OBJECT-ORIENTED CLASSIFICATION FOR WETLAND MAPPING USING LANDSAT-ETM AND RADARSAT-1 IMAGES IN THE CONTEXT OF THE CANADIAN WETLAND INVENTORY (CWI)

M. Grenier [a], A.-M. Demers [a], S. Labrecque [a], M. Benoit [a], R. Fournier [b], B. Drolet [a]

[a] Environment Canada, Canadian Wildlife Service, Québec region. 1141 route de l'Église, Sainte-Foy, QC, Canada G1V 4H5; marcelle.grenier, anne-marie.demers, sandra.labrecque, martine.benoit, bruno.drolet)@ec.gc.ca

[b] Université de Sherbrooke, Département de géomatique appliquée, Boul. de l'Université, Sherbrooke, QC, Canada J1K 2R1; Richard.Fournier@USherbrooke.ca

Environment Canada tested a multi-scale object-oriented classification on five (5) test sites using satellite images to map wetlands in the context of the Canadian Wetland Inventory (CWI). The objective of this study is to assess the method best adapted for a national inventory program to map five wetland classes (bog, fen, swamp, marsh and shallow water) for a minimal mapping unit of one (1) hectare. Previous work using traditional classification and decision-tree (© CART) suggests that using RADARSAT-1 and Landsat-ETM images is suitable to account for some spatial variability intrinsic to wetlands. However, the use of traditional statistical classification methods on satellite images (30 m resolution) proves to be unsuccessful in distinguishing wetland classes due to confusion in spectral signatures. Confusion is also common between wetland and upland classes. Parametric methods are therefore not well suited to map wetland with RADARSAT-1 and Landsat-ETM images.

In order to overcome the current limitation of methods to maps wetlands, we developed a mapping method using following the principles of object-oriented segmentation available with the eCognition software (© Definiens). In addition, the method uses a hierarchy of spatial objects from the coarser to finer scales adapted to wetland mapping which is referred to as a top-down approach. Image segmentation and multi-scale (hierarchic) classification can handle heterogeneous wetland complexes and translate them into single polygons if specific rules are loosely followed. One key rule is to adjust the segmentation of the object of interest to improve the classification. This approach has shown that wetlands are easier to classify when the geo-ecological context (object-based) is used instead of the traditional pixel-based approach. Our results were validated by an expert-interpret. We found that object-oriented classification provides the flexibility required to map complex units as variable (spatially and temporally) as the five wetland classes dictated by the Canadian classification System. The directives and rules for mapping are transportable within a reasonable level of adjustment between test sites. We therefore demonstrate with our five test sites how the object-oriented method is suitable to the mapping requirements of the CWI.