AGRI 0266 - INTRODUCTION TO FOREST OPERATIONS

Catalog Description

Advisory: Completion of AGRI 0260 with grade of "C" or better
Hours: 90 (36 lecture, 54 laboratory)
Description: Overview of forest operations and environmental issues associated with today's forest management practices. Use of mechanized equipment as a tool to meet various forest management objectives. (CSU)

Course Student Learning Outcomes

- CSLO #1: Analyze forest management scenarios to determine appropriate forest operations and management.
- CSLO #2: Evaluate the environmental, economic, and social impacts of forest operations using best management practices.
- CSLO #3: Design integrated operational plans that incorporate silvicultural prescriptions, equipment selection, and regulatory compliance.
- CSLO #4: Apply mechanized equipment and field techniques to optimize forest management outcomes safely and efficiently.
- CSLO #5: Synthesize ecological, operational, and regulatory information to solve real-world forest management problems.

Effective Term

Fall 2026

Course Type

Credit - Degree-applicable

Contact Hours

90

Outside of Class Hours

72

Total Student Learning Hours

162

Course Objectives

Lecture

1. Analyze the role of forest operations within broader forest management objectives.
2. Evaluate how operational decisions affect ecological and economic outcomes.
3. Assess how forest type and stand structure influence operational decisions.
4. Analyze ecological constraints that shape forest management strategies.
5. Compare and evaluate different harvesting methods and justify selections based on environmental and economic considerations.
6. Apply safe chainsaw techniques and analyze felling scenarios for operational effectiveness.
7. Evaluate operational risks and develop mitigation strategies for tree felling, balancing productivity and safety.
8. Assess equipment suitability for different site conditions and operational goals.
9. Analyze trade-offs between equipment efficiency and environmental impacts.
10. Design efficient processing and loading sequences to optimize operations.
11. Evaluate alternative operational workflows to enhance productivity and safety.
12. Analyze terrain, hydrology, and environmental constraints to design sustainable forest roads.
13. Evaluate road alignment and design choices using Best Management Practices (BMPs).
14. Assess the environmental consequences of forest operations on soils and waterways and propose mitigation strategies.
15. Apply and evaluate regulatory requirements in forest operational planning.
16. Analyze operational plans for compliance with environmental regulations.
17. Create operational schedules that optimize efficiency and sustainability, considering constraints such as terrain, stand structure, and equipment availability.
18. Integrate silvicultural prescriptions with operational planning, analyzing the compatibility of equipment and methods with stand management goals.
19. Evaluate hazards and operational risks in forest operations and design safety protocols and mitigation strategies.
20. Evaluate the potential of GIS, drones, and automation for improving operational planning and apply technology-based solutions to optimize forest operations.
21. Synthesize environmental, social, and economic data to assess operational effectiveness.
22. Propose operational improvements based on case study analysis.

Laboratory

1. Measure and analyze forest stand characteristics (DBH, height, species, age class, density, basal area) to assess forest composition and structure.
2. Identify forest types and structural characteristics and relate them to forest management strategies.
3. Compare and evaluate harvesting methods based on ecological, economic, and operational factors, and recommend suitable strategies.
4. Demonstrate safe chainsaw operation and field safety protocols, including hazard identification and mitigation.
5. Recognize, describe, and evaluate mechanized forest equipment for operational suitability, efficiency, and site limitations.
6. Plan and simulate operational sequences for processing and loading logs to maximize efficiency and safety.
7. Minimize environmental impact.

8. Assess soil and water impacts of forest operations, identifying compaction, erosion, and sensitive areas, and recommending mitigation measures.
9. Interpret forestry regulations and case studies to ensure operational compliance and propose modifications for legal and sustainable management.
10. Integrate stand data into harvest planning, including scheduling, equipment allocation, and operational sequencing for sustainable outcomes.
11. Match silvicultural prescriptions with appropriate operations and equipment, considering operational constraints and site impacts.
12. Apply safety and risk management principles to simulated operational scenarios and communicate mitigation strategies effectively.
13. Use GIS and mapping tools to plan forest operations, identify constraints, and optimize decisions.
14. Evaluate sustainable forest operations, synthesizing environmental, social, and economic trade-offs to develop recommendations.
15. Integrate course knowledge into a comprehensive forest operation plan, balancing operational efficiency, environmental protection, safety, and professional communication.

