

Development of Environmental Indicators for the US Great Lakes Basin Using Remote Sensing Technology

Investigators and Institutions:

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Project Summary:

Coastal regions, estuaries/bays and forest environments are significant natural resources in the Great Lakes region, providing a significant economic base as well as many essential ecosystem services. Although traditional wetland and forest measurement techniques are accurate, they are extremely expensive and labor intensive.

The objective of this research is to use remote sensing technology, coupled with GIS, to improve mapping of coastal environments and forests in the Great Lakes basin, provide data for the development of ecological risk assessment indicators and to serve as important background information for ecosystem characterization of ecological response variability. We propose to use multi-temporal Landsat-7 (ETM+), 1 and 4 meter IKONOS data, multi-band airborne video and Radar Interferometry to more specifically characterize coastal vegetation, coastal morphology and forests in the Great Lakes region.

Scientific questions to be addressed are: 1) is IKONOS data a viable alternative to color infrared (CIR) photographs for detailed mapping of coastal ecosystems, 2) will interferometric synthetic aperture radar (INSAR) data provide sufficient topographic detail to identify stressors related to high-water levels and shoreline morphology, 3) will the increased resolution of ETM+ data provide significant additional information (e.g. subcanopy flooding, canopy characteristics, age/size class, stem density) about Lake States forests that will be useful to resource managers, 4) can multi-season ETM+ data allow more accurate classification watershed vegetation, and 5) determine if it is practical for potential users to gather these detailed spaceborne measurements, using these methods, across large study areas.

Expected Benefits:

These data will be valuable for improving basic inventory and monitoring of coastal areas, wetlands and forest environments, but will also be critical for improving models of wildlife use of these ecosystems and decision support for watershed health. The work will be conducted at CWE/NRRI, University of Minnesota where remote sensing technology has been extensively applied to issues of natural resources inventory, monitoring and general use in decision-support for local, state, and federal agencies.