

# **Center for Remote Sensing and Environmental Analysis**

College of Humanities and Social Sciences

## **Self-Study/Program Review (2017–2023)**

Director: Jindong Wu, Ph.D., Professor

Associate Director: Robert Voeks, Ph.D., Professor

Year Established: 2007

Year of Last Review: 2016

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Center Location: H-419

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## I. Mission and Goals

The Center for Remote Sensing and Environmental Analysis (CRSEA) employs satellite imagery and other remotely sensed data to obtain information about the surface of the Earth, and to analyze and model biophysical environmental change. CRSEA supports student learning with relevance both for careers and advanced graduate study, provides an image processing and computation facility for faculty and student research, enhances faculty and student recruitment, and offers new opportunities for seeking grants, contracts, and philanthropic donations in support of faculty and student research.

The primary goals of CRSEA are:

- To establish and maintain a well-equipped remote sensing facility and relevant curricula that will attract undergraduate and graduate students to California State University, Fullerton (CSUF);
- To create a student learning center that will qualify our graduates for careers in the rapidly-growing and increasingly applicable field of geospatial analysis;
- To encourage Master's-level students from a range of disciplines—geography, environmental studies, and others—to integrate remotely sensed data into their research;
- To provide a technologically advanced remote sensing laboratory for cooperative research on environmental problems between faculty and students;
- To establish a facility for cooperative research enterprises between CSUF faculty and environmental stakeholders—local, state, federal, and private.

CRSEA directly supports the missions of the Department of Geography & the Environment in offering courses and research opportunities in environmental analysis and application of geospatial technology, particularly remote sensing.

The mission and goals of CRSEA are well aligned with the University Strategic Plan (2018-2023) for maintaining academic excellence. In particular, CRSEA strives to attain the following CSUF Mission and Goals:

*Goal 1: Provide a transformative educational experience and environment for all students.*

*Goal 2: Strengthen opportunities for student completion and graduation.*

The growing demand for remote sensing and environmental expertise has been tremendous in recent years, extending to the private, governmental, and academic sectors. CRSEA provides advanced education and training that link degree and career to ensure Titan graduates are prepared to excel in the workforce or in further education (Goal 1). By engaging students with

high-impact practices in teaching and research, CRSEA seeks to improve student retention, eliminate barriers to graduation, and prepare students for success in a global society (Goal 2).

## **II. Activities**

### ***Curricular Development***

CRSEA provides students with a well-rounded education by offering a breadth of remote sensing and affiliated environmental analysis courses at 100-, 300-, 400-, and 500-levels. These courses prepare students with knowledge and skills in understanding Earth's physical environment and analyzing complex environmental issues.

#### *Remote Sensing Courses:*

- GEOG 486 Environmental Remote Sensing (Added an online modality)
- GEOG 489 Digital Image Processing (Added an online modality)
- GEOG 530T Monitoring Ecosystem Processes

#### *Affiliated Environmental Analysis Courses:*

- GEOG 110 Introduction to the Natural Environment
- GEOG 120 Global Environmental Problems
- GEOG 325 Natural Vegetation
- GEOG 328 Global Change and Environmental Systems
- GEOG 425 Tropical Rainforests
- GEOG 432 Ecotourism
- GEOG 520 Seminar in Physical Geography

### ***Research***

Between 2017 and 2023, the following research projects were initiated and carried out by CRSEA faculty and students.

- Estimation of Phytomass and Ecological Services of Urban Trees with Multi-Resolution Satellite Remotely Sensed Imagery
- Assessing Salton Sea Water Surface Change with Landsat TM and OLI Satellite Imagery
- Quantifying the Spatial Patterns of Wildfire Burn Severity with Satellite Remote Sensing
- Thermal Infrared Remote Sensing for Water Temperature Assessment along the Santa Ana River Using an Unmanned Aerial Vehicle System

- Exploring Colony Dynamics of Elegant Terns in the Southern California Bight in Relation to Prey Availability, Oceanographic Conditions, and Predator Disturbance
- The Ethnobotany of Eden: Rethinking the Jungle Medicine Narrative
- God's Healing Leaves: The Colonial Quest for Medicinal Plants in the Torrid Zone

### ***Community Engagement***

CRSEA has been actively engaged with intramural and extramural communities. Both directors serve on the Environmental Studies Program council. Dr. Wu has served as the coordinator for the Certificate in Geospatial Technologies, our newly developed degree program (more on this later). He has also served as a mentor in the Faculty Mentor Connex Program to provide support to pre-tenured faculty across the university on their research/creative activities, teaching, service, and career development. In addition, Dr. Wu served on the Academic Senate Standing Committee on the Library and the Technology Committee of the College of Humanities and Social Sciences.

