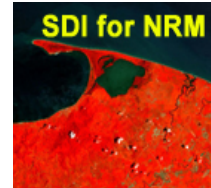




# ESSC 575 - Field Practicum Earth System Science: Science and Technology for Sustainability



**ESS Core Courses**

**Objectives, Description, Prerequisites**

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1999 Project  
1997 Project**

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Mayterm Trip**

**Forum  
Sust. Science**



**Norton  
Neighborhood  
Healthy Cities  
Maps - Aerials**

**Dunbar: Fiji,  
Honduras**

**Hayes:  
Rattlesnakes**

**Limnogeology:  
Buchheim: Great  
Basin-  
Ford: Great Salt  
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RI: Salton Sea  
GSLB Hydro-  
Observatory**

**Ford: Honduras**

**Photo Gallery**

Earth System Science Core Courses - LLU-SST - EBS							
<b>Bob Ford Home</b>	<b>SPOL 665 Info-Tech.</b>	<b>BIOL 549 Biodiv. &amp; Conser.</b>	<b>SPOL 624 Nature-Soc. Thought</b>	<b>SPOL 554 Env. Eq. Eco. Dev. Policy</b>	<b>ESSC 401-2 ES-Sci.</b>	<b>ESSC 541-2 Remote Sensing</b>	<b>ESSC 575 Field Practicum</b>

## The ESS (Earth System Science) Core Courses:

**ESSC 575: Field Practicum in Applied Earth System Science**--is the **CAPSTONE** research-oriented course in a sequence of active learning interdisciplinary senior/graduate-level courses, e.g. **ESSC 401-402, SPOL 665, SPOL 524, BIOL 549, SPOL 624, and ESSC 541-542** that provide the opportunity for students to experience "how earth system science is done" by active participation in analysis of *real-world* global change, **sustainability science**, and social policy problems inherent in real places, ecosystems, regions, sociocultural or public policy institutional/community settings (urban or rural). The course expands experiences first encountered in foundation courses which are all part of the **LLU ESSE21 Project** (Earth Systems Science Education for the 21st Century).

The **methods, tools, and concepts** emphasize use of computer visualization, modeling, and other Geospatial Decision-Support-System (**GDSS**) tools besides traditional field methods from the social, behavioral, health, and biophysical sciences applicable to a diversity of integrated systems science and thinking situations encountered in both formal as well as applied science such as planning, marketing, and public policy. The focus will be on use of Geographic Information Science (**GIS**), Global Positioning Systems (**GPS**), Remote Sensing (**RS**), and other systems modeling tools (**STELLA, NetWeaver/GeoNetweaver**) as well as qualitative methods such as **PRA** Participatory Rural Appraisal (**PRA**) for collaborative decision-making.

**Problem themes** chosen for analysis are by design **inter-disciplinary and place-based**--that is they focus on real

places, regions, ecosystems, social policy problems and issues that lend themselves to ESS (Earth Systems Science) critical thinking, analysis, and problem-solving (see places below).

A key **goal** is to promote **team-research skills** by providing a mechanism for linking students and faculty with local experts and the community at large in policy analysis and implementation, i.e. these will be "real" problems not just "make-do" classroom exercises and experiences.

**Academic partners** bring to bear expertise, networks, software/hardware, datasets, and field research linkages within the Loma Linda University (**LLU**) , School of Science and Technology (**SST**) and other local, regional and global partners, e.g. School of Public Health (**SPH**) Geoinformatics Unit (**HGU**) and well as outside partners in the **Inland Empire** (Riverside-Pomona-San Bernardino region east of Los Angeles) and globally including many, e.g. see **partners from Honduras**. Other local and US partners include:

- **CEEMaST**, Center for Education and Equity in Mathematics, Science, and Technology, California State University, Pomona. Contact: Dr. Jodye I. Selco Email: [jjiselco@csupomona.edu](mailto:jjiselco@csupomona.edu)
- **CGISR**, Center for Geographic Information Science Research: Contact : Miriam Cope, Director Email: [macope@csupomona.edu](mailto:macope@csupomona.edu)
- **Redlands Institute**: CES / MS\_GIS in cooperation with ESRI's - Sustainable Development solutions group.
- **Leica/Geo** - ERDAS Imagine
- **Clark Labs** - IDRISI Kilimanjaro
- **Isee, Inc.**(STELLA)
- **ICRSE** - International Center for Remote Sensing Education
- **CGIAR-CSI** -Consortium for Spatial Information

Places chosen for study will include both domestic and international, e.g. limnogeology in the **Rocky Mountain province**, biology of rattlesnakes in the **US Southwest**, the integrated water resources in the Salton Sea Basin (with the **Redlands Institute**) as well as coastal zone management (CZM) and biodiversity conservation on the **Mosquito Coast of Honduras and Fiji, East Africa, Jamaica, and the Bahamas**, as

well as environmental **health geoinformatics** problems such as air pollution, **West Nile Virus**, cancer risk, or social welfare and crime issues in Southern **California's Inland Empire** such as the **East Valley COMPASS** crime and safety program in Redlands/San Bernardino East Valley region, or the **Norton Neighborhoods / Healthy Cities Project** adjacent to **Loma Linda** and **San Bernardino**.

