



Introducing EcoFS' 2017

Colorado Ecosystem Field Studies

A Rocky Mountain field course developed by Professor Steve Johnson
Affiliate faculty of the University of Montana at Missoula's Environmental Studies Program.

A 3-WEEK, COLLEGE-ACCREDITED, HANDS-ON SCIENTIFIC ANALYSIS OF THE MAJESTIC COLORADO ROCKY MOUNTAIN ECOSYSTEM

LOCATION: Cal-Wood Education Center, a 1,200-acre private, outdoor classroom near Boulder, Colorado in the foothills of the Rocky Mountains. Course location elevation is 7,500 - 8,500ft.

COURSE CREDITS: ENST 391-Colorado Ecosystem Field Studies for 3 undergraduate semester transfer credits through the Environmental Studies Program of the University of Montana at Missoula. Open to students from any university or major. *While over 130 universities accept EcoFS courses for transfer credit, students must confirm with their department how these credits transfer for their degree.*

DATES: June 18 – July 8 or July 15– August 4 (courses are identical, just two date choices)

CLASS SIZE: 20-22-Students

EcoFS and Cal-Wood Education Center offer a unique opportunity to study a healthy and diverse Colorado Rocky Mountain ecosystem. Daily hikes, ecosystem explorations and hands-on scientific investigations create a robust, ecologically-based academic learning experience. Students synthesize & apply information they have gained from their classroom & textbook context while actively studying & exploring a spectacular mountain environment.

To learn more & **APPLY**- visit
www.ecofs.org



ECOSYSTEM Field Studies

This is Where Your
Classroom Education
Comes to Life!

Colorado Ecosystem Field Studies is a hands-on, 21-day field class that provides incredible academic opportunities for experiential investigation of Rocky Mountain ecosystems. Ecological concepts & field methods are examined in great detail yet the knowledge & techniques gained are applicable to any ecosystem. Instruction is delivered with inquiry-based activities incorporating observation & data collection, small working groups, lecture, focused exploration through daily hikes & explorations, guest speakers & off-site trips. During the second half of the course students create and implement an original ecosystem field research project.

Course Objectives:

Students will...

- * Achieve a deep knowledge base of the structure & functioning of the Colorado Rocky Mountain ecosystem.
- * Gain expertise in utilizing a variety of ecosystem field tools & techniques.
- * Learn rigorous scientific research skills including observation, hypothesis formation, sampling, mapping, modeling & data analysis.
- * Develop a passion for a particular academic or career path within ecosystem science.
- * Participate positively in a safe, rewarding & challenging group hiking/camping experience.

Course Location

Nestled in the Colorado Front Range at an incredible base-camp at 8,000 ft.

Cal-Wood Education Center is a private, non-profit organization located on 1,200 acres in the foothills of the Front Range of the Rocky Mountains. It is located approximately 45-minutes northwest of Boulder and surrounded by US National Forest & just a few miles outside of Rocky Mountain National Park. This spectacular learning center lies at an elevation of 7,500-8,500 feet & contains miles of trails & vast tracts of montane forest, lush meadows, ponds, streams, & highly abundant wildlife.

Cal-Wood is utilized for a variety of educational programs such as school groups, professional trainings, retreats & summer camps. Cal-Wood has a conservation easement on the property & conducts an active natural resource management program with projects in forestry, wildlife, & non-native plant species. This course is based out of Cal-Wood's secluded, spacious Solitude Camp & we utilize the main Cal-Wood lodge for hot showers, wifi, laundry & emergencies. Visit www.calwood.org for more info.

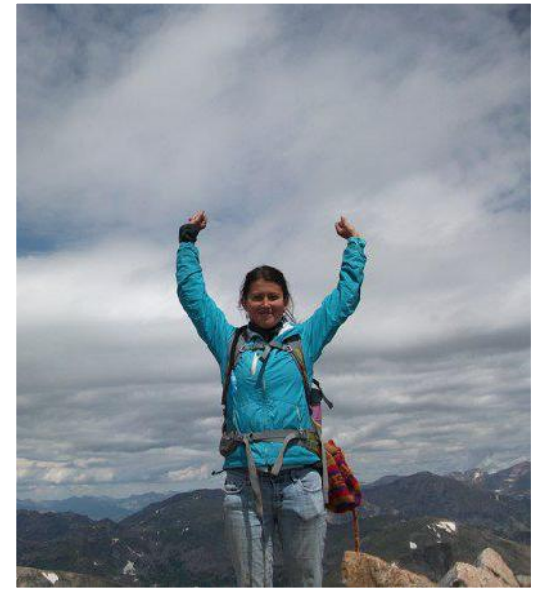
A Typical Day...

