

# ESS 0012 - FIELD METHODS IN ECOLOGY

## Catalog Description

Also known as BIOL 0013

Advisory: Completion of BIOL 0014 or ESS 0014 strongly recommended

Hours: 90 (36 lecture, 54 laboratory)

Description: Introduction to methods for sampling and studying environmental parameters of ecosystems and organisms. Provides experience with quantitative and qualitative field research techniques and procedures applicable to environmental assessment and population monitoring and proper reporting methods. Field trips required. Students may be required to provide their own transportation. (CSU)

## Course Student Learning Outcomes

- CSLO #1: Synthesize data to critique, develop and evaluate a scientific hypothesis.
- CSLO #2: Evaluate the current standards and methods used to do field studies and determine which methods are best applied to different situations following proper ethical considerations as well as State and Federal regulations.
- CSLO #3: Synthesize ecological information and utilize the same to evaluate biological systems and populations.

## Effective Term

Fall 2025

## Course Type

Credit - Degree-applicable

## Contact Hours

90

## Outside of Class Hours

72

## Total Student Learning Hours

162

## Course Objectives

Students will demonstrate acquired knowledge and skills via their performance on lecture exams, laboratory/field practicums, laboratory/field reports/write-ups, quizzes, research reports, projects, identifications and problem calculations.

Lecture Objectives:

1. Judge the differences between a null and alternative hypothesis (Lecture Outline Ia,b).
2. Evaluate the feasibility of a scientific hypothesis for scientific effectiveness and cost effectiveness (Lecture Outline Ic,d,e).
3. Discuss legal and ethical issues regarding field ecology (Lecture Outline If,g).
4. Describe ecological factors related to population growth and interactions between species (Lecture Outline IIa,b).

5. Identify ecological units and subunits (Lecture Outline IIa,b, IIIa,b,c,d).
  6. Determine which statistical tests are best applicable to different types of ecological field studies (Lecture Outline IIIa,b,c,d). a
  7. Write a scientific proposal and a scientific paper based upon data collected doing research (Lecture Outline Ia,b,c,d,e,f,g; IIIa,b,c,d; IVa; VIa,b,c).
  8. Locate and analyze a scientific paper written on original research from a primary source journal (Lecture Outline IVa,b,c).
  9. Analyze charts and graphs as part of an analysis of the results of a research study (Lecture Outline IVc; VIc).
  10. Explain the use of maps for the identification of home range units, vegetation characteristics and management plans. (Lecture Outline VIIa,b,c,d).
  11. Analyze the efficacy of the standards and methods utilized to research plants and animals (Lecture Outline VIII a,b,c,d,e,f).
  12. Determine the best standards and methods for assessing plants and animals (Lecture Outline VIII a,b,c,d,e,f).
- Laboratory Objectives:
1. Develop and implement a research project utilizing the methods described in the course (Lab Outline Ia).
  2. Utilize a t-test, Mann Whitney U, Chi-square test, ANOVA, regression analysis, and population estimators in a statistical analysis of data provided and collected in the field (Lab Outline IIIa,b,c,d).
  3. Develop graphs and charts to display data in a meaningful way (Lab Outline Ia; IIIa,b,c,d).
  4. Complete an application for a scientific collecting permit and discuss the legal issues surrounding the restrictions of that permit (Lab Outline Ia).
  5. Maintain a field journal and/or data sheets for the collection of field observations and the collection of data (Lab Outline Ia, VIa,b,c,d,e,f).
  6. Utilize taxonomic keys and field guides for the identification of species (Lab Outline Va).
  7. Write a taxonomic key (Lab Outline Va).
  8. Implement a scientific research project based upon a written proposal (Lab Outline Ia; IIb, IIIa,b,c,d; IVa,b,c,d;V; VIa,b,c,d,e,f).
  9. Use a map and compass in the field to determine a location on a map and to find a mapped location in the field (Lab Outline Va).
  10. Use maps to map telemetry data, home ranges, and vegetation(Lab Outline IV ,b,c,d).
  11. Analyze the efficacy of the standards and methods utilized to research plants and animals (Lab Outline VIa,b,c,d,e,f).
  12. Determine the best standards and methods for assessing plants and animals (Lab Outline VIa,b,c,d,e,f).
  13. Utilize techniques for the sampling of plants and animals in the field for data collection related to field study (Lab Outline VIa,b,c,d,e,f).

