

Mapping and Monitoring Wetland Ecosystem Health Using High-Resolution *Casi* Imagery.

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Wetlands within the Lake Erie basin are among the most productive, life-supporting ecosystems in this region of North America. They provide habitat for fish, wildlife and waterfowl; hydrological benefits by regulating water levels; water quality protection and several economic benefits through recreation and tourism (Wetzel, 1992; Klemas *et al.*, 1993). Human activities within these environments, however, have led to the disappearance of as much as 70% of the pre-settlement wetland area (Krieger *et al.*, 1992; Mitsch, 1992). The Lake Erie basin has one of the highest rates of long-term wetland loss in Canada. Land use within this basin has also severely affected the quality and quantity of wetland vegetation within this region. Loss of both inland and coastal wetlands has occurred, to a large extent, from the conversion of wetlands by draining them for intensive agriculture and, to a lesser extent, by infilling them for commercial and/or residential development (Snell, 1987; Mitsch and Gosselink, 1993). As a result, a range of methods have been developed in order to accurately monitor and assess remaining wetlands, in terms of their status and health. Remote sensing techniques provide powerful tools that can be used to map, monitor and assess the remaining Lake Erie wetlands. Traditional methods of collecting wetland data have included the use of aerial photographs and detailed ground surveys. Improvements in remote sensing, however, provide many advantages over traditional methods including timely data collection with lower costs over time, data in a digital format, a standardized data-collection procedure and an opportunity for data integration within a geographical information system (Cihlar, 1996; MacDonald, Dettwiler and Associates, 1998). Recent advances in remote sensing have provided an opportunity to acquire detailed information about wetland environments including precise *x, y* location, the shape and size of wetland areas, wetland vegetation types/classes (at the community and species level), vegetation extent and distribution, land use, wildlife habitat classes and water quality through the use of high-spatial and high-spectral (or "hyperspectral") resolution imaging spectrometers (Consulting and Audit Canada, 1994; Jollineau, 1997; MacDonald, Dettwiler and Associates, 1998). Current research activities are evaluating imaging spectrometers (e.g. the Compact Airborne Spectrographic Imager or *casi*) to determine the extent to which these instruments can be used to meet the operational wetland mapping and monitoring requirements of a variety of government and non-government agencies including the Canadian Wildlife Service, Ducks Unlimited Canada, and other federal and provincial government agencies responsible for wetland conservation. Of special interest in this context is the use of *casi* imagery to monitor and assess wetland ecosystem health.