Life Sciences and
Facility Management

Institute of
Computational Life Sciences

Project Work 2 - Outline		
Study Cohort		Applied Digital Life Sciences 2023
Title		Modelling Wildlife Corridors: Spatial Analysis of Topographic and Landscape Barriers to determine Ecological Connectivity
Confidential		No
Specialisation		Digital Environment
Minor(s)		Ecology and Geodata Processing
Names	Students	Buchmann Lukas
	Supervisor	Ratnaweera Nils

Assignment

- **Initial status**
- **Objectives**
- **Additional Assignment Modalities**

Initial Status

Habitat fragmentation caused by human infrastructure, land use change, and settlement expansion is one of the main drivers of biodiversity loss in Europe, including Switzerland. Wildlife corridors are essential tools to maintain ecological connectivity by enabling species to move between core habitats and sustain viable populations (*Haddad et al. - 2015 - Habitat fragmentation and its lasting impact on Ea.pdf*, o. J.).

In Switzerland, a high population density coupled with a dense network of transport infrastructure creates significant barriers for wildlife. Mammals like the roe deer, which depend on forests and agricultural lands for their habitat and seasonal migrations, are particularly affected. Major roads and railways dissect their territories, isolating populations and increasing mortality risk, which disrupts fundamental ecological processes like dispersal and genetic exchange (*T Findlay und Bourdages - 2000 - Response Time of Wetland Biodiversity to Road Cons.pdf*, o. J.).

Geographic Information Science (GIS), combined with high-resolution geodata, provide the essential methodological framework for addressing habitat fragmentation. By integrating data which map terrain, and detailed land-cover information, researchers can model the landscape from a species perspective. Techniques like habitat suitability modelling and least-cost path analysis are used to analyse existing barriers and identify the most likely routes animals would take, thus pinpointing the optimal locations for potential wildlife corridors (*Animal Conservation - 2022 - Kaasiku - Predation‐mediated edge effects reduce survival of wader nests at a wet.pdf*, o. J.).

Objectives

The project aims to develop, improve, and evaluate a GIS-based connectivity model for deer in the canton of Schaffhausen, using Python. The project will:

1. Create a resistance surface by combining topographic, land-cover datasets to represent movement constraints of deer in the landscape.
2. Perform Least-Cost-Path analysis by computing the cumulative cost from each start point to selected endpoints to identify potential wildlife corridors connecting suitable habitat patches.
3. Improve the resistance surface with additional data.
4. Identifying key bottlenecks, major obstacles, and areas that may limit ecological connectivity.
5. Highlighting patterns revealed by the data and simulations.

Additional Assignment Modalities

The project will be carried out as an individual research project within the framework of Project Work 2. It is based on publicly available

	geospatial datasets. Initially, the three datasets https://www.swisstopo.admin.ch/en/landscape-model-swisstlm3d, https://www.wsl.ch/en/projects/corine-switzerland/ and https://www.swisstopo.admin.ch/de/hoehenmodell-swissalti3d, will be used. Then, depending on how the project develops, further data sets may be included. The project is limited to one species (roe deer) and one study region (Schaffhausen) to allow for a detailed spatial analysis within the given timeframe. The expected result is a connectivity model and accompanying cartographic products that will serve as a decision-making aid for projects in the field of nature conservation and spatial planning. Furthermore, a scientific paper in Quarto and an oral presentation of the project will be delivered. The Best Practices for Reproducibility, Reusability and Collaboration will be implemented according to the document “A Guide to Reproducibility, Reusability, and Collaboration”.
Formal Requirements	All relevant Guidelines for student papers
Timeline	See Project Plan
Submission Deadline (12:00 PM)	11.12.2025
Remarks	
Workplace	ZHAW Wädenswil

Sources

Animal Conservation—2022—Kaasiku—Predation-mediated edge effects reduce survival of wader nests at a wet.pdf. (o. J.).

Haddad et al. - 2015—Habitat fragmentation and its lasting impact on Ea.pdf. (o. J.).

T Findlay und Bourdages—2000—Response Time of Wetland Biodiversity to Road Cons.pdf. (o. J.).

Modeling Wildlife Corridors

Spatial Analysis of Topographic and Landscape Barriers to Enhance Ecological Connectivity

Project start: Mo, 9.15.2025

Display week: 1

Project Work 2 Lukas Buchmann

TASK	ASSIGNED TO	PROGRESS	START	END
Initiation and Planning				
Method Research	Lukas Buchmann	60%	9.15.25	10.16.25
Data Acquisition	Lukas Buchmann	60%	9.15.25	10.16.25
Disposition Submission	Lukas Buchmann		10.17.25	
Execution				
Data Preparation	Lukas Buchmann	20%	10.18.25	10.22.25
Set up infrastructure	Lukas Buchmann	20%	10.18.25	10.23.25
First Resistance Surface	Lukas Buchmann		10.21.25	11.2.25
Apply Least-Cost-Path	Lukas Buchmann		10.30.25	11.8.25
First Basic Model	Lukas Buchmann		11.9.25	11.9.25
Evaluation and Improvement				
Search Additional data	Lukas Buchmann	10%	11.10.25	11.18.25
Improve Model	Lukas Buchmann		11.12.25	11.23.25
Identify Corridors	Lukas Buchmann		11.20.25	11.29.25
Evaluate Corridors	Lukas Buchmann		11.24.25	12.1.25
Final Model	Lukas Buchmann		12.2.25	12.2.25
Project Documentation and Presentation				
Paper Writing	Lukas Buchmann		10.26.25	12.3.25
Final Paper Review	Lukas Buchmann		12.4.25	12.10.25
Paper Submission	Lukas Buchmann		12.11.25	
Presentation Preparation	Lukas Buchmann		12.9.25	12.18.25
Presentation	Lukas Buchmann		12.19.25	
Quality and Progress Review				
Pre-submission of work	Lukas Buchmann		11.13.25	
Meetings with Review	Lukas Buchmann