

ABSTRACT OF THE THESIS

DYNAMICS OF SOIL ALGAE IN FIELD AND FOREST ENVIRONMENTS

By MARGO ELAINE HUNT

Thesis director: Professor Gary L. Floyd

The prokaryotic (blue-green) and eukaryotic algal components of soil were quantified and identified generically over a seventeen month period in two successional fields and a climax forest. A correlation of the quantitative and qualitative changes was sought with other biological components of soil and the major chemical and physical parameters of their environment.

The highest counts obtained for the eukaryotic algae were 3.3×10^7 , 2.2×10^7 , and 1.2×10^5 cells/gm soil for a 1-yr old field, an 11-yr old field, and the forest, respectively. The highest counts obtained for the blue-green algae were 8.2×10^5 , 2.3×10^5 , and 1.6×10^4 cells/gm soil for the 1-yr old site, the 11-yr old site, and the forest, respectively. The number of algae in all three sites declined from previous spring highs by one to three orders of magnitude during the summer. There was no decline in winter. The greatest number of algal genera was found in the 1-yr old field,

i.e., 28 of a total 35 isolated or 80%; fewer were observed in the 11-yr old field and the forest, 57% and 63%, respectively.

A predictive model of a soil ecosystem was formed by multiple regression analysis. The significant factors that showed a relationship with the blue-green algae were pH, time, magnesium, precipitation, and the eukaryotic algae, $R^2 = 45\%$. The significant factors that showed a relationship with the eukaryotic algae were time, magnesium, and the blue-green algae, $R^2 = 37\%$. Prediction equations were tested against additional data with success.

Application of a herbicide, 3-(3,4-dichlorophenyl)-1-methoxy-1-methyl urea (linuron), to the 1-yr field was found to have a short-term significant effect on the numbers of blue-green algae isolated. No significant effect on numbers of eukaryotic algae was observed.