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APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR INVENTORY AND CLASSIFICATION OF WETLANDS.

Dr. David S. Gilmer
U. S. Fish & Wildlife Service
Northern Prairie Wildlife Research Center
Jamestown, North Dakota 58401

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David S. Gilmer (IN 300) and J. Colwell, ERIM

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16. Abstract

Discrimination of prairie ponds and lakes was not appreciably improved using two MSS channels vs a single channel (MSS7). The use of two channels, however, may prove to be effective in normalizing the influence of certain external effects on level slicing. Evaluation of this concept is in progress. Multi-temporal processing using July and ~~September~~ Landsat data is now in progress. Significant results of data analysis will be described in the final report.

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LANDSAT-2

Title: Application of LANDSAT system for improving methodology for inventory and classification of wetlands.

LANDSAT Proposal No.: 23000

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A. Problems

We have experienced some delay in our work schedule caused by personnel changes and evaluation of new concepts in data analysis. A three month no-cost time extension has been requested.

B. Accomplishments

During this current quarter the emphasis has been twofold: (1) processing of Landsat MSS data; and (2) the development of procedures for using this data to assist wildlife managers in better managing waterfowl populations. Details of these efforts are contained in the following material.

Pond Differentiation

Some investigators have indicated that better separation between water and non-water classes could be achieved using two Landsat channels rather than the use of a single channel.* We previously evaluated this concept on 1973 Landsat data but the results did not show increased discriminability using two channels of data. In view of our need to optimally differentiate ponds from other targets we decided to conduct a more exhaustive evaluation on another Landsat data set collected on 15 July 1975.

Using the 15 July data, a total of 40 signatures representing most of the terrain classes and spectral variability present in the scene were determined. Mean values of these signatures were plotted in two combinations of two-channel data space, namely MSS4 vs MSS7, and MSS5 vs MSS7. The results are presented in Figures 1 and 2. Based on these results we see little or no additional value to using any data other than MSS7 to differentiate water from non-water.

However, there may be other advantages to two channel data processing. One of the serious limitations of a single channel approach is that the optimal "slicing level" may change from time to time, from frame to frame,

*NASA, L. B. Johnson Space Center, August 1973, "Development of a two-channel linear discriminant function for detecting and identifying surface water using ERTS-1 data."

or even within a frame, as external factors such as atmospheric conditions or solar zenith angle change. For example, for one set of MSS7 data we processed, a level slice at a digital count of 7 was used on one frame (May 4), but a level slice of 9 had to be used on a frame obtained the following day (May 5) in order to get comparable results in the overlap region. The apparent reason for this change was hazy atmospheric conditions on the May 5 data. Without a change in level slice there would have been substantial errors in the data. For example, a single lake which had an indicated contiguous area of 88 ha using the May 4 data and a level slice of seven had 7 discontinuous groups of points indicating 42 ha using the same level slice on the May 5 data.

One possible two channel processing approach, ratioing, is generally effective at normalizing the multiplicative part of external effects. Therefore, we are investigating the utility of ratioing in normalizing the slicing level for differentiating ponds. These results will be reported when the analysis is complete.

Multitemporal processing

In previous work we found Landsat classification of terrain types less accurate than desired for certain classes of materials. For example, we had some difficulty differentiating small grain vegetation from shallow marsh vegetation using July 1973 data.

In an attempt to improve classification performance we decided to implement multitemporal Landsat data processing. Since July data had previously been identified as a near optimum time for classification of most terrain classes, we searched for another time of year (phenological stage) which would facilitate differentiation of classes which proved troublesome using just July data.

We did this by examining ground truth designations of terrain classes on aerial photographs, and by extrapolating these identifications to Landsat color IR composites. Twelve color IR composites were examined, encompassing the period from May to October. On the basis of this analysis it was concluded that a September data set would best complement a July data set for differentiation of terrain classes.

The two specific dates which were chosen for multitemporal processing were July 15, 1975 (observation 5087-16304) and September 16, 1975 (observation 2237-16415). The July 15 data (CCT's) were already in house. The September 16 data were ordered, and were received on 2 June 1977.

Since receiving the September data we have done a format conversion on it to make it compatible with ERIM hardware/software. We are now in the process of rotating and scaling the July and September 1975 Landsat data so that the two data sets can be merged for multitemporal processing.

Utilization of Landsat Data

Terrain classification maps, in themselves, should be useful to waterfowl managers. However, it is our hope to be able to develop procedures to analyze the terrain classification in order to quantitatively assess the quality of the waterfowl habitat. We have made a review of the available literature which has led to our development of preliminary concepts which could be used to construct ratings of waterfowl habitat quality. These initial concepts are presently being reviewed at NPWRC.