Our days are filled with academic adventure while hiking & exploring the Rocky Mountains

Typically, we have a morning class session with a short lecture relating to topics & activities of the day. We then hike to various areas of Cal-Wood for focused exploration & structured field activities with observation & data collection in small work groups. Expect 1-2 hours of lecture time and a 1/2-hour lunch break at a scenic location. There are four exciting off-site field trips to study other Colorado ecosystems.

The group returns to camp @ 5:00pm, happy, tired & filled with the energy of natural discovery. Total daily hiking averages 2-5 miles in rugged terrain & often off-trail. Students enjoy a healthy & hearty camp dinner (you will not go hungry!). The remainder of the day & evening is unstructured allowing for tent-work (homework), independent study, & personal time. Students sleep (soundly) in personal tents.

The first half of the course includes nightly homework assignments that synthesize & apply data & observations from the day. The second half phases into independent study relating to independent research projects. Cal-Wood Lodge is a 10 minute walk from camp & available for hot showers, phone, wifi access, laundry, & emergencies.



Course Schedule of Topics & Activities:

Each day runs 8:30am-5:00pm with a 30-minute lunch break

Day 1- Cal-Wood & Camp Orientation

Pick-ups in Boulder for transport to Cal-Wood Education Center
To Solitude Camp base-camp - Introductions, camp setup

Lecture/discussion topics:

Outdoor safety - emergency scenarios & procedures, wildlife & other environmental concerns, health & hygiene
Course overview - syllabus, educational approach,

Day 2- Rocky Mountain Geography & Climatology

Lecture/discussion topics:

Colorado geography - landscape features, topographical analysis
Maps - types, terms, research uses, GIS & Google Earth
Climatology - global & local processes, mountain factors, measurement, importance to ecosystems

Field activities:

North vs. south facing slope site comparison - create transects & measure climatological & geographic variables such as slope angle, aspect, elevation, air & ground temperature/humidity, wind speed/direction, cloud type/cover
Map skills - use of topographic maps & GPS
Compass - bearing & pacing skills, utilization for transects & research

Day 3- Biodiversity- macroinvertebrate collections

Lecture/discussion topics:

Biodiversity- species concept, adaptations, richness & abundance, diversity types & indices, research techniques
Cal-Wood invertebrate overview- common aquatic & terrestrial groups, importance & role in ecosystem, collection & observation methods
Field observation & the scientific method- scientific observations & recording

Field activities:

Biological collections - collect, observe, & identify terrestrial & aquatic macro-invertebrates, compare populations in varied communities, analyze adaptations
Animal communication study - observe & classify animal calls & sounds

Day 4- Geology- rock & landscape investigations

Lecture/discussion topics:

Geologic processes - geologic time-scale, plate tectonics, erosion, importance to ecosystem structure & functioning
Formation of Colorado Rocky Mountains & the Front Range- major geologic episodes, landscape features, mining history
Rocks & minerals - Front Range rock & mineral types, identification methods, human use, minerals & biotic organisms

Field activities:

Geologic investigation - hike the Cal-Wood valley to observe, map & measure geologic features, formations & mineral deposits
Rock/mineral collection - analyze & identify rocks & minerals using geologic hammers & hand lens
Mica mine exploration- visit a historic Colorado mine, observe mica crystals in pure mineral form

Day 5- Ecosystem Ecology- soil & water analysis

Lecture/discussion topics:

Abiotic ecosystem processes - biogeochemical cycles, energy flows
Soil - formation, composition, classification, ecosystem importance
Water - physical & chemical factors, mountain hydrology, measurement techniques

Field activities:

Soil analysis & collection - dig soil pits, identify horizons, measure water infiltration rate, soil moisture, temperature. In lab setting classify soil texture, sorting, & perform chemical tests for Ph, NPK levels. Compare parameters in different habitat types.
Water quality analysis - chemical/physical tests of pond & stream. Measure turbidity, flow, temperature, Ph, N & P, levels.

Assignments

+Percentage of Overall Grade

35% = Daily reading & "tentwork" assignment. Tentwork is given nightly for first half of course to synthesize & apply data & observations.

15% = 10-minute field presentation on the research project

30% = 10-page written research paper expanding on field research project. Due 2 weeks after course ends.

