

# CET Syllabus of Record



**Program:** China Fieldwork Semester

**Course Code/ Course Title:** (XZ/ ENVR 151) Landscape Ecology

**Total Hours:** 45

**Recommended Credits:** 3

**Primary Discipline / Suggested Cross Listings:** Environmental Science / Biology, Research Methods

**Language of Instruction:** English

**Prerequisites/Requirements:** None

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## Description

Landscape Ecology is an immersive environmental science course focusing on landscape ecology and conservation biology. The course focuses on how patterns develop on landscapes as a result of the physical environment, biotic processes, and disturbance. Major topics include: the geologic basis of landscape, how climate, geology, and biodiversity influence ecosystem and community structure, the relationships between land and water use and ecosystem disturbance, population changes, and biodiversity decline, and restoration ecology, landscape management, and sustainable design. The course is taught using case-based and problem-based learning, with day-long fieldwork activities each week, in addition to readings and class meetings. The course concludes with a three-week concentrated field research component during CFS travel through the UNESCO World Heritage Three Parallel Rivers region in northwest Yunnan, including observation of the endangered black-neck crane in the Tibetan region of Shangri-la, as well as the Yunnan snub-nose monkey in the Baima Mountain Nature Reserve.

## Objectives

Through this course, students:

- Apply hands-on research skills of data collection, including identification of geological features, chemical and macroinvertebrate water testing, forest surveys, wildlife identification and observation
- Analyze research data with reference to scholarly monographs, articles, and interviews with local experts, and to discuss data findings and secondary sources in seminar format
- Document, edit, and publish their field research in a variety of formats: a field journal, short films, and project reports entered into the Yunnan Sustainability Network database
- Learn first-hand about human interactions with the environment through the study of local agriculture, fisheries, ethnobotany, the environmental impacts of development, and efforts aimed at ecological restoration

## Course Requirements

Attendance requirements are outlined the CET Attendance Policy.

Students are expected to keep up with the weekly workload and learn independently. Readings (typically 20-30 pages per week) coordinate with field activities and the CFS thematic core units. Discussions of readings and fieldwork uses a seminar format. Throughout the semester students

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engage in fieldwork, as well as a variety of group research projects. Students maintain a robust field journal documenting their experience, observations, and research. Group projects documenting water and air quality, forest health, land use, agricultural practices, and wildlife populations are added to the multi-year longitudinal environmental study of Xizhou and communities in the Three Parallel Rivers region and Tibetan plateau. All student research is archived in the Yunnan Sustainability Network database.

Student Led Discussions: Each week rotating groups of 2 – 3 students present a summary and discussion of course readings. Students giving the presentation produce a list of at least five discussion questions, give context to the thematic unit, and identify scientific, economic, social, and/or political implications associated with the issue. The group is responsible for leading a 30-minute discussion on the topic. Each student presents a maximum of two times during the semester. Grades are based on completeness and accuracy, quality of the presentation, and depth of the discussion questions.

Fieldwork and Journal: Fieldwork is an integral part of Environmental Science. It gives students hands-on experience, reinforces concepts, and helps develop analytical thinking skills. Fieldwork is carried out in groups of 2 – 3 students. Students are expected to keep their own field notebook or journal. Discussion among group members is encouraged, but each person must record their own data and observations, do their own calculations, construct their own tables, graphs, and maps, and write their own analyses.

Research Projects: Fieldwork involves group research projects. All data is recorded in the Field Journal. Project reports are prepared by the group members. Some project reports are presented as entries for the Yunnan Sustainability Network database. This format must have the following components: Title, Names (group members), Introduction (stating objectives, an explanation of what you are trying to prove, and/or what principles are being investigated; may include a hypothesis), Materials and Methods (a step-by-step outline or flow-diagram of the procedure), Results (observations and data arranged in tables, graphs, and/or diagrams; appropriately labeled), Discussion (data analysis, meaning of results, and error analysis where appropriate), and References.

### Methods of Evaluation

Student grades are formulated according to the following breakdown:

- Thematic unit assessments (quizzes and short essays): 20%
- Participation in seminar-style discussions and fieldwork: 20%
- Documentation Reports: 30%
- Comprehensive Field Journal: 30%

### Readings

Navjot S. Sodhi and Paul R. Ehrlich, *Conservation Biology for All*.

