

**SC 470**

**Applied Techniques in Restoration**

**3 Credits**

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## SC 470 Version: 1



# Applied Techniques in Restoration

## Calendar Description

Applied restoration ecology provides students with an advanced and applied understanding of current techniques. The course addresses how practical restoration techniques are applied based on scientific, environmental, and social considerations. Students develop critical thinking and analytical decision making skills through scientific review, case studies and discussion.

## Rationale

This is a required course for students enrolled in the Conservation and Restoration Ecology major of the Environmental Science Diploma. Impacts of natural and anthropogenic disturbances causing ecological changes challenge the integrity of biodiversity, ecological services and human well-being. The multidisciplinary field of restoration ecology addresses these ecological issues with the aim to assist and enhance the return of previous ecological function in a degraded, damaged, or destroyed ecosystem. Restoration ecology is a developing science in which success can be uncertain, requiring applied problem solving. Practitioners need to connect cause and effect within these damaged ecosystems to assess each situation and use knowledge of ecosystem function to develop adaptable and practical plans for restoration. This is done using current research, case studies and discussion to identify approaches for successful practices. This course uses these resources to investigate and learn current techniques in the practice of ecological restoration in a variety of biophysical settings.

## Prerequisites

SC 329 and SO 340

## Co-Requisites

None

## Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. assess environmental factors and elements of successful versus failed restoration projects.

2. make decisions for implementing restoration strategies, measuring and monitoring ecological outcomes of restored ecosystem through case studies and literature reviews.
3. critique current uncertainties in restoration ecology and suggest key ecological questions that should be addressed to improve restoration.
4. propose technical solutions and management approaches to overcome challenges in ecological restoration.
5. investigate applied and advanced techniques to restore and repair specific habitats such as grassland, forest, wetland and riparian, river and wildlife.
6. apply advanced techniques and practices and select appropriate methods and tools for designing and conducting restoration projects.
7. critique and evaluate case studies to synthesize lessons regarding advanced knowledge in restoration ecology.
8. achieve professional skills in reading, analyzing, writing and discussing ecological restoration from multiple disciplinary perspectives.
9. apply learning outcomes to assignments, the final exam, professional communication and creative design of restoration projects.
10. adapt and respond to future development of restoration ecology techniques and solutions through continued education and innovation.

## Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

- A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
- B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
- C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
- D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.
- E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

## Resource Materials

### ***Required Text:***

Required readings for each lecture discussion is posted on D2L in advance of class. Students need to read these materials prior to class to prepare for discussion, and students are tested on

these readings on the exams. There is no required textbook for this course; however, you are required to research, read and discuss case studies from scientific journal, technical and project reports. Several texts are recommended for students who need extra help or review of the theories covered in this class.

***Required reading list:***

A variety of publications are provided for the student by the instructor. Required and recommended sources such as texts, web sources, databases, journals and other are presented in class and shared through the online learning platform.

***Recommended texts***

Gerling, H.S., M.G. Willoughby, A. Schoepf, K.E. Tannas, and C.A. Tannas. 1996. A guide to using native plants on disturbed lands. Agriculture, Food and Rural Development and Alberta Environmental Protection, Edmonton, AB.

MacKenzie D. 2011. Best Management Practices for conservation of reclamation materials in the Mineable Oil Sands Region of Alberta. Best Management Practices Task Group of the Reclamation Working Group of the Cumulative Environmental Management Association, Fort McMurray, AB.

Native Plant Working Group. 2000. Native Plant Revegetation Guidelines for Alberta.

Sinton-Gerling H. (ed.), Alberta Agriculture, Food and Rural Development and Alberta Environment. Edmonton, Alberta.

Smreciu, A., H. Sinton, D. Walker, and J. Bietz. 2002 Establishing Native Plant Communities. Alberta Agriculture, Food and Rural Development, Alberta Environment and Alberta Sustainable Resources Development.

Whisenant, S.G. 1999. Repairing damaged wildlands: A process-oriented, landscape-scale approach. Cambridge University Press. Cambridge, United Kingdom.

**Conduct of Course**

This course consists of approximately 42 hours of lecture. The lecture is formalized classroom situation where the instructor introduces and discusses pertinent topics, students take notes, question and discuss during the lecture. Students are expected to participate in discussion and are responsible for specific topics in the course. In each study topic or each study week, journal articles and/or project reports are introduced by both the instructor and the students in which the student is assigned and is responsible for discussion of restoration techniques, limitations and solutions to overcome ecological issues. Students are expected to research and provide other

related theories and journal articles or projects for class discussion. Students are required to attend lecture periods to contribute to class discussions and review of topic information.

Absence during in class assignments results in a grade of zero being assigned. Participation is evaluated in the class based on attendance and discussion. Specifics are discussed by the instructor. All material presented and discussed by the instructor and students is considered material for the exam.

Field trips, labs or conferences may be incorporated into the course. Students are required to participate and time may be given in lieu of time spent on other activities. Assignments are made for each study unit.

## Evaluation Procedures

Assignments include written case studies, literature review and class presentation for selected topics in advanced restoration ecology. The final exam may contain discussion-type, scenario analysis, short answer, matching, true-false-justify, and multiple-choice questions. Exam material is based on that provided by the instructor, the case studies discussed, readings, and the student research presented in class.