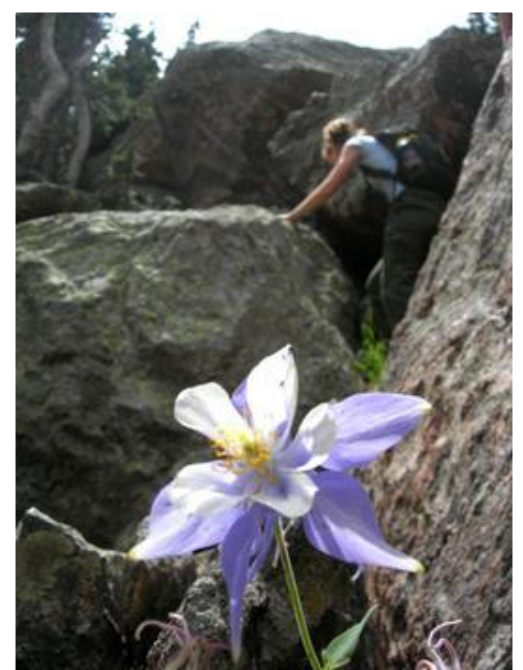
10% = Course participation

10% = Final written exam (via email). Due 1 week after course ends.

Readings

National Audubon Society Field Guide to the Rocky Mountain States, Alden & Grassy, 1999

How to Do Ecology- A Concise Handbook, Karban & Huntzinger, 2nd Edition 2014



Day 6- Ecosystem Trip to Indian Peaks Wilderness Area

Lecture/discussion topics:

Colorado Front range life zones - elevational impact on biological communities & ecosystem components

Sub-alpine life zone focus- species of interest, geologic & geographic differences

Field activities:

Ecosystem investigation Journey to the Brainard Lake National Recreation Area, a spectacular high-elevation location that contains the Indian Peaks Wilderness Area. Hike through the sub-alpine life zone community with old-growth forest & past glacial lakes & features. Compare ecosystem variables & species composition/diversity to the lower elevation of Cal-Wood.

Day 7- Wildlife Ecology & Animal Behavior

Lecture/discussion topics:

Colorado/Cal-Wood wildlife overview- common species, species of population concern & ecosystem importance

Animal Behavior- animal observation skills, pros & cons of behavioral studies, ethogram usage

Wildlife research techniques - sampling methods, intrusive vs. non-intrusive techniques, population studies

Field activities:

Animal behavior study- observe & document behavioral variables using ethograms & other wildlife tools

Wildlife evidence analysis - field identification & measurement of signs, tracks, scat, markings, shelters etc.

Day 8- Colorado Forest Ecology

Lecture/discussion topics:

Colorado forest ecosystems – common tree species, insect & diseases, role of fire, forest monitoring & management, human utilization,

Community Ecology – forest inter-relationships, community types

Field activities:

Forest stand analysis - conduct site surveys & calculate forest densities, volume, spacing & canopy cover. Identify tree types, measure diameter, height, fire history, insect/disease infestation. Determine age & growth history by extracting & analyzing tree core samples with increment borers.

Day 9- Ecosystem trip to Rocky Mountain National Park

Lecture/discussion topics:

Rocky Mountain National Park - history, geography, ecosystem issues, wildlife species of interest

Geologic characteristics - glacial mechanics & features- moraines, U-shaped valleys, cirques, lakes

Sub-alpine life zone - ecosystem characteristics, species variation

Field activities:

Ecosystem investigation - hike from the Bear Lake trailhead past mountain lakes, streams, waterfalls & majestic sub-alpine, old-growth forest to alpine tree-line. Identify dramatic geologic & glacial features.

Dinner in Estes Park

Day 10- Research Design

Lecture/discussion topics:

Book discussion group activity for the How to Do Ecology textbook
Convene at 1:00 pm

Day 11- Vegetative Survey & Pollination Study

Lecture/discussion topics:

Plants - classification, physiology, role in ecosystem processes

Fungus & lichens - characteristics & ecosystem function, diversity

Field activities:

Vegetative surveys - identify, classify, & measure flora in quadrats, calculate relative abundance & diversity indices, observe features & physiology in lab setting

Pollination analysis - record & measure pollination visits to flowers.

Research Project

The culminating assignment is a field research project & presentation. Students develop an original research project based upon scientific field observations they perform. In their project, students will process observations, formulate hypotheses, design an experimental methodology, conduct background research, & collect & analyze field data. A culminating class presentation outlines the research project & expands on key concepts. Finally, post course, students complete a written scientific research paper that encapsulates the project.