<http://www.mongabay.com/conservation-biology-for-all.html>.

Lambert, David. *The Field Guide to Geology*. Checkmark Books, 2007.

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Economy, Elizabeth C. *The River Runs Black: The Environmental Challenge to China's Future.*

Ithaca, N.Y: Cornell University Press, 2010.

Ma Jun. *China's Water Crisis.* Norwalk, CT: EastBridge, 2004.

### Additional Resources

Additional articles as assigned.

Ecology: Scitable The Nature Education Knowledge Project.

<http://www.nature.com/scitable/knowledge/ecology-102>

Film: *Up the Yangtze* (Yung Chang, 2009)

### Outline of Course Content

Each unit comprises 2-4 weeks.

#### Unit 1: Place

Foundations of the Physical Environment: Students do labs and fieldwork in Applied Geology, including rocks and minerals, plate tectonics, mountain building and crustal deformation, and the climate of Dali. Fieldwork is on Cangshan Mountain, a national level geopark and nature reserve.

Lake Erhai Physical Geography and Water Quality: Students investigate the physical geography and major water quality problems of Lake Erhai

#### Unit 2: Dwelling

Biotic Processes: *What is Conservation Biology* –This unit addresses overarching questions concerning efforts to preserve biodiversity, the impact of human population growth and resource consumption. Student research focuses on *Biodiversity* – biodiversity types, global and spatial patterns, key constraints, importance of biodiversity in balanced systems; *Ecosystem Function and Services* – review of ecosystem components and factors that regulate populations and communities (range of tolerance, competition, predation, symbiosis, density, environmental resistance); importance of ecosystem services (focus on forests and wetlands – regulation of hydrologic cycle, climate mitigation and soil management); *Land Use and Habitat Classification* – residential, agriculture, grazing lands, forests, aquatic ecosystems (rivers, streams, lakes, wetlands).

Fieldwork projects in this unit include:

- *Ecosystems Ecotour:* Students design an ecological tour through 1 of 3 ecosystems: a forested area with a stream, a wetland, or a reclaimed mining site with an organic orchard)
- *Migratory Bird Count:* Students participate in migratory waterfowl population research)
- *Landscapes Shaped by Running Water and Ground Water:* Students survey the Xizhou area for evidence of landscapes carved by flowing water, deposition of alluvium, and erosional features. They also explore ground water features such as karst topography and visit a local hot spring.
- *Stream Monitoring: Macroinvertebrate & Water Quality Testing:* Students sample for macroinvertebrates as indicators of stream health and water quality index as in Lake Erhai.

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### Unit 3: **Belief**

Ecological Disturbance (1): Students in this unit research the impacts of deforestation – forestry ecology and management (fire, pathogens and pests, resource extraction, monocultures), erosion and sedimentation, desertification, biodiversity, carbon sinks, ecological services; the impacts of wetland loss – ecological services, flooding, water pollution, biodiversity; and the local impacts of climate change – changes in climate, weather, water availability, glacial melting, impacts on ecosystems, biodiversity and food production.

Fieldwork projects in this unit include

- *Mapping and Inventory of Wetland Restoration*: Students monitor the progress of the restoration of aquaculture ponds to constructed wetlands in the Xizhou area.
- *Mapping and Inventory of Forests and local tree species*: Students survey trees around temples and sacred spaces in the Xizhou area.

### Unit 4: **Work**

Ecosystem Disturbance (2): Students in this unit research habitat loss and fragmentation, focus on deforestation and the impact of agriculture on habitat and biodiversity loss; habitat islands and influence on biodiversity; impact of edge habitat; spatial context of fragments; corridors; stages of landscape change and mosaics; use of marginal lands. Special focus in this unit is on:

*Agriculture* – local food production (agricultural techniques, animal farming), use of chemical fertilizers and pesticides (health impacts), soil degradation (erosion, desertification, salinization, over cultivation), sustainable agricultural practices (organic fertilizers, biological pest control) and soil conservation strategies, importance of crop genetic diversity; local aquaculture

