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EXPLORING MOISTURE INDICES FOR CHARACTERIZING DROUGHT IN VERMONT

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In Vermont, the spectre of drought and its corresponding range of impacts is a source of ongoing concern for scientists, emergency management officials and policy makers alike. The ongoing 2001-2002 drought has again highlighted a number of previously observed characteristics in terms of the timing of the onset during the fall and winter, the highly variable spatial nature of the severity of the impacts and the diverse atmospheric dynamics that operate over such a small area. Unlike the droughts of 1994-1995 and 1998-1999, however, the 2001-2002 drought has not to date been reversed or tempered by a severe weather event of the magnitude of a tropical cyclone or its remnants. As the state moves towards the creation of a comprehensive drought mitigation plan, it becomes imperative to quantify appropriate triggers for both summer and winter conditions. One component of this revolves around quantifying the amount of surface moisture present across the state at any given time period since this will have a bearing on the agricultural and forestry sectors to name a few. Given the existing network density, remotely sensed data have been explored as an alternative that captures the spatial heterogeneity of the land use/land cover across the state and the coincident moisture conditions.

A number of moisture indices were examined to quantify their usefulness in the Vermont context. The first involved a moisture scheme developed for the semiarid Brazilian northeast using Landsat Thematic Mapper (TM) bands 1, 4 and 6 (Dupigny-Giroux and Lewis, 1999). The index is given by the triangular spectral relationship of the thermal infrared temperatures plotted against the ratio of band 4 to band 1. The application of this index to a midlatitude context yielded interesting results. These included the fact that the characteristic shape of the index was only observed during the summer, as well as the fact that the bounding asymptotes of the index varied in feature space from one time period to the next. These, and other observations were a function of the climate and vegetative differences that exist between the two environments.

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As such, another line of enquiry involved the wetness and greenness components of the Tasseled Cap transform of Kauth and Thomas (1976). The coincident use of these imagery allowed for the distinction between non-turbid and silt-laden water; the mapping of wetland extents (which vary between drought and "normal" years); the monitoring of blue/green algal blooms (another marked water-related drought characteristic) and; irrigated features that were juxtaposed with dryland vegetation. From these observations, indicators were created from which drought magnitude as well as amelioration were mapped.

The use of remotely sensed imagery has proven to be an invaluable tool in quantifying and monitoring surface moisture in Vermont during recent droughts. The format of the data and their spatial extent offer further advantages to their integration into the proposed GIS-based drought mitigation planning process.

Dupigny-Giroux, L.-A. and Lewis, J.E., 1999: A Moisture Index for Surface Characterization over a Semiarid Area. *Photogrammetric Engineering and Remote Sensing*, **65**(8), 937-945.

Kauth, R.J. and Thomas, G.S., 1976: The Tasseled Cap - A Graphic Description of the Spectral-Temporal Development of Agricultural Crops as Seen by Landsat. in *LARS: Proceedings of the Symposium on Machine Processing of Remotely Sensed Data*, West Lafayette, IN, 4B-41 - 4B 51.