Extramurally, Dr. Voeks has been the Editor-in-Chief of *Economic Botany* since 2009. Dr. Wu served on the Scientific Committee for the IEEE International Geoscience and Remote Sensing Symposium, chaired a paper session on "Remote Sensing of Water Bodies" at the 5th International Workshop on Earth Observation and Remote Sensing Applications, and has served as a reviewer for all major journals in the field of remote sensing.

## **III. Organizational Structure and Governance**

Housed within the College of Humanities and Social Sciences, CRSEA is affiliated with the Department of Geography and the Environment. As an interdisciplinary center, it has attracted participation from interested faculty and students campus wide. CRSEA faculty has collaborated with colleagues across campus and served on various Master's thesis committees.

CRSEA currently operates with an informal research group of CRSEA affiliated faculty but without a formal advisory board. We were pursuing the idea of setting up an advisory board, but relinquished the plan after further consideration. CRSEA operates with neither baseline budget support nor administrative staff. We simply do not have the financial capacity and human resources to cover the hidden costs of forming and maintaining an advisory board.

## **IV. Resources and Sustainability**

The Center is administered by a Director and an Associate Director. Currently, Dr. Wu serves as Director and Dr. Voeks as Associate Director. CRSEA is located in H-419 and consists of a

dedicated teaching laboratory and a research facility. CRSEA operates on “soft money.” Over the review period, CRSEA received intramural research and teaching grants worth \$24,000. We have been proactively seeking extramural funding opportunities by submitting research grant proposals to various agencies.

The Center was established in 2007 with the support of a grant from NASA and matching funds provided by the College of Humanities and Social Sciences. Desktops and workstations may need to be replaced and upgraded every few years when the cost of maintaining hardware outweighs the benefit of keeping old machines. Most software used in the Center has been provided through the CSU system-wide licenses, although we have acquired and will continue seeking funds from the College of Humanities and Social Sciences to support other essential software.

## **V. Highlights and Accomplishments**

Between 2017 and 2023, CRSEA fulfilled its mission and goals through a variety of research, teaching, advising, and community engagement activities. CRSEA faculty published a book, 13 peer-reviewed articles and book chapters, and 8 book reviews. During the same period, CRSEA faculty and students also presented numerous papers at regional, national, and international conferences.

CRSEA directors were recognized by various organizations for their accomplishments related to research, teaching, and service. Dr. Voeks received the Mary Klinger Book Award for *The Ethnobotany of Eden*, was honored with the President’s Award by the Society for Economic Botany and the Distinguished Faculty Award by the College of Humanities and Social Sciences. Dr. Wu received a Faculty Legacy Award for Excellence in Scholarly and Creative Activity and Innovations in Pedagogy and a Dean’s Faculty Scholarly Achievement Award from the College of Humanities and Social Sciences.

Over the years, CRSEA has attracted some of our best undergraduate and graduate students and provided them with high-quality education in remote sensing and environmental analysis. Twelve graduate students have worked on their theses or dissertations with CRSEA directors. Among them, seven M.A. or M.S. students were enrolled in Geography, Environmental Studies, Geology, and Biology at CSUF; five Ph.D. students were from Brazil and Mozambique.

In response to the growing demand for geospatial professionals, we developed a 15-unit Certificate Program in Geospatial Technologies to prepare CSUF students with the skills and knowledge essential for the potential career in remote sensing and spatial analysis. Students completing the certificate will understand a variety of geospatial technologies, including

Geographic Information Systems, Global Positioning Systems, Web mapping, and image processing and interpretation techniques.

## **VI. Planning and Strategic Outlook**

Over the next three years, the Center plans to achieve the following:

- Expand CRSEA affiliated research group; reach out to new faculty hired during the pandemic years with expertise or interest in environmental science and spatial analysis and cultivate a collaborative research group.
- Promote across campus collaboration by organizing seminars or symposiums showcasing teaching and research activities in the related fields.
- Recruit more students to participate in undergraduate and graduate research, which was severely impacted by the drastic decrease in student enrollment (particularly graduate students in Geography) in the last few years. We would follow the recommendations made to us in the recent Geography Program Performance Review to grow student enrollment.
- Continue seeking research funding through public agencies and private foundations.