ACCESS NUMBER: IA8-27

STUDY TITLE: Mapping of Seagrasses by Remote Sensing in the Eastern Gulf of Mexico

REPORT TITLE: Mapping of Submerged Vegetation Using Remote Sensing Technology

CONTRACT NUMBERS: BLM: IA8-27

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA: Eastern Gulf of Mexico

FISCAL YEAR OF PROJECT FUNDING: 1978

COMPLETION DATE OF REPORT: 1981

COST: FY 1978: $5,000

CUMULATIVE PROJECT COST: $5,000

PROJECT MANAGERS: K. Savastano

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KEY WORDS: Eastern Gulf; Florida; baseline; seagrasses; aerial photography; photographs; subtidal; St. Joseph Bay; estuarine; coastal zone; maps; historical review; macrophytes

BACKGROUND: Seagrasses have a potential role as indicators of the impact of man's activities on estuarine and coastal ecosystems. Information on changes in seagrass distribution, abundance, and diversity can aid in decisions and guidelines for coastal zone management. However, it is first necessary to develop a technique to provide distribution and abundance data accurately and economically. Aerospace color remote sensing could satisfy this requirement. This project was designed to investigate the potential for utilizing this technology with modifications for mapping seagrass distributions.

OBJECTIVES: (1) To evaluate a 21-channel solid state array spectroradiometer (SAS); (2) to determine if common seagrasses and other bottom types can be detected and differentiated with high resolution spectral data; (3) to develop and document applicable computer algorithms for processing, analyzing, and classifying spectral data into charts of seagrass distribution; and (4) to determine any deleterious effects of water depth and optical properties on spectral signatures of seagrasses.

DESCRIPTION: Two types of data were collected. The first type involved surface truth data collected from 20 stations in St. Joseph Bay, Florida on 17 May 1978. Remote sensing data were collected on 18 and 19 May 1978. Surface truth data were used to identify indigenous seagrasses and to describe respective environments. The remotely sensed data were collected from a Beechcraft E-18S equipped with a 70-mm Hasselblad camera, Zeiss RMK 15/23 camera with a 15.24-cm focal length lens, a RS-18 multispectral scanner, and the SAS. Flights were flown at 1,520 m for the RS-18 and at 3,050 m for the SAS data collection efforts. Remote sensing data were analyzed using spectral information from the training fields and a discriminant function analysis computer program to develop algorithms used in a supervised pattern recognition approach. Secondarily, spectral data were combined with supervised data groupings in a hybrid supervised-unsupervised maximum likelihood pattern recognition approach.

SIGNIFICANT CONCLUSIONS: The project demonstrated the ability to use remotely sensed data and advanced computer techniques to map monospecific benthic vegetation in a fairly stable environment. However, the project was unsuccessful in evaluating the feasibility of mapping multispecies benthic vegetation assemblages in complex open coastal environments.

STUDY RESULTS: The project failed to produce a usable classification product for the user community. It was determined that several modifications were needed before the SAS could be considered an operational sensor, including: (1) a wider field of view so that ground track and aircraft attitude are not so critical; (2) a greater dynamic range for the signal in order to accommodate varying signal levels encountered in a mission; (3) a higher data rate to lower the aspect ratio thereby giving better ground resolution; (4) inclusion of aircraft attitude data in the SAS data stream to allow correction of the data for pointing errors; and (5) overall system noise reduction to achieve true 8-bit resolution.

Qualitative comparison of the classification results with ground truth data led to the conclusion that the classification maps were detailed and accurate. However, some imperfections were noted in the maps. Comparisons were made of seagrass distributions in the bay using historical data and the remotely sensed information from this study. The estimate of 2,300 to 2,400 hectares of vegetation covering the bay measured in this study compared well with an estimate of 2,560 hectares reported in 1972. This supported a finding that the bay macroplant community distribution is relatively stable on an annual basis.

The multispectral scanner sensor used in this investigation offered advantages over surface based mapping or mapping from conventional aerial photography in terms of resolution of different water depths, bottom types, and types and densities of submerged vegetation coverage.

STUDY PRODUCT: Savastano, K. J., K. H. Faller, L. W. McFadin, and H. Holley. 1981. Mapping of Submerged Vegetation Using Remote Sensing Technology. A final report by the National Marine Fisheries Service, Southeast Fisheries Center for the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office,

New Orleans, LA. NTIS No. PB82-163072. NOAA Technical Memorandum NMFS-SEFC-73. Contract No. AA551-IA8-27. 68 pp.

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