and [Johan Temnerud](#), Swedish University of Agricultural Sciences.

2) A spatial statistical model is fitted to the spatial information, which is the output in project 1), using the R-based SSN package (Ver Hoef et al. 2014). The goal is to fit the model using a reasonable correlation structure and investigate how well the model can represent data. A special interest is to estimate the influence of the presence of lakes on water chemistry.

Level: Bachelor/Masters in statistics.

Requirement: basic knowledge in R.

Supervisor: [Claudia von Brömssen](#) and [Johan Temnerud](#), both at Swedish University of Agricultural Sciences.

## References

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- Theobald, D.M., Norman, J.B., Peterson, E.E., Ferraz, S.B., Wade, A. and Sherburne, M.R., 2006. Functional Linkage of Water basins and Streams (FLoWS) v1 User's Guide: ArcGIS tools for Network-based analysis of freshwater ecosystems, Natural Resource Ecology Laboratory, Fort Collins, 43 pp. <http://www.stat.colostate.edu/~nsu/starmap/pps/Technical%20Reports/FLoWS.Users.Guide.pdf>
- Ver Hoef, J.M., Peterson, E., Clifford, D. and Shah, R., 2014. SSN: An R package for spatial statistical modeling on stream networks. *Journal of Statistical Software*, 56(3): 1-45. <http://www.jstatsoft.org/v56/i03/> and <http://cran.r-project.org/web/packages/SSN/index.html>