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## **OBJECTIVES:**

1. Introduce students to the systems approach to learning and doing research in STEM (Science, Technology, Engineering, and Mathematics) and encourage capable students to pursue careers in this arena, particularly in applied areas of **CBNRM** (Community-based Natural Resource Management).
2. Develop basic competence in the use of integrative computer modeling and mapping/GIS analysis tools such as **IDRISI, ERDAS, ArcView, SAS, NetWeaver/GeoNetweaver** tools as well as **STELLA II**, and field tools such as **ArcPAD, GPS** and "qualitative" tools such as **PRA (Participatory Rural Appraisal)** or "collaborative decision-making" tools.
3. **Learn-by-doing** in a team setting how science is done: hypothesis testing and defining, data analysis and collection, critical thinking and written communication, etc.

### ***Catalog Description - ESSC 575:***

*Students and teachers work together in the field to apply geospatial tools, Earth System Science methods and concepts, social policy analytical frameworks, and other conservation science methods to integrated place-based "sustainability" problems within a given ecosystem, community or region. The focus is on applying in practice the concepts and tools of "sustainability science" (see: <http://sustsci.aaas.org/>). Practice using field analytical tools such as GPS, ArcPAD (mobile GIS), varied ecological monitoring and assessment instruments (focused on ecosystems analysis, e.g. water, land, air, ecosystems), PRA (Participatory Rural Appraisal) as well as traditional ethnographic and socioeconomic "qualitative research" methods. Places chosen for study will include both*

*domestic and international:* For example:

- limnogeology in the Rocky Mountain province,
- biology of rattlesnakes in the US Southwest,
- integrated water resources in the Salton Sea Basin (with the Redlands Institute)
- coastal zone management (CZM) and biodiversity conservation on the Mosquito Coast of Honduras and Fiji , East Africa, Jamaica, and the Bahamas,
- environmental health geoinformatics problems such as air pollution, West Nile Virus, cancer risk,
- social welfare and crime issues in Southern California's Inland Empire such as the East Valley COMPASS crime and safety program in Redlands/San Bernardino East Valley region, or the Norton Neighborhoods / Healthy Cities Project adjacent to Loma Linda and San Bernardino.

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## 1997 PROJECT

The first course was done Spring 1997 and included students and faculty from Westminster College of Salt Lake City working in collaboration via the Web with the Department of Geography at the University of California, Santa Barbara under **Dr. James Proctor** who teaches a course entitled: ***Human-Induced Environmental Change (GEOG 186)***. This was part of an NSF-funded effort called **GLOBAL DIALOGUES PROJECT**. You can read the results in a publication entitled:

**James M. Hurley, James D. Proctor, and Robert E. Ford. 1999.** Collaborative Inquiry at a Distance: Using the Internet in Geography Education. *Journal of Geography* , Vol 98(3):128-140.

Each campus group studied an aspect of human-environment interaction in their respective mountain regions. The **UCSB** group focused on Sequoia and Kings Canyon National Park (SEKI) while Westminster College of Salt Lake City focused on environmental change in the Wasatch Mountains, Utah (**GSL Virtual Tour and Learning Module**) . Communication methods,

such as e-mail, world-wide-web, internet chat, and *CUCMe*, were utilized to collaborate and link research and communicate between the three groups.

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## **1999 THEMES/PLACES:**

**The Spring 1999 mayterm semester course focused on four primary issues and three places:**

### **Themes:**

- Coastal zone management,
- Applied earth systems science
- Biodiversity and conservation
- H DGC - Human Dimensions of Global Change

### **Places:**

- **Great Salt Lake, Utah** (see **GSL Virtual Tour and Learning Module**)
- **Mosquito Coast of Honduras** (1999 **ESS Field Course**) - see **1999 WCSLC Mayterm trip**
- **Sierra Nevada of California** (**UCSB via the Internet**)

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## **2004/2005 Field Research Themes and Places:**

A planning field trip was taken in **July 2004 to Honduras** to plan the field course in ESS which started in Spring/Summer of 2005 (**ESSC 575**)--see the **Honduras Field Project**. The focus will be on joint student-faculty research touching both areas of sustainable development and biodiversity conservation under **Robert Ford** as well as marine biology with **Stephen Dunbar**. Go here for selected **2004/2005 fieldtrip photos**.

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## **CONTACT:**

- **Robert E. Ford**, Professor of International Sustainable Development and Social Policy in the Department of Social Work and Social Ecology , and Earth and Biological Sciences, School of Science and Technology, Loma Linda University , Loma Linda, CA 92350
- **Stephen G. Dubar**, Assistant professor of marine biology, Earth and Biological Sciences, School of Science and Technology, Loma Linda University , Loma Linda, CA 92350

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### **TIME/LOCATION:**

The current field course for Spring/Summer 2005 is focusing on the **Mosquito Coast of Honduras**.

