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**GEOSPATIAL EDUCATION AND RESEARCH
DEVELOPMENT: A LABORATORY FOR REMOTE SENSING
AND ENVIRONMENTAL ANALYSIS (LaRSEA)**

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FINAL REPORT

For the period ending September 30, 1998

Prepared for

NASA Langley Research Center
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Under

NASA Grant NAG5-6491
ODURF #174011

January 1999



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1.0 PROJECT SUMMARY

Old Dominion University has claimed the title "University of the 21st Century," with a bold emphasis on technology innovation and application. In keeping with this claim, the proposed work has implemented a new laboratory equipped for remote sensing as well as curriculum and research innovations afforded for present and future faculty and students. The developments summarized within this report would not have been possible without the support of the NASA grant and significant cost-sharing of several units within the University. The grant effectively spring-boarded the university into major improvements in its approach to remote sensing and geospatial information technologies. The university has now committed to licensing Erdas Imagine software for the laboratory, a campus-wide ESRI geographic information system (GIS) products license, and several smaller software and hardware utilities available to faculty and students through the laboratory. Campus beneficiaries of this grant have included faculty from departments including Ocean, Earth, and Atmospheric Sciences, Political Science and Geography, Ecological Sciences, Environmental Health, and Civil and Environmental Engineering. High student interest is evidenced in students in geology, geography, ecology, urban studies, and planning. Three new courses have been added to the catalog and offered this year. Cross-cutting curriculum changes are in place with growing enrollments in remote sensing, GIS, and a new co-taught seminar in applied coastal remote sensing. The enabling grant has also allowed project participants to attract external funding for research grants, thereby providing additional funds beyond the planned matching, maintenance and growth of software and hardware, and stipends for student assistants. Two undergraduate assistants and two graduate assistants have been employed by full-time assistantships as a result. A new certificate is offered

to students completing an interdisciplinary course sequence in remote sensing and coastal environments. Subsequent phases of the project are under planning, including seminars for regional coastal managers and public dissemination of remote sensing science through the local media and university publications.

2.0 PROJECT DESCRIPTION

2.1 Research and Teaching Activities

2.1.1. Research Enablement

This grant began at a most opportune time as the regional demand for geospatial information and research expertise was beginning to grow. Supplementary funding by Old Dominion University provided for a centralized GIS server which is also capable of image analysis. This has expanded the ability for research to 20 more faculty and graduate students than otherwise available in a single-seat laboratory. The matching gained by a site license for ESRI GIS products also has produced a growing interest faculty development toward GIS and remote sensing. Graduate students have begun to pursue remote sensing applications projects in Oceanography, Ecology, and Geology, including three doctoral candidates and two masters students. This is compared to a state of zero student usage of RS/GIS techniques in research only two years ago.

External regional entities have been beneficiaries of this grant as well. Training or assistance has been provided to personnel from: Chincoteague National Wildlife Refuge, Eastern Shore of Virginia National Wildlife Refuge, Hampton Roads Planning District Commission, interns from the Virginia Beach City Environmental Planning Office, Virginia Department of Public Health- Norfolk Health Department Vector Control, and Applied Marine Research Laboratory. New grants directly consequent to this grant include partnerships with Eastern Shore of Virginia National Wildlife Refuge, National Science Foundation multi-institutional grant with Memphis University, and a grant from NASA Langley Research Center. Further, several proposals have been generated by faculty integrating RS/GIS approaches, including the following submissions: NASA Remote Sensing Applications Center (RESAC) for Coastal Environmental Health, National Science Foundation,

Institute for Global Environmental Change (NIGEC), Parsons Foundation, and NASA Solid Earth and Natural Hazards Program.

Specific Objectives and Results of LaRSEA:

- 1 Implement an integrated curriculum for teaching remote sensing and coastal environmental studies:

Result: Added three new courses in oceanography and geography.

- 2 Establish laboratory facilities for research and instruction in image processing and related geospatial techniques (Phase I of a centralized university center for geographic information science):

Result: Added both instructional and research labs, including increasing demand for a third student lab equipped for GIS/RS studies in Spring 1999.

- 3 Train region professionals in state-of-the-art image processing and associated spatial information technology:

Result: Provided training or assistance to US Fish and Wildlife personnel at Chincoteague and Eastern Shore National Wildlife Refuges, Hampton Roads Planning District Commission, and Virginia Beach City Planning Departments. Negotiating contracting of short-courses for summer 1999.

- 4 Integrate remote sensing into environmental monitoring and restoration programs by establishing a regional node of expertise:

Result: Proposals submitted and network of professionals established.

