Reprinted from

Tenth International Symposium

Machine Processing of

Remotely Sensed Data

with special emphasis on

Thematic Mapper Data and

Geographic Information Systems

June 12 - 14, 1984

Proceedings

SUMMARY OF THE NASA/GODDARD GEOBOTANICAL PROGRAM

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(Manuscript not available at time of
printing.)

ABSTRACT

During the period 1979 to 1982, we
conducted a field remote sensing-geobotan-
ical experiment at a variety of sites in
the sulfide districts of central Virginia.
The first two years can be considered a
training phase. During this period the
experiment was designed as a series of
paired test sites. One of the sites in
each pair was placed over a known area of
high soil trace metal concentrations (sul-
fides of copper, lead and zinc). The
other or background site in each pair was,
as best as could be determined, similar to
its "mineralized" match in all aspects,
save the presence of the high soil trace
metal concentrations. At each site leaf
samples were collected systematically
throughout the growing season and measured
for spectral reflectance using a three
band hand-held radiometer configured to
mimic three bands of the Thematic Mapper
-- TM3, TM4, and TM5. Soil samples were
taken at the base of each tree samples and
were analyzed for concentrations of trace
metals, micro- and macronutrients. These
data were then analyzed to assess patterns
of variation related to a number of factors.

In the last year of the research an
experiment was set up to test the techniques
and results developed in the two previous
years. This experiment involved searching
"blind" for a soil anomaly in an area 1.2km
by 0.5km in central Virginia near the town
of Arvonia. The presence and locations of
the anomalies were known to a mining com-
pany (with whom we had a cooperative agree-
ment) but not to us. The only a priori
knowledge available to us was 1) the
presence of anomalous soil trace metal con-
centrations somewhere in the area; 2) our
previous results, specifically the "fall
window"; 3) very general lithological in-
formation. Using a 420 tree sampling grid,
leaf reflectance values were obtained on
four dates during the fall period. Appli-
cation of some very simple data manipula-
tion techniques and contouring the results
yielded four reflectance anomalies cover-
ing about 20% of the test site. When soil
chemistry data were subsequently made
available to us, the largest two anomalies
corresponded well with the highest copper
concentration at the site.

In further more formal analysis to
evaluate the quality of our results, we
examined the errors of omission and com-
mission created by the technique. From
these we suggest a general strategy for
use of the technique and outline a simu-
lation or gaming approach towards selec-
tion of technique parameters for a specif-
ic exploration setting and a related
expected gain.