Three parameters which have been shown to be important to waterfowl productivity are: 1) the number of ponds in May; 2) the number of ponds in July; and 3) the ratio of the number of ponds present in May and July.* These are all potentially estimable using Landsat data. We are presently constructing relationships between Landsat derivable parameters and duck production for Stratum 46.

C. Significant Results

Significant results will be described in the final report.

D. Publications

None during this period.

E. Recommendations

None

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* Cooch, F. G. 1969. Waterfowl-production habitat requirements. pp. 5-10 in Saskatoon Wetlands Seminar. Canadian Wildlife Service Report Series No. 6, Ottata, Ontario.

Geis, A. D., R. K. Martinsen, and D. R. Anderson. 1969. Establishing hunting regulations and allowable harvest of mallards in the United States. J. Wildl. Mgmt. 33(4):848-859.

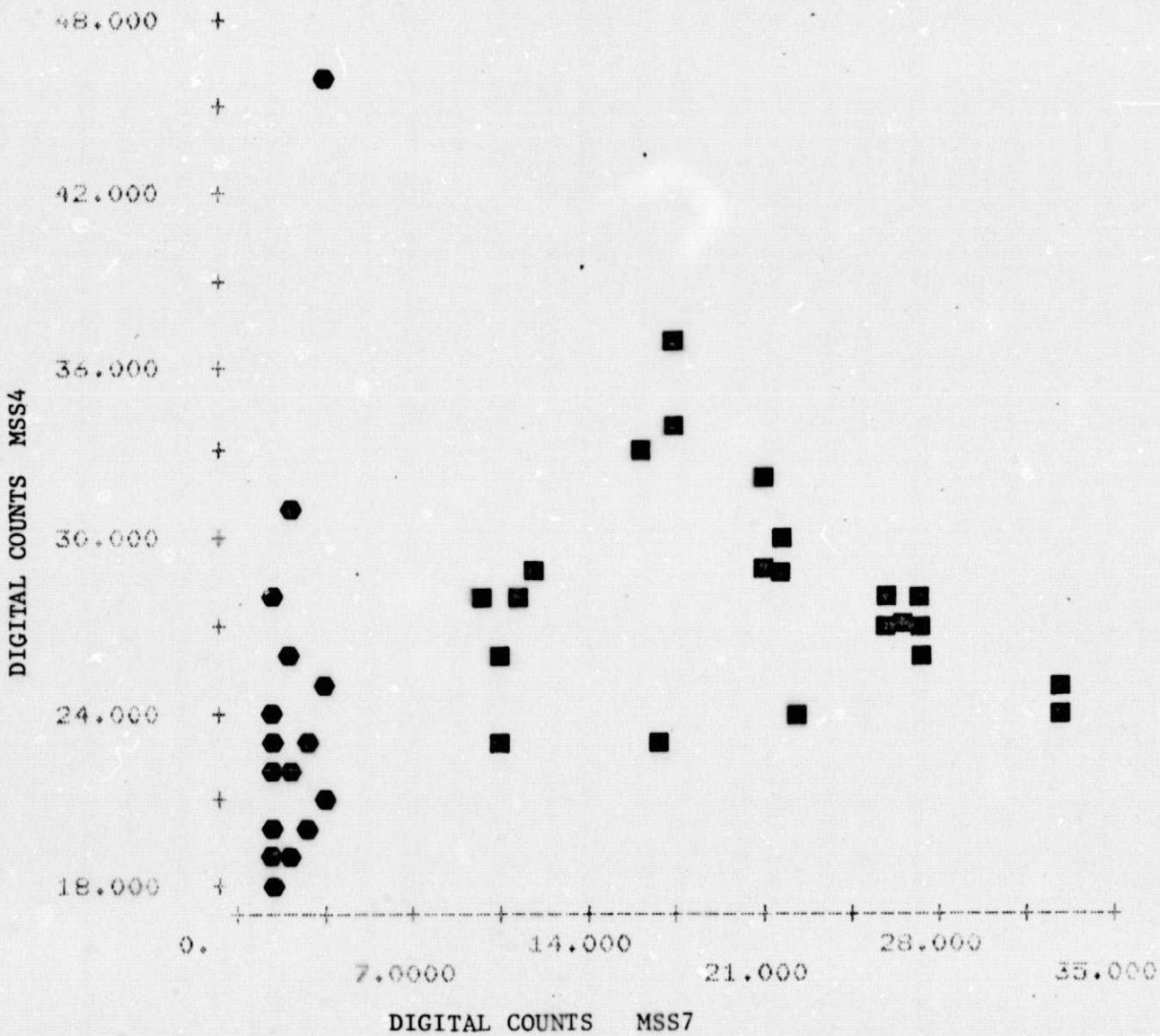

FIGURE 1. SCATTER PLOT OF MEAN DIGITAL VALUES FOR WATER (●) AND NON-WATER (■) CATEGORIES FROM 15 JULY 1975 LANDSAT DATA.

