80-word summary

Landscape processes as well as plant decomposition affect soil carbon sequestration rates and carbon cycling globally. In this thesis, I build a landscape scale model of soil carbon in freshwater wetlands, and then extend the analytical methodologies and statistical models applied to the investigation of decomposition of plants. I develop open-source software for carbon component estimation and apply it to wetland plant species, and use carbon composition to explain variation in predictive models applied to an experimental investigation of decomposition.