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### **PREREQUISITES:**

This is a senior/graduate-level seminar project-oriented course designed for pre-certification Education majors, Environmental Studies, Biology, Geology, Public Health, Computer Science, Nursing, Medicine, and Physical Sciences majors. Students must have completed the ESSC (Earth System Science) core sequence of courses or equivalent including:

- **ESSC 401/402 - Earth System and Global Change**
- **BIOL 549 - Biodiversity and Conservation**
- **SPOL 554 - Environment, Resources and Development Policy**
- **SPOL 624 - Nature/Society Thought and Social Policy**
- **SPOL 665 - Information Technology and Decision Science**
- **ESSC 541/542 - Remote Sensing/Systems Modeling in the Earth, Health and Social Sciences**

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### **Participating Schools and Institutions (past and present):**

- **CEEMaST**, Center for Education and Equity in Mathematics, Science, and Technology, California State University, Pomona
- **CGISR**, Center for Geographic Information Science Research, California State University, Pomona
- **Department of Geography, University of California Santa Barbara** with *Dr. James Proctor* who teaches a course entitled: *Human-Induced Environmental Change* (GEOG 186)- University of California, Santa Barbara
- **ESSE21 - Earth Systems Science Education for the 21st Century - USRA/NASA**
- **University of Utah** - Geography Department
- **Michigan State University - Department of Entemology - CEVL - Computational Ecology Visualization Laboratory**
- **Redlands Institute** - an applied research group at the University of Redlands that promotes collaborative, interdisciplinary research to develop solutions to critical environmental concerns - see specifically the CES and MS-GIS programs
- **University of Oklahoma** ESSE program
- **Westminster College of Salt Lake City** - was the ESSE sponsor from 1995-1999

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## **KEY ONLINE RESOURCES:**

### **General topics:**

- **Cultural / Human Geography** - systematic themes
- **Environmental Studies**
- **General Web resources** category List
- **Geography** - Mapping - GPS - Field Methods Resources
- **Geosciences** - Environment and Geoscience Sources
- **Regional:** Place, Region, Location

### **Ocean-Water-Hurricane Resources:**

- **Aquatic Ecology**
- **Coastal Zone** resources
- **Freshwater Lakes**
- **Great Lakes**

- **Hydrosphere**
- **Limnology:** Lakes and Inland Seas
- **Marine/Coastal Science**
- **Saline Lakes (Great Salt Lake Virtual Tour and Learning Module)**
- **TATU** (Hurricane Mitch)
- **USGS - Hurricane Mitch Programme - USAID**
- **Water Resources and water quality** Issues

### **Misc. Earth System Science (ESS) - Modeling Resources**

- **Bretherton Diagram** - ESSE
- **Creative Learning Exchange** - list of projects/materials - Systems Dynamics Group (SDEP) MIT
- **CEVL** - Computational Ecology Visualization Lab - Michigan State
- **Cybernetics** and Systems Science resources
- **ESSE** - Earth System Science Education Project (ESSE)-Related Resources
- **GIS/LIS and Remote Sensing** - Aerial Photo Resources
- **Modeling the Environment (Island Press)** - Models and Cases - Guide to Exercises - Model on Brine Shrimp - **Mono Lake**
- **Modeling**, Simulation and Visualization Resources
- **Pegasus Communications** - books on System Dynamics
- **SDEP Project** (System Dynamics in Education) - see especially the **Road Maps** guide
- **STELLA** resources
- **System Dynamics Group** - Sloan School of Management/MIT - 2002-3 Publications List
- **Systems Thinking** and Dynamic Modeling and Simulation - TOOLS
- **University of Oklahoma** - ESSE course materials
- **Visualization** and Web Graphics
- **Web Publishing** Resources - Teaching on the Web:
- **Woodrow Wilson Foundation** - Earth System materials

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### **Human Dimensions of Global Change (HDGC):**

- **AAG** (Association of American Geographers) Human Dimensions of Global Change Specialty Group
- **EES** - Earth's Environment and Society Group
- **GC** - Global Change and Hazards resources
- **HDGC** (Hands-on Resources) Project - AAG
- **Module on LULC** (Land Use/Land Cover and Global Change) and

**Resource Links**

- **VGD** - Virtual Geography Department project - homepage
- **Forum: Science and Innovation for Sustainable Development**

**Central America and Caribbean Web Resources:**

- **Belize** - country resources
- **Caribbean - Marine and Coastal Science**
- **Caribbean - Environment - Geosciences**
- **Caribbean - Cultural/Geographical**
- **Central America - Cultural**
- **Central America - Environment/Geosciences**
- **General resources**
- **Honduras** - country resources
- **Hurricane Mitch** - Honduras disaster links
- **Mexico** - country resources
- **Nicaragua** - country resources
- **South America** - general resources
- **TATU (Hurricane Mitch)**
- **USGS - Hurricane Mitch Programme** -

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