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Natural Sciences
  - AA/AS - Natural Sciences Laboratory
- 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: Students will work in groups to analyze a scenario involving harvesting methods and equipment selection in a 100-acre mixed forest with diverse terrain and sensitive soils. They will discuss strategies to balance timber productivity with environmental protection, including method and equipment choices, soil and water safeguards, and operational trade-offs. Groups will then report their conclusions to the class, expanding the discussion with reasoning and justification. Evaluation will emphasize the clarity of reasoning, understanding of environmental constraints, and ability to weigh trade-offs effectively. Objectives: 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
- Objective Examinations
  - Example: Students will work in groups to analyze a scenario involving harvesting methods and equipment selection in a 100-acre mixed forest with diverse terrain and sensitive soils. They will discuss strategies to balance timber productivity with environmental protection, including method and equipment choices, soil and water safeguards, and operational trade-offs. Groups will then report their conclusions to the class, expanding the discussion with reasoning and justification. Evaluation will emphasize the clarity of reasoning, understanding of environmental constraints, and ability to weigh trade-offs effectively. Objectives: 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
- Problem Solving Examinations
  - Example: Students act as operations managers for a 150-acre mixed-species forest and develop a harvest plan that balances timber recovery, environmental protection, and operator safety. They must select appropriate harvesting methods and equipment for different stand conditions, design road and skid networks to minimize environmental impact while maximizing efficiency, implement BMPs to protect soil and water, and outline key safety protocols. Evaluation will focus equally on analysis of terrain and stand conditions, justification of methods and equipment, integration of environmental protection, planning of roads and skids, and safety measures (20 points each). Students are expected to submit a clear, well-structured plan, including maps, diagrams, or sketches, demonstrating thoughtful trade-offs and critical thinking. Objectives: 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
- Projects
  - Example: Students will plan and execute safe and efficient tree felling operations while considering environmental, operational, and safety constraints. The project involves assessing site and tree characteristics, selecting appropriate felling methods and equipment, and designing a felling plan that integrates best management practices and safety measures. Students will then demonstrate or simulate the felling process, applying proper techniques and safety protocols, and finally reflect on the operation, evaluating efficiency, hazards encountered, and environmental protection. Evaluation will focus on the quality of planning, safe execution, adherence to BMPs, and depth of reflection on lessons learned. Objectives: 5, 6, 7, 8, 9, 10, 11, 12, 13

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Students will assess site conditions to determine appropriate equipment and operational strategies for forest management. The instructor will demonstrate soil texture assessment, slope measurement, and hazard identification techniques, while students work in small groups to collect soil samples, measure texture, evaluate terrain, and recommend suitable mechanized equipment and field techniques. Students will document their findings in a field worksheet, including soil composition, slope measurements, and recommendations that balance operational efficiency, safety, and environmental protection.

Lecture:

1. Students first receive an instructor-led overview of forest operations, mechanized harvesting methods, road and skid planning, and soil protection strategies including BMPs. Students then work in small groups to analyze a forest operation case study, identifying

operational and soil management challenges, evaluating current practices, and proposing improvements that balance efficiency and environmental protection. Each group presents their analysis and recommendations to the class, justifying choices with lecture content and course concepts, followed by discussion and Q&A.

Distance Learning

1. Students access a multimedia presentation covering major soil organisms, their ecological roles, and implications for forest soil fertility and mechanized operations. The instructor provides transcript, captions, audio, and video illustrations to explain bacteria, fungi, invertebrates, and microfauna, emphasizing their roles in decomposition, nutrient cycling, soil structure, and operational constraints. Following the lecture, students create an electronic concept map or summary table linking soil organism groups, functions, and interactions to forest management practices, including equipment selection and BMPs, using LMS tools or other software.

