Watershed and Stream Protection and Restoration

COURSE IDENTIFICATION

CODE	SEM	HT	HP	HA	SCT	PREREQUISITES	COURSE LEVEL OR CATEGORY	RESPONSABLE UNIT
AG040513	Summer	1	0	2,1	2	Postgraduate inscription	Elective	Postgraduate School

One SCT credit point is equivalent to 25 student learning hours.

COURSE DESCRIPTION

The course explores the principles of restoration and sustainable management of streams and watersheds. This will include an overview of hydrologic, sediment transport, geomorphic, and ecological principles applicable to the assessment of stream channel and watershed condition, developing approaches to stream management and restoration, and evaluating the performance of restoration projects. We will also emphasize the interrelated nature of hydrology, hydraulics, sediment transport, geomorphology, aquatic ecology, and riparian ecology.

LEARNING STRATEGIES

Due to the breadth of the material covered in this course, we will emphasize a holistic perspective on restoration and the interconnectedness of various disciplines and processes. The course material will be covered using a range of techniques including lectures, videos, journal paper discussions, student presentations, and working sessions. The lectures are intended to introduce general principles and connect general themes.

COURSE COMPETENCIES (Type: B=Basic, G=Generic, E=Specific)

At the conclusion of this class, students will be able to:

- Explain the scientific aspects of stream and watershed restoration to non-scientists in a fashion that enhances understanding and decision-making.(G)
- Obtain/compile and interpret relevant data to describe watershed and stream processes.(G)
- Explain and predict the effects of natural and anthropogenic stressors on streams and watersheds.(G)
- Compare and critique the various techniques and/or philosophies of restoration topics.(E)
- Propose or formulate restoration approaches to specific cases of stream and watershed degradation.(E)

LEARNING RESOURCES

Lectures. Case studies. Student debates.

COURSE OUTLINE

Day	Lecture (morning)	Lecture (afternoon)
1 Processes driving stream ecosystems	• The state of affairs • Stream corridor dynamics • Disturbances and response in aquatic ecosystems	• Restoration relevant hydrology • Restoration relevant hydraulics
2 Sediments and Ecology	• Sediment transport and continuity • Regime theory and channel evolution • Dominant discharge and bankfull flow	• Stream corridor habitats • Aquatic ecology principles • Riparian ecology principles
3 Restoration Principles and Approaches	• Restoration principles • Restoration goals and objectives	• Site assessments and investigations Stream classification systems
4 Stream Restoration Design	• Principles of channel design for restoration • Alluvial, regime, and analog methods	• Channel design application Design workshop
5	• Environmental flows • Treatment techniques	• Project implementation • Monitoring plans

Implementation of active and passive restoration projects		Reflection on restoration performance

Reading Materials

- NEH-653: NRCS - Federal Stream Corridor Restoration Handbook
https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/manage/restoration/?cid=stelprdb1043244
- NEH-654: NRCS – Stream Restoration Design
http://policy.nrcs.usda.gov/viewerFS.aspx?id=3491
- Various journal papers and PDF documents provided by the instructor

Major Topics

- Stream corridor processes and characteristics
- Disturbances affecting stream corridors
- Restoration, rehabilitation, and reclamation concepts
- Ecological principles to guide stream designs
- Site assessment and investigation
- Principles of channel design and restoration treatments
- Sediment regimes, transport, and continuity
- Project implementation and monitoring

INSTRUCTORS (List non-exclusive)

Instructor	*Department*	*Area or major field*
Mark Stone	Civil Engineer, Center for Water and the Environment. University of New Mexico	Biological System Engineering, Civil and Environmental Engineering.
Cristián Kremer	Soil and Engineering. University of Chile	Biosystem Engineering, Soil Physics, Irrigation and Drainage.

GRADING (under review every term)

Activity	*Percentage (%)*
Exam 1	50
Exam 2	50