## General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

## Articulation Information

- CSU Transferable

## Methods of Evaluation

- Classroom Discussions
  - Example: Lecture Objective #2 Evaluate the feasibility of a scientific hypothesis for scientific effectiveness and cost effectiveness. Students will present the scientific hypothesis they would like to test for their term project. Through discussion directed by the instructor the students in the class will discuss the feasibility of the project and help to brainstorm methods by which the work could be completed.
- Essay Examinations
  - Example: Lecture Objective #3 Discuss legal and ethical issues regarding field ecology. Essay Question: Your manager has informed you that they would like you to conduct a mark/recapture survey on the local white footed woodrat population but anecdotal information suggests that this population of organisms is sensitive to certain types of handling techniques. Propose a method for the assessment of the size of this population that is mindful of the needs of the population.
- Objective Examinations
  - Example: Lecture Objective #6 Determine which statistical tests are best applicable to different types of ecological field studies. Objective Question: Which of the following statistical tests would be best for determining potential selection of habitat? a. Mann-Whitney Test b. Chi-square test. c. t-test. d. ANOVA
- Projects
  - Example: Laboratory Objective #1 Develop and implement a research project utilizing the methods described in the course. Students will develop an original research paper based upon a hypothesis they developed. They will present the data they collected and analyzed in the proper scientific format. Papers will be evaluated on content, structure, readability, level of communication and peer review.
- Reports
  - Example: Lab Objective #1: Develop and implement a research project utilizing the methods described in the course. Students will develop a hypothesis that they will spend the semester testing. Students will summarize their experience in a report presented at the end of the term. This report will be presented in standard scientific journaling format: abstract, introduction, materials and methods, results, discussion, literature cited. The report will be graded using a rubric and assigned points.
- Skill Demonstrations
  - Example: Laboratory Objective #9 Use a map and compass in the field to determine a location on a map and to find a mapped location in the field. Students will be provided with maps marked with locations in the field. The students will then navigate to those locations using the map and a compass. Students will then be taken to a location not previously utilized. At that location, the students will be asked to identify their location on a map using local landmarks and features.

## Repeatable

No

## Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Laboratory Objective #9: Use a map and compass in the field to determine a location on a map and to find a mapped location in the field. Students will travel to the field and be given a map of the area. Students will use landmarks in the area to triangulate their position. Once their position on the map has been determined, they will calculate the UTM coordinates of that location. During this process the instructor will guide students through their calculations and the identification of useful landmarks. Instructor will also discuss the importance of being able to locate your position of a map in the field. Safety issues and protocols will also be discussed.

Lecture:

1. Lecture Objective #3: Discuss legal and ethical issues regarding field ecology. Students will be presented with a case study by the instructor for analysis. Legal and ethical issues of the study will be discussed. Students will later design a field project that considers the legal and ethical issues surrounding that project. Instructor will facilitate the peer review of each other's projects. Projects will be revised accordingly.

Distance Learning

1. Lecture Objective #9: Analyze charts and graphs as part of an analysis of the results of a research study. Instruction will be given regarding the interpretation of graphs and tables for the presentation of data. The instructor will present well constructed and poorly constructed tables and graphs and identify the differences between the two. Students will then visit the website "The World in Data". They will select a graph and a chart to analyze from the site. In the discussion board the students will present the graph and chart they selected and identify the main components of each. The students will then discuss the efficacy of how the data was presented.

## Typical Out of Class Assignments

### Reading Assignments

1. Review a selected scientific article from a peer reviewed journal. Be able to identify the hypothesis that was tested, whether or not the hypothesis was supported, and the methodology used to test the hypothesis. Demonstrate knowledge of the basic structure of a scientific paper by listing the type of information contained within each section.
2. Critically analyze and edit a proposal submitted by another student in class. Provide useful corrections and guidance to that student that will aid in the further development of their proposal.

### Writing, Problem Solving or Performance

1. Complete an application for a Scientific Collecting Permit from the California Department of Fish and Game.
2. Write a scientific proposal for original research to be conducted during the course of the semester. The proposal must contain sections relatable to a scientific paper. The proposal must outline a project that can be conducted by the student. The proposal also must contain primary source articles for background and support.

## Other (Term projects, research papers, portfolios, etc.)

1. Conduct original research in Field Ecology and write a scientific paper based upon that research. The paper must contain primary source articles for background and support.

## Required Materials

- Practical Field Ecology: A Project Guide
  - Author: Philip Wheater, James Bell and Penny Cook
  - Publisher: Wiley
  - Publication Date: 2020
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:
- Practical Statistics for Field Biology
  - Author: Fowler, Cohen and Jarvis
  - Publisher: Wiley
  - Publication Date: 1998
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:
- Writing Papers in the Biological Sciences
  - Author: McMillan
  - Publisher: Bedford/St. Martin's
  - Publication Date: 2020
  - Text Edition: 7th
  - Classic Textbook?:
  - OER Link:
  - OER:

**Other materials and-or supplies required of students that contribute to the cost of the course.**