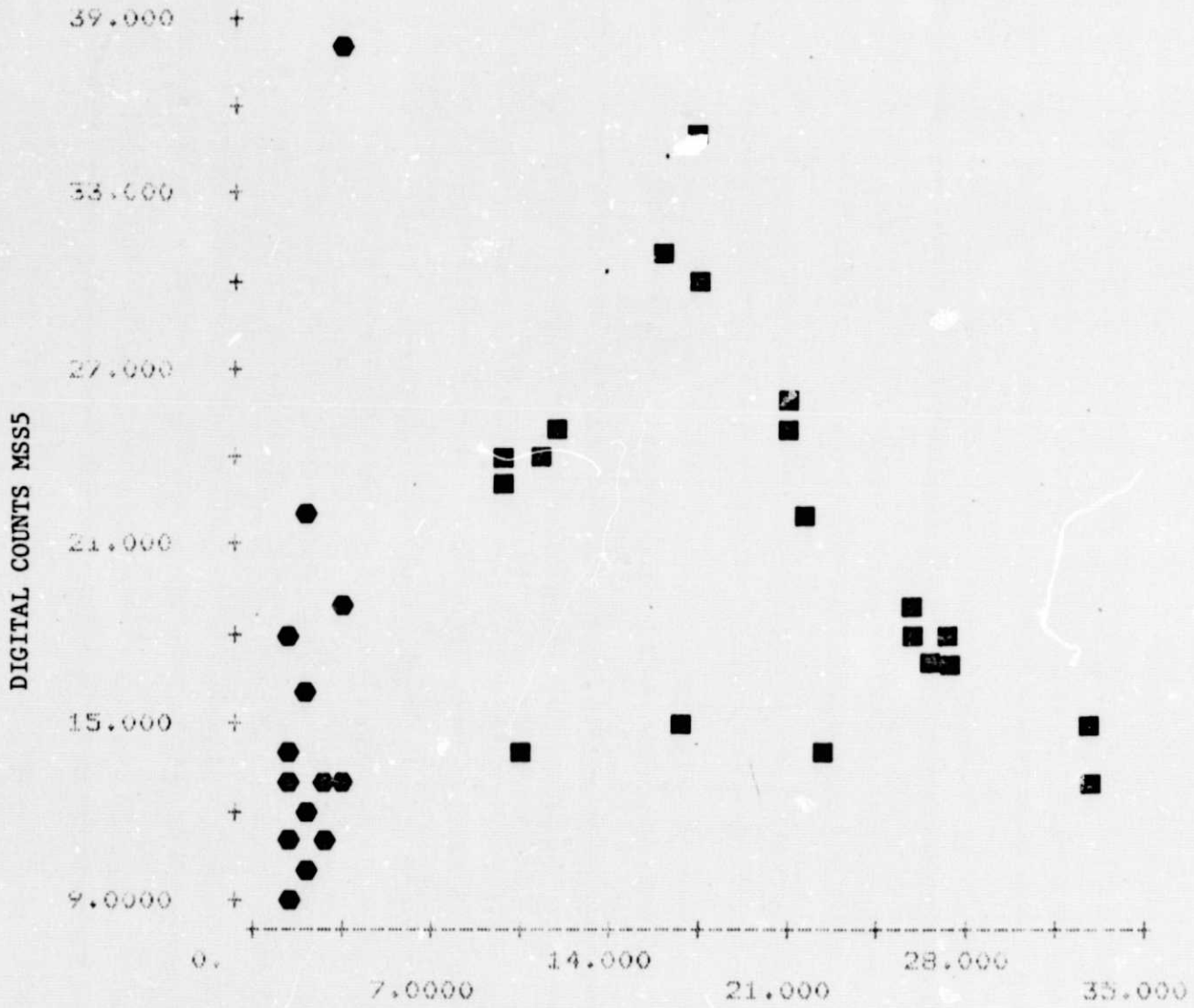

FIGURE 2. SCATTER PLOT OF MEAN DIGITAL VALUES FOR WATER (●) AND NON-WATER (■) CATEGORIES FROM 15 JULY 1975 LANDSAT DATA.