Examples of past research topics:

- * *Correlation between age & circumference of ponderosa pine trees*
- * *Communication patterns of golden mantle ground squirrels*
- * *Slope angle as a determinant of plant species diversity*
- * *Dragonfly nymph population differences in the Upper vs. Lower pond*
- * *The effect of tree density on the average annual growth rate of douglas fir*
- * *Comparison of wildflower diversity between riparian & non-riparian areas*
- * *Great-horned owl dietary preferences based on pellet analysis*
- * *Thistle abundance in disturbed & undisturbed montane meadows*
- * *Nitrate & phosphate level variation in the soil of aspen groves*
- * *Comparison of backswimmer leg lengths & swimming speeds*
- * *Pollination visitation types & rates of the Colorado Columbine wildflower*
- * *Elk population density on & off trail based on scat abundance*
- * *Ph differences in flowing vs non-flowing water sources*



Day 12- Ecosystem trip to the Boulder Grasslands & Eldorado Canyon State Park

Lecture/discussion topics:

Grassland & foothills life zones - ecosystem characteristics, species of interest, abiotic comparison, elevational variables
Geologic characteristics- sedimentary formations & features, fossils
Colorado water conservation

Field activities:

Ecosystem analysis –Hike through pristine grassland communities of Boulder. Continue into dramatic Eldorado Canyon State Park & observe spectacular sedimentary formations along the swift-flowing South Boulder Creek. Compare ecosystem variables & species composition.

Dinner in Boulder

Day 13- Sampling Methods

Lecture/discussion topics:

Ecosystem sampling methods -transects & quadrats, randomization, stratification, replication, scope of projects

Field activities:

Independent research- process scientific observations, devise hypotheses, create initial methodology & research design
Individual consultations-advisement for research projects

Day 14- Independent Research Projects

Field activities:

Independent research- process observations, refine hypotheses & experimental design, begin data collection
Individual consultations-advisement for research

Day 15- Independent Research Projects

Field activities:

Independent research- intensive data collection

Day 16- Restoration Ecology

Lecture/discussion topics:

Ecosystem restoration overview - goals & methods
Current Cal-Wood restoration projects- forestry, wildlife, non-native plants

Field activities:

Independent research - intensive data collection

Day 17- Ecological Data Analysis

Lecture/discussion topics:

Basic data analysis – basic analysis methods, statistics overview

Field activities:

Independent research - intensive data collection

Day 18- Ecosystem trip to Indian Peaks Wilderness

Lecture/discussion topics:

Alpine tundra life zone - ecosystem characteristics, wildflower populations, alpine species of interest & concern, climatological extremes

Field activities:

Ecosystem analysis- ascend above tree-line, along a glacial moraine & permanent snowfield to a pass along the Continental Divide. If weather & energy permit, we will attempt the summit of Mt. Audubon at 13,320!

Dinner in Jamestown

Day 19- & Presentation Prep

Lecture/discussion topics:

Presentation techniques - effective communication & displays

Field activities:

Independent research -final data collection, data analysis

Day 20- Student Presentations

Field activities:

Student presentation of field research projects

Day 21- Student Presentations/Closing

Field activities:

Student presentation of field research projects
Camp breakdown, Closing

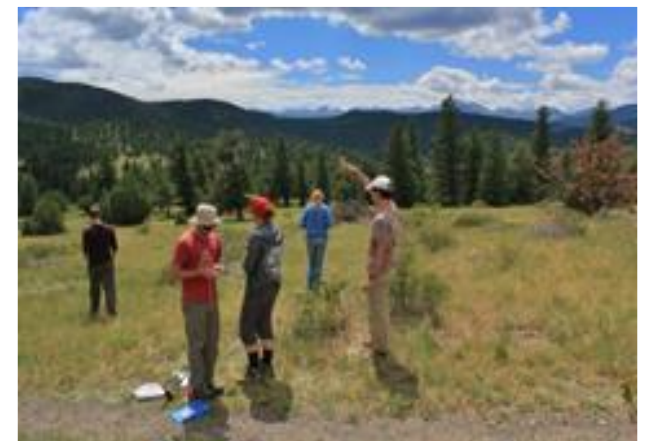
Course ends at 5:00pm

Extended Credit Opportunities

EcoFS' Extended Credit courses are available to accepted students of the Colorado Ecosystem Field Studies course & only for those participating in Course 1- June 18 – July 8. Upon completion of the course, students stay on-site for one month, July 11- Aug 11, & participate in one of the following 3-credit options:

***Independent Research- ENST 492
or
Conservation Internship- ENST 398***

Visit the ecofs.org website for all details on these course options.



For all further course info including details on costs, credits & application please visit:

www.ecofs.org