Land, Air and Water Resources (LAWR)

Studies in Land, Air and Water Resources provide students with a foundation in physical and chemical processes and how these interact in ecosystems to control the transport and fate of naturally-occurring elements and pollutants in the environment. The concentration emphasizes viewing ecosystems as integrated systems by requiring at least one course in ecosystem ecology and one course in environmental information systems. Students with interests in toxicology, hydrology, climate change, soil and air pollution, for example, are encouraged to choose the LAWR concentration.

Learning Goals: The overarching goals are to provide students with in-depth understanding of the chemical, physical, geological, and biological processes that govern the composition of natural and managed ecosystems, and with experience in the methods used to obtain, analyze, interpret, and evaluate biogeochemical information. Students who complete the LAWR concentration will have knowledge sufficient to describe cycles of biologically and geochemically important chemical elements within and through ecosystems.

Note: Some of the courses in this concentration require more than the minimum math and physics requirements for the ESS major. We recommend that students in the LAWR concentration take two semesters of calculus and two semesters of physics.

Course Requirements: Nine courses beyond the ESS core requirements.

Core Curriculum required choice: Physics
Core Curriculum required choice: BIOEE 1610: Ecology and the Environment

1 additional Biological Sciences course:
Choose one biological sciences course for the Life Sciences

1 additional Chemistry course: Choose a physics course (from Core Curriculum) and
Choose one additional chemistry course
   Chem 1560: Introduction to General Chemistry* (F, Su)
   Chem 2070: General Chemistry I* (F, Su)
   (2070 preferred; often a prerequisite for other LAWR courses)

1 additional Quantitative course: Choose Math 1106 or Math 1110
   Math 1106: Calculus for the Life and Social Sciences* (S)
   Math 1110: Calculus I* (F, S, Su)

1 Biogeochemistry course: Choose PLSCS 3650 or EAS/NTRES 3030
   PLSCS 3650: Environmental Chemistry: Soil, Air and Water (S)
   EAS/NTRES 3030: Introduction to Biogeochemistry (F)

5 additional courses from LAWR elective lists
Choose 1 course from List 1, 2 and 3 and then two more courses from any list.

LAWR List 1: Chemical/Physical Science
LAWR List 2: Environmental Informatics
LAWR List 3: Integrated Ecosystems/Ecology
Additional elective from LAWR List 1, 2 or 3
Additional elective from LAWR List 1, 2 or 3

Other Cornell University courses similar in content and level (3000-level or above), but not on these lists, may be chosen in consultation with your advisor.
# LAWR Elective List

## LAWR List 1: Chemical/Physical environmental science
### Water management/hydrology
- **BEE 3500** Biological and Bioenvironmental Transport Processes (F, Su)
- **BEE 3710** Physical Hydrology for Ecosystems (S, alternate years)
- **BEE 4270** Water Measurement and Analysis Methods (F)
- **BEE/EAS 4710** Introduction to Groundwater (S)
- **CEE 3310** Fluid Mechanics (F)
- **CEE 4320** Hydrology (S)
- **EAS 3530** Physical Oceanography (F)
- **EAS/BIOEE 3500** Dynamics of Marine Ecosystems (F)

### Atmosphere/climate
- **BEE/EAS 4800** Our Changing Atmosphere: Global Change and Atmospheric Chemistry (F)
- **EAS 1310** Basic Principles of Meteorology (F)
- **EAS 2680** Climate and Global Warming (S)
- **EAS 3050** Climate Dynamics (F)
- **EAS 3340** Microclimatology (availability will vary)
- **EAS 3420** Atmospheric Dynamics (S)

### Terrestrial/soil science/geology
- **EAS 2250** The Earth System (S)
- **EAS 3010** Evolution of the Earth System (F)
- **EAS/NTRES 3030** Introduction to Biogeochemistry (F)
- **EAS/PLSCS 4830** Environmental Biophysics (F, alternate years)
- **PLSCS 2600** Soil Science (F)
- **PLSCS 3210** Soil and Crop Management for Sustainability (S)
- **PLSCS 3630** Soil Genesis, Classification, and Survey (F)
- **PLSCS 3650** Environmental Chemistry: Soil, Air, and Water

## LAWR List 2: Environmental informatics
- **CEE/PLSCS 4110** Applied Remote Sensing and GIS for Resource Inventory and Analysis (F)
- **CRP 4080** Introduction to GIS (F, S)
- **EAS 2900** Computer Programming and Meteorology Software (S)
- **PLSCS 2200** Introduction to Mapping and Spatial Analysis with GIS (F)
- **PLSCS 4200** Geographic Information Systems (S)

## LAWR List 3: Integrated ecosystems / ecology
- **BIOEE 4570** Limnology: Ecology of Lakes, Lectures (S)
- **BIOEE/EAS 4620** Marine Ecosystem Sustainability (F)
- **BIOEE/PLHRT 4730** Ecology of Agricultural Systems (F)
- **BIOEE 4780** Ecosystem Biology (S)
- **NTRES 3220** Global Biodiversity (F)
- **NTRES 4200** Forest Ecology, Lectures (F)
- **NTRES/BIOEE 4560** Stream Ecology (F, alternate years)
- **PLHRT/PLSCS 4660** Soil Ecology (S)