IB 171: Freshwater Ecology, Spring 2016
Tues, Thurs 2-3:30pm
3 units

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Office hours: Tuesday 11-12 noon and by appointment

Lakes, rivers, wetlands, and estuaries are biologically rich, dynamic, and among the most vital and the most vulnerable of Earth's ecosystems. This course will introduce students to the natural history and evolutionary, and population, community, and landscape ecology of the world's freshwater and estuarine ecosystems. This course will cover broad principles of ecology, hydrology, biogeochemistry, and biotic and landscape dynamics, but will illustrate these with detailed examination of the biota and environments of freshwater and estuarine environments. The features and processes that influence resilience of freshwater ecosystems to climate, harvesting, land use, and biotic change will be emphasized. The course will have 3 h of lecture per week, two exams, and an optional field trip.

Jan 19 Overview, logistics
Jan 21 The hydrologic cycle and water as the medium of life

Jan 26 Freshwater environments: springs, streams, rivers
Jan 28 Freshwater environments: wetlands, lakes and estuaries

Feb 2 History and natural history of freshwater biota: bacteria, algae, fungi
Feb 4 History and natural history of freshwater biota: macrophytes and woody riparian vegetation

Feb 9. History and natural histories of freshwater biota: Invertebrates
Feb 11 History and natural histories of freshwater biota: Vertebrates

Feb 16 Performances of freshwater organisms along environmental gradients
Feb 18 Changing distributions and abundances of organisms, conditions and resources: tracking versus enduring

Feb 23 Midterm Exam
Feb 25 Species interactions - overview

Mar 1 Size structured interactions in freshwaters (predation, competition)
Mar 3 Context-dependence of benign and adverse interactions

Mar 8 Seasonality, disturbance, stress and phenology
Mar 10 Cross-ecosystem linkages: benthic-pelagic in lakes, river-uplands, and river-coastal oceans

Mar 15 Energy sources, trophic efficiency and distribution of trophic level biomass
Species impacts on ecosystems (non-trophic, 'ecological engineering')
Mar 17 Invasions and extinctions in fresh waters

Mar 21-25 (Spring break)

Mar 29 Species impacts on ecosystems (non-trophic, 'ecological engineering')
Mar 31 Invasions and extinctions in fresh waters

Apr 5 Warming, drought, and eutrophication
Apr 7 Freshwater diseases and parasites under global change

Apr 8-9: Optional trip to the Eel River Biology Conference (Fortuna, CA) and the Angelo Coast Range Reserve (http://angelo.berkeley.edu).

Apr 12 Case history—The browning of boreal freshwaters
Apr 14 Case history—The thirsty Eel: flood, drought, and shifts between salmon supporting and cyanobacterially degraded food webs

Apr 19 Restoration and resilience in freshwaters and watersheds
Apr 21 Final exam

Requirements for class:

Midterm Exam, **February 23**, 30 points

Synthesis paper due **March 31**, 20 points. Students will write a paper (8-10 pages single spaced, including figures and references) that projects the future of a specific (real) freshwater or estuarine ecosystem of their choice over the next 5, 10, and 50 years, under justifiable (from literature) assumptions about climate change, land and water use, and biotic responses. The analysis should be grounded in scientific knowledge of the ecophysiology and ecology of key organisms, as well as species interactions and feedbacks between organisms and ecosystems.

Final Exam, **April 21**, 40 points

Participation in class discussion 10 points