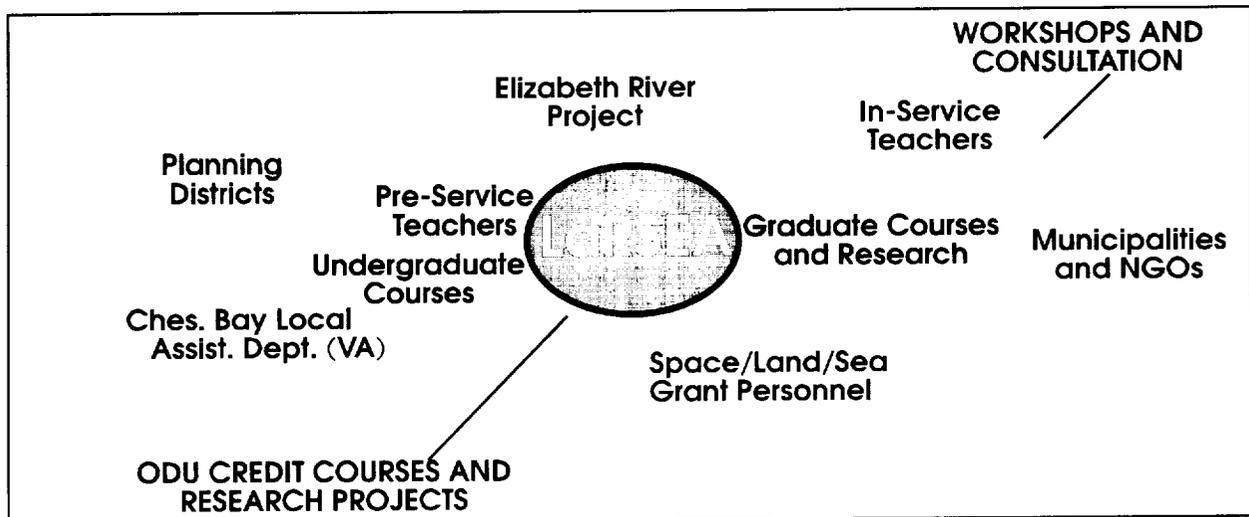


Figure 1. LaRSEA instruction, research, and workshop training among university and regional user groups.

Improved remote sensing instruction will enable improved earth systems education (c.f., Nellis 1994). These educational advances at our institution will be conducted by curriculum changes and laboratory implementation.

2.1.3 Curriculum Structure

The infrastructure contributes to undergraduate projects and graduate theses not listed in primary coursework. The following courses have been improved by availability of centralized hardware and software in our instructional lab:

- GEOG 300 Maps and Geographic Information
- GEOG 402/502 Geographic Information Systems
- GEOG 403/503 Remote Sensing of the Environment
- GEOG 404/504 GIS Management
- GEOG 490/590 Applied GIS/Cartography

GEOG	422/522	Coastal Geography
OCEAN	414/514	Coastal Landscape Ecology
OCEAN	436/536	Barrier Islands and Tidal Inlets

New courses which have been approved and taught thus far include the following:

GEOG	404/504	Digital Techniques for Remote Sensing
GEOG	419/510	Spatial Analysis of Coastal Environments
OCEAN	415/515	Spatial Analysis of Coastal Environments (co-taught)

Courses pending submission and curriculum review:

OCEAN	7xx/8xx	Field & Remote Analyses of Coastal Systems
GEOG/OCEAN	495/595	Seminar in Coastal Research
GEOG/OCEAN	7xx/8xx	Statistical Approaches in Remote & Field Assessments
GEOG	590	Applied GIS/Cartography

2.1.4 Academic Certification

A certificate provides incentive for specialization in remote sensing and coastal studies, recognition in the rapidly expanding fields of remote sensing and GIS, and aid students interested in pursuing careers and postgraduate studies. Few models of professional certification are available in this realm beside those of the American Society for Photogrammetry and Remote Sensing (Certified Mapping Scientist and Photogrammetrist). The certificate we offer amounts to the equivalent of a interdisciplinary minor and is available to undergraduates and graduates. The Appendix A gives the flyer presently used to promote the certificate. Appendix B is the university catalog listing.

2.1.5 Training and Professional Development

Our goal for professional training is to raise the awareness and abilities of remote sensing applications among selected professionals (planners, land managers and cooperative extension agents). The laboratory will hold its first "Open House" at Old Dominion University in January 1999. We now plan to hold additional demonstration days, targeting faculty and students independently to become involved in lab courses and research. Thus far, there have been a small number of professionals coming to take formal courses. Three to four students have enrolled in remote sensing exclusively because of the availability of the certificate.

2.2. Equipment Description

2.2.1 Dedicated Space and Support

Two laboratories have been developed. The research lab is located in the Oceanography/Physics building and provides office space for investigators and students requiring the high-end machines and peripheral devices. The OCPS lab, is located on the third floor among faculty offices, a sediment dynamics research lab, a general-use geology/oceanography computer lab, and a small seminar room. Seminar speakers and other visitors are often shown the laboratory when guests of the Department or College of Sciences. The instructional lab is located in the Batten Arts & Letters building in the heart of campus classrooms facilities and proximate to most geography courses. This lab was renovated and rewired with 100-megabit to desktop Ethernet. This allowed very large bandwidth across campus through the ATM fiber network and servers, including redundant pathways. Both labs have telephones, backup power supplies/surge protectors, and additional door locks for security.