*Water Resources and Pollution* – water use and availability, overdraw and scarcity, diversions/transfer projects, dams, local irrigation techniques, consequences of drought and flooding, subsidence; local agricultural impact on water quality (nutrients, pesticides, sediment, eutrophication); human waste (sewage and pathogens, sewage treatment); impervious surfaces and runoff; best management practices

*Mining* – types of mining (subsurface, strip, open pit) and processing (smelting, heap leaching), impacts on land, water and air quality (erosion and sedimentation, habitat loss, acid mine drainage, dust and particulates, heavy metals contamination); marble production

Fieldwork projects in this unit include:

- *Research Historical Land Use and Landscape Patterns*: Students visit local Land Use Planning Office to ascertain historical records
- *Mapping Edge Habitat, Fragments and Corridors*: Students visit their land use areas to verify Google Earth images, photo-document sites, and document edge habitat and corridors.
- *Mapping and Inventory of Crops, Soil Erosion, Nutrient Management, Pesticide Use*: Students visit local families to document land holdings, crop inventory, signs of erosion, nutrient management and pesticide use

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- *Genetic Diversity in Food Crops*: Students visit local markets to record genetic diversity of food crops. This is followed by research of crop origin, uses, breeding, and importance of maintaining crop diversity
- *Mapping and Inventory of Aquaculture*: Students visit and interview local aquaculture farmers to document practices

### Unit 5: Diversity

This unit consists of intensive fieldwork activities undertaken during CFS travel to the Three Parallel Rivers region and the Tibetan plateau. The main focus of the unit is biodiversity and cultural diversity. Fieldwork projects in this unit include:

- Haba Sacred Forest project: Students conduct a three-day survey of water quality, forest diversity, birds and wildlife, ethnobotany and medicinal plants, and the impacts of agriculture and grazing in and around the sacred forest of Haba Village.
- Tibet Reforestation and Preservation: Students visit Pudacuo National Park in Shangri La County to explore reforestation efforts and national park protection in China. This park is the first in China to meet IUCN standards.
- Mapping & Inventory of Grazing Lands in Tibet: Students visit local families to document land holdings, crop inventory, grazing practices, signs of erosion, nutrient management, pesticide use, and changes in landscape and biodiversity
- Black-Necked Crane Bird Counts: While in Shangi-La, students participate in a Black-Necked Crane bird count at wintering grounds in the Napahai Marsh.
- Investigating Karst Topography: While at the Napahai Marsh in Shangi-La, students observe evidence of karst topography.
- Snub-Nose Monkey Monitoring: Students participate in on-going research of the critically endangered snub-nose monkey populations at the Baima Mountain Preserve in the Three Parallel Rivers Field Station.
- Tengchong Reforestation: Students visit the Tengchong reforestation project in the Three Parallel Rivers region. The Nature Conservancy is working with local communities in this reforestation effort that focuses on climate mitigation and biodiversity. Comparisons are made to previously observed reforestation efforts.

### Unit 6: Modernity

Modernity: Landscape Planning, Development, and Urbanization: In this unit, which begins in Xizhou and ends in Shanghai, students consider different types of development (urban migration, creation of cities, sprawl, smart growth, eco-cities, growth boundaries, new urbanism, mixed development, brownfield development), energy use and air quality, energy efficiency and green design, transportation (cars, electric vehicles, mass transit) solid waste disposal (open burning and incineration, landfills, recycling), water conservation (domestic, xeroscaping, gray water systems), storm water management, sustainable cities. Students consider issues surrounding *Land Preservation* – national parks, national forests, wilderness areas, climate mitigation, land trusts, work with NGO's; conservation and human livelihoods, poverty, equity, religion, resource rights. Fieldwork projects in this unit include:

- *Water Quality Impact of "200 Villages Two Pollutants" Constructed Wetland*: Students evaluate the impact of this constructed wetland on the water quality of Lake Erhai. Water

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- quality index is tested for inflow and outflow water. The wetland is also evaluated as habitat through species richness and abundance indices.
- *Constructed Wetlands & Sewage Treatment:* Students visit the local wetland sewage treatment facility. They evaluate the effectiveness of the wetland for nutrient enrichment prevention and as source of habitat for waterfowl.
  - *Urbanization and city planning:* Students visit the Shanghai Planning Museum and environmental NGOs in Shanghai.