

**A METHOD FOR MAPPING THE SPATIAL DISTRIBUTION  
OF SUSPENDED SEDIMENTS WITHIN LAKES OR RESERVOIRS  
USING LANDSAT MULTISPECTRAL SCANNER DATA**

John Harrington, Jr., Frank Schiebe, and John Ross  
USDA Agricultural Research Service  
Water Quality and Watershed Research Laboratory  
Durant, OK 74702

**ABSTRACT**

The cost of in situ sampling for water quality precludes frequent observation. Remote sensing satellites provide an alternative means for obtaining detailed information concerning the synoptic patterns of suspended sediment within surface waters. This paper discusses the methods used to prepare thematic maps of the spatial pattern of suspended sediment variation within Lake Thunderbird, a water supply and flood control reservoir in central Oklahoma. Landsat MSS data for 15 dates from 1987 and 1988 were analyzed and mapped. Areas within the reservoir corresponding to five distinct classes of suspended sediment concentration (i.e., 0-25 mg/l, 25-50 mg/l, 50-75 mg/l, 75-100 mg/l, and > 100 mg/l) were determined for each date. Examination of these thematic maps provides important insights concerning the physical limnological cycle for Lake Thunderbird and the size of the reservoir area impacted by sediment laden runoff from precipitation events of varying magnitude.

The method used in producing the thematic maps involves use of a theoretically-derived exponential equation that relates the exoatmospheric reflectance recorded by the Landsat satellite to suspended sediment concentrations. This equation was calibrated using data from 16 lakes in southcentral Oklahoma. The raw Landsat MSS digital numbers are converted to corresponding suspended sediment concentration using the exponential equation. An atmospheric correction factor that also takes into account the problems introduced by the cubic convolution transformation used in geometric correction of the data is incorporated in this data transformation. The atmospheric correction and thematic classification is applied to Landsat MSS band 3 data.

The importance of this capability for global water quality monitoring will be identified. In addition, potential problems associated with the transfer to this procedure to other environments will be addressed.