3.0 APPENDICES

Certification

in

Remote Sensing for Coastal Environmental Analysis

Purpose: The certificate verifies that graduates have literacy and a basic proficiency that prepares them for high-demand careers in remote sensing and GIS, with an emphasis on coastal environments and their management.

Description: The following courses provide an interdisciplinary program for students wishing to pursue careers in coastal management and research, remote sensing, or geographic information systems (GIS) applications. Rendered upon completion of the requirements, the certificate is an academic affidavit comprised of courses in geography and coastal oceanography, the certificate is administered jointly by the two departments. Students must take course in the following areas with a cumulative GPA of 3.0 or higher and no grade below a C in the following courses. The certificate is available to undergraduate and graduate students, and postgraduate professionals who meet the requirements. Students with comparable professional experience may be able to waive selected courses.

I. Core Courses

Ocen 414/514	Coastal Landscape Ecology	3 hrs
Geog 404/504	Remote Sensing of the Environment	<u>3 hrs</u>
		6 hrs

II. Interpretive Analysis Course

(pre-requisites: Ocen 414/514 Geog 404/504)

Geog 496/596	Spatial Analysis of Coastal Environments	
or		
Ocen 419/519	Spatial Analysis of Coastal Environments	<u>3 hrs</u>
		3 hrs

III. Capstone Courses

Select a 3 credit hr course from the list below:

Ocen 432/532	Oceanography of the Virginia Coast	(3 hrs)
Ocen 436/536	Barrier Islands and Coastal Lagoons	(3 hrs)
Geog 422/522	Coastal Geography	(3 hrs)
Geog 490/590	Applied GIS Cartography	(3 hrs)
Ocen 695	Research	(3 hrs)
Geog 697	Independent Study	(3 hrs)

TOTAL	<u>3 hrs</u>
	12 hrs

Undergraduate and Graduate Certification in Remote Sensing for Coastal Environmental Analysis

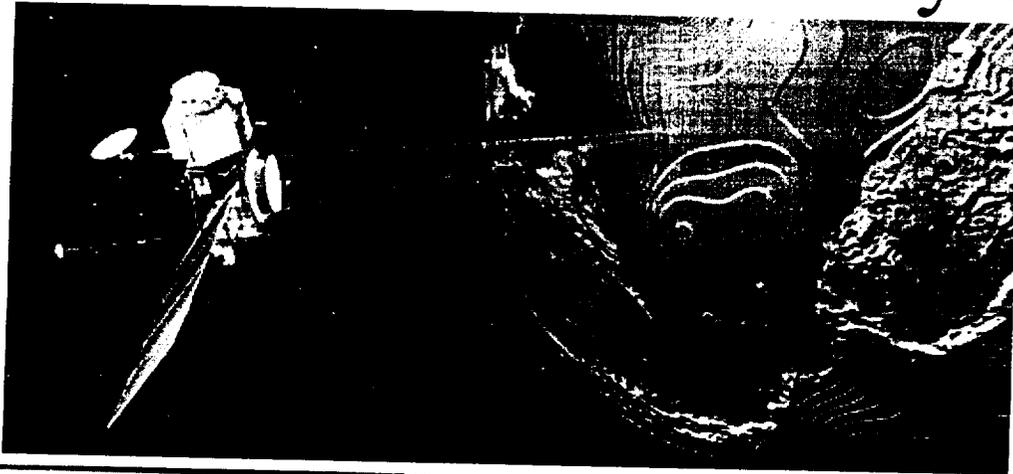
The certificate in remote sensing for coastal environmental analysis provides an interdisciplinary program for students wishing to pursue careers in coastal management and research, remote sensing, or geographic information systems (GIS) applications. Rendered upon completion of the requirements, the certificate is an academic affidavit comprised of courses in geography and oceanography and is administered jointly by the two departments. Students must take courses in the areas listed below and complete them with a cumulative GPA of 3.00 or higher and no grade below a C (2.00). The certificate is available to postgraduate professionals who meet the requirements. Students with comparable professional experience may be able to show competence in selected courses through examination.

Students seeking undergraduate certification complete the 400-level courses, and those seeking graduate certification complete the 500- and 600-level courses.

- I. **Core Courses:** OCEN 414/514 and GEOG 404/504 (six credits).
- II. **Interpretive Analysis Course:** GEOG/OCEN 416/516 (three credits).
- III. **Capstone Course:** Select a three credit hour course from the following: OCEN 432/532, 436/536, GEOG 422/522, 490/590, OCEN 495/695, and GEOG 497/697 (3 credits).



Laboratory for Remote Sensing and Coastal Environmental Analysis



Old Dominion University

Department of Ocean, Earth, and Atmospheric Sciences
Department of Political Science and Geography

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