ENV-426

Fluvial biogeosciences

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Cursus	Sem.	Type
Environmental Sciences and Engineering	MA1, MA3	Opt.
Mineur STAS Russie	H	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Project	2 weekly
Number of positions	

Summary

Stream and river ecosystems are increasingly deteriorated owing to global change and climate change. Students will understand basic physical, chemical and biological processes in streams and rivers, and how they relate to ecosystem health and integrity .

Content

The class will provide fundamental insights into physical and chemical processes of stream and river ecosystems, which will be linked to the ecology and ecosystem processes therein. At the end of the class, acquired knowledge will be converged into a discussion on ecological restoration strategies and the management of water resources in the Anthropocene.
The class (2 ETCS, Prof. Battin) will encapsulate the following units:

1. Introduction and rationale — why fluvial biogeosciences?
2. From geomorphology and hydrology to ecosystems
3. The basics of benthic and hyporheic life
4. Streams and rivers are global players — from water resources to biogeochemistry
5. Carbon and nutrient cycling
6. Ecosystem metabolism
7. Biogeosciences for environmental engineers and scientists

The class will be accompanied by the practical work (2 ETCS) in the laboratory and in the field. It will convey insights into research on fluvial biogeosciences, including porposal writing, and practical work related to metabolism and microbial ecology. Students will learn on a weekly basis how to design, plan and carry out a small research project; this requires the regular presence of the students to conduct fieldwork, lab work and computer exercises. The project will be led by Dr. Amber Ulseth and Dr. Hannes Peter, and assisted by the Doctoral Assistants David Scheidweiler and Asa Horgby

Keywords

biogeosciences, streams and rivers, hydrodynamics, biogeochemistry, ecosystem science, benthic life, nutrient cycling, metabolism, restoration, management

Learning Prerequisites

Recommended courses

The BSc Class Aquatic Ecosystems (ENV-321) would be an asset.

Important concepts to start the course

A basic understanding of fluvial ecosystems, hydrology, geomorphology and hydraulics would be helpful.

Learning Outcomes

By the end of the course, the student must be able to:

- Report on their project on fluvial biogeosciences
- Assess / Evaluate critical environmental issues related to stream ecosystems
- Theorize basic concepts in fluvial biogeosciences
- Assess / Evaluate benthic life
- Assess / Evaluate ecological restoration strategies
- Generalize theory in fluvial biogeosciences
- Carry out simple experiments in fluvial biogeosciences

Teaching methods

power point, black board, hand-on in the lab and in the field, computer exercises

Expected student activities

Interactions and discussions with teachers
feedback and respond to questions
feeback in an appropriate manner on the content and its presentation
conduct a supervised small research project
report on the methods and results from the practical work

Assessment methods

written exam (70%)
project - active work in the lab, field and report (30%)

Supervision

Office hours	Yes
Assistants	Yes
Others	office hours: Tuesday 11:00 to 12:00 (Prof Battin) assistants: Dr Amber Ulseth and Dr Hannes Peter

Resources

Bibliography

Calow P and Petts GE 1992 The Rivers Handbook. Blackwell
Dodds W and Whiles M 2010 Freshwater Ecology. Academic Press
Goldman CR, Kumagai M and Robarts RD 2013 Climatic change and glibal warming of inland wates. Wiley-Blackwell
Palmer, M. A., Hondula, K. L., & Koch, B. J. (2014). Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals. Annual Review of Ecology, Evolution, and Systematics, 45(1), 247–269. doi:10.1146/annurev-ecolsys-120213-091935
Williamson, C. E., Dodds, W., Kratz, T. K., & Palmer, M. A. (2008). Lakes and streams as sentinels of environmental change in terrestrial and atmospheric processes. Frontiers in Ecology and the Environment, 6(5), 247–254. doi:10.1890/070140
Palmer, M. A., & Febria, C. M. (2012). The Heartbeat of Ecosystems. Science, 336(6087), 1393–1394. doi:10.1126/science.1223250
Battin, T. J., Kaplan, L. A., Denis Newbold, J., & Hansen, C. M. E. (2003). Contributions of microbial biofilms to ecosystem processes in stream mesocosms. Nature, 426(6965), 439–442. doi:10.1038/nature02152
Battin, T. J., Luyssaert, S., Kaplan, L. A., Aufdenkampe, A. K., Richter, A., & Tranvik, L. J. (2009). The boundless carbon cycle. Nature Geoscience, 2(9), 598–600. doi:10.1038/ngeo618

Ressources en bibliothèque

- The Heartbeat of Ecosystems
- Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals

- Lakes and streams as sentinels of environmental change in terrestrial and atmospheric processes
- The rivers handbook / Calow
- Contributions of microbial biofilms to ecosystem processes in stream mesocosms
- Climatic change and and global warming of inland waters / Goldman, Kumagai, Robarts
- Freshwater ecology / Dodds, Whiles
- The boundless carbon cycle