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Wild boar damage mapping in agricultural grass and wheatlands using drone data

Wild boar has been damaging agricultural fields in Sweden. By collecting drone data from damaged agricultural fields, damage mappings can be created that can aid the creation of precise mitigation strategies for this conflict. This master's thesis developed three methods that can automatically transform drone data from agricultural lands into wild boar damage mappings with centimeter-level spatial resolution in agricultural grass and wheatlands.

There has been an increase in wild boar (*Sus Scrofa*) population in Sweden (Swedish Association for Hunting and Wildlife Management). The coexistence of humans and wild boar has been challenging and has led to conflicts. So does the wild boar damage agricultural lands in Sweden of which the negative consequences were estimated to be around 17% of the Swedish net farm income in 2015 (Gren et al., 2019).

The creation of mitigation strategies for this conflict can be aided by having precise wild boar damage mappings. Currently in Sweden, field surveys are done to collect data on wild boar damage. However, these are time-consuming and often lead to inaccurate and too coarse data. Studies have been looking into alternatives and found drone data to have potential. This data has a centimeter resolution and can be collected with high efficiency and flexibility in usage.

This master's thesis focused on creating automated methods that transform this drone data into wild boar damage mappings for grass and wheatlands in Boo, Hjortkvarn Municipality, Sweden. Three methods were developed and tested for performance. Two methods, the object and pixel-based classifications, used two-dimensional (2D) multispectral drone data and used the machine learning classifier Random Forest (RF) and Support Vector Machine (SVM) to perform the damage mapping for grass and wheatlands. The third method used three-dimensional (3D) drone data to create wild boar damage mappings for wheatlands.

The results showed that the best overall performance in wild boar damage mapping was achieved by the object-based SVM for both grass (overall accuracy 91%) and wheatland (85%). This method relied mostly on the texture-related values to create the damage mappings. The object and pixel-based classifications mapped similar damage locations but the pixel-based mapped them less dense. The 3D method failed to map a lot of the damage.

Keywords: Physical Geography and Ecosystem analysis, Unmanned Aerial Vehicle, Wild Boar, Agriculture, Machine Learning, Random Forest, Support Vector Machine, Geo-information Science, Remote Sensing, RStudio

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