Typical Out of Class Assignments Reading Assignments

Students will review recent scientific articles or case studies on forest soil management, operational impacts, or BMP effectiveness provided by the instructor. Students will annotate the articles and summarize key findings, highlighting connections to mechanized operations, soil protection, and sustainable forest management, as well as considering trade-offs between operational efficiency and environmental protection. Objectives: 5, 6, 7, 8, 9, 10

Writing, Problem Solving or Performance

Students will read instructor-assigned scientific articles or case studies on forest soil management, operational impacts, or BMP effectiveness. Following instructor guidance and the assignment rubric, students will annotate the articles and then write a comparative synopsis summarizing and contrasting the findings. The synopsis should highlight practical recommendations for minimizing operational impacts on soils, consider trade-offs between operational efficiency and environmental protection, and reference specific data or figures from the studies. Objectives: 5, 6, 7, 8, 9, 10

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

In this portfolio assignment, students will create a comprehensive inventory of mechanized equipment and field techniques used in forest operations. They will analyze each piece of equipment and technique for operational use, safety considerations, environmental impacts, and best management practices, and provide example scenarios for optimal application. Students will then synthesize their inventories into a cohesive portfolio, reflecting on how these tools and techniques can be integrated to optimize forest management outcomes while minimizing risk and environmental impact. Objectives: 5, 6, 7, 8, 9, 10, 11, 12

Required Materials

- Restoring forests and trees for sustainable development
  - Author: Pia Katila, Carol J Pierce Colfer, Wil de Jong, Glenn Galloway, Pablo Pacheco, Georg Winkel
  - Publisher: Oxford University Press
  - Publication Date: 2024
  - Text Edition: 1
  - Classic Textbook?: Yes
  - OER Link:
  - OER: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/ https://watermark02.silverchair.com/isbn-9780197683927.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAzI OHQmY4NpVeFTIPRdFssaBIKCwww1dIUpvM_TfB-_R4sMBi54WnwML-bfaRJqJcRTAL4NIJlWrCXmyVl3e0gjW2s7r_6LNit7WkI4goDNNIYpwFvQEzR3 fTWTNbqyROeE455SZsfhN6-QVBwJ_2xp4isA7Cb1XSC0dtz8vVGMwlshn0Tph5RlrPOz0DNuG5ekQz48Vzb X-BLNuvwvkd3OdS5bDbaJS2VCtXYB26JDja4QTv-sAOLq3pmn_zEib8xPrMIDMh1aSSY9VYmDuSupYcCAXWBTalN9S007DBPkH h9WPSRDqGSmhd_vGLhlMqw12TzZbT8e0CCMFuAkwd_J9MJLrmkhgNF8W XLexBBssAdOa6S7RlXdV2qz6vdDvWig0RWG5yaRJNjEbDPYURpqhQSvII-9u xCwNnpQTOAULVJgavN6gunFxJqS_Qy3UWdVPjAa0ZqTmKlH
- Forest Policy and Governance in the United States: An Introduction
  - Author: Jesse Abrams
  - Publisher: Routledge
  - Publication Date: 2023
  - Text Edition: 1
  - Classic Textbook?: Yes
  - OER Link:
  - OER:
- Technologies, Applications and Assessments for Proper Sustainable Forest Operations (SFO)
  - Author: Rachele Venanzi Rachele Venanzi JS Janine Schweier Janine Schweier RP Rodolfo Picchio Rodolfo Picchio
  - Publisher: MDPI Books
  - Publication Date: 2022
  - Text Edition: 1
  - Classic Textbook?: Yes
  - OER Link:
  - OER: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/ https://mdpi-res.com/bookfiles/book/7721/Technologies_Applications_and_Assessments_for_Proper_Sustainable_Fore v=1761530897

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