The final grade for the course is weighted according to the following schedule:

Participation in Class Discussion	5%
Presentation of a case study	10%
Individual Report on a case study	10%
Assignments	35%
Final Exam	40%
Total	100%

To obtain credit for this course:

All assignments must be completed and handed in on time. Deadlines for submission of written work are non-negotiable. A deduction of 25% per day, including weekends, is applied to late submissions. Exceptions are made only for documented medical or compassionate reasons, attendance of academic conferences, job interviews or for other absences (i.e. field trips) that are required for study and professional careers. In such cases an email or letter must be provided by your instructor(s), supervisor (s), or medical officer. All assignments and exam are graded on a percentage (%) basis and a total course percentage is calculated using the above weighting values. Finally, the total course percentage is converted to a letter grade based on the college grade strip. A minimum grade of D (50%) is required to pass the course. Details of assignments and case study presentation, including deadlines, are announced in class.

Cheating, plagiarism and other forms of academic dishonesty are unacceptable and are dealt with according to College regulations. It is a serious offence and can result in suspension or expulsion from the College.

## Knowledge/Skills Matrix

Students apply and demonstrate their knowledge and skills to use

### A. Communication Skills

<b>A1. by listening, reading, interpreting information, and communicating effectively</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, presentations, exams; goals: 2, 3, 4, 5, 7, 8, 9
<b>A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, presentations, exams; goals: 2, 3, 4, 5, 7, 8, 9
<b>A3. by using libraries, Internet, technical publications, journals and other sources to find pertinent information</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, presentations, exams; goals: 1, 2, 3, 4, 5, 7, 8, 9, 10

### B. Teamwork Skills

<b>B1. by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 4, 8, 9
<b>B2. by using interpersonal skills to resolve conflict, relate to others, and assist others</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 4, 8, 9
<b>B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 8, 9,
<b>B4. by treating other members of the group open-mindedly and fairly</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 8, 9
<b>B5. by developing tactics/strategies to accomplish tasks</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, presentations; goals: 2, 4, 6, 7, 8, 9

### C. Critical Thinking Skills

<b>C1. by seeing critical thinking as a lifelong process of self-assessment</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, exam; goals: 1, 2, 3, 4, 6, 7, 8, 9, 10
<b>C2. by examining problems closely</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions, exam; goals: 1, 2, 3, 4, 6, 7, 8, 9, 10
<b>C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions; goals: 1, 3, 5, 7, 8, 9
<b>C4. by seeking out the truth</b>	

	<b>Evaluation(s)/Goal(s):</b> assignments, discussions; goals: 2, 5, 7, 8, 9
<b>C5. by finding solutions; make decisions</b>	
	<b>Evaluation(s)/Goal(s):</b> presentations, assignments, exam; goals: 2, 4, 6, 7, 8
<b>C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic</b>	
	<b>Evaluation(s)/Goal(s):</b> presentations, discussions; goals: 3, 4, 5, 6, 10
<b>C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences</b>	
	<b>Evaluation(s)/Goal(s):</b> presentations, discussions; goals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**D. Adaptability Skills**

<b>D1. by working independently or as part of team</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, presentations, discussions; goals: 8, 9
<b>D2. by carrying out multiple tasks or projects</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, presentations, discussions; goals: 1, 3, 4, 7, 8
<b>D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, presentations; goals: 3, 4, 5, 6, 10
<b>D4. by being open and respond constructively to change and uncertainty</b>	
	<b>Evaluation(s)/Goal(s):</b> assignments, discussions; goals: 3, 5, 6, 10

**E. Positive Attitude and Behavioural Skills**

<b>E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 1, 3, 4, 7, 8, 9
<b>E2. by showing interest, initiative, and effort</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 3, 4, 7, 8, 9, 10
<b>E3. by affirming the need for positive solutions and encourage positive interaction and feedback</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions, presentations; goals: 3, 4, 7, 8, 9, 10
<b>E4. by balancing personal and family activities with job-related activities</b>	
	<b>Evaluation(s)/Goal(s):</b> discussions; goals: 8, 9, 10

**Grade Equivalents and Course Pass Requirements**

*A minimum grade of D (50%) (1.00) is required to pass this course.*

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

**Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.**

## **Attendance**

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

- a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
- b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification for each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

## **Course Units/Topics**

The following are possible topics to be covered in class. Topic order may change due to exams, assignments or presentations. Within each heading are topics for study theories and case studies, research and discussion.

- A. Adaptive management and evaluation of success in restoration
  - a. Adaptive management defined, application and examples of use
  - b. Current restoration evaluation metrics, timelines and requirements
  - c. Alternative evaluation metrics
- B. Techniques in grasslands restoration
  - a. Challenges in grassland restoration
  - b. Restoring natural disturbance regimes
  - c. Re-establishing native species and community function



- C. Techniques in mixed wood forest restoration
  - a. Challenges in mixed-wood restoration
  - b. Establishing forest trajectories/structure
- D. Techniques in boreal forest restoration
  - a. Challenges in boreal forest restoration
  - b. Restoring oil and gas disturbances; seismic lines, well sites, and roads
  - c. Restoring boreal forest plant communities
- E. Techniques in non peatland (mineral wetland) restoration
  - a. Challenges to non peatland restoration
  - b. Restoring water levels
  - c. Restoring vegetation and function
- F. Techniques in peatland restoration
  - a. Challenges in peatland restoration
  - b. Developments in peatland restoration
- G. Techniques in stream and river restoration
  - a. Challenges in stream and river restoration
  - b. Re-establishing vegetation and native species for bank and riparian function

There is no lab in this course, but the field tours and attending workshops/conferences may be included. The exercises and assignments are not restricted but may include the following:

1. Exploring ecological indicators of different restored habitats
2. Eliminating invasive species and unwanted successional pathways
3. Reflection for professional practice in restoration ecology
4. Literature lists & reviews on restoration issues and solutions
5. Writing a formal technical report in restoration ecology
6. Group presentation on case studies



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