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Tools for the Analysis of connectivity in Riverine landscapes

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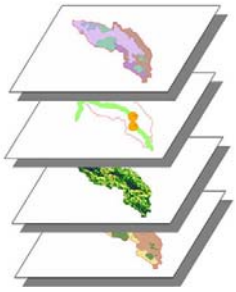
Overview

- definition of riverine landscapes
- quantifying fragmentation
- characterising barriers
- habitat connectivity
- Outlook



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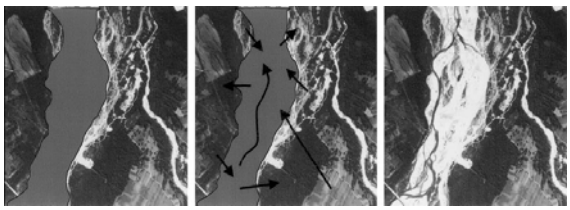
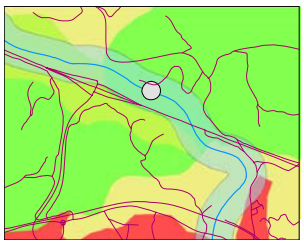
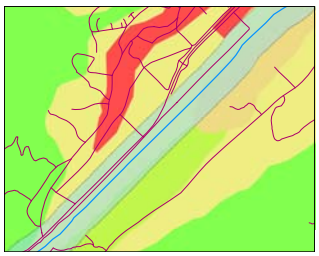
Riverine landscapes



Wiens_2002





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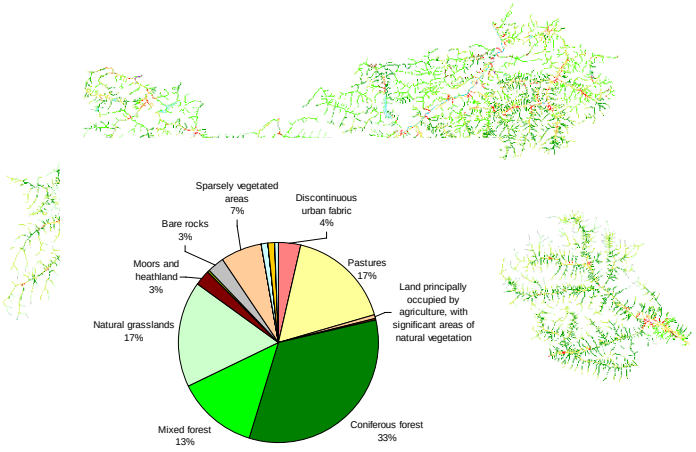

data source: Tiris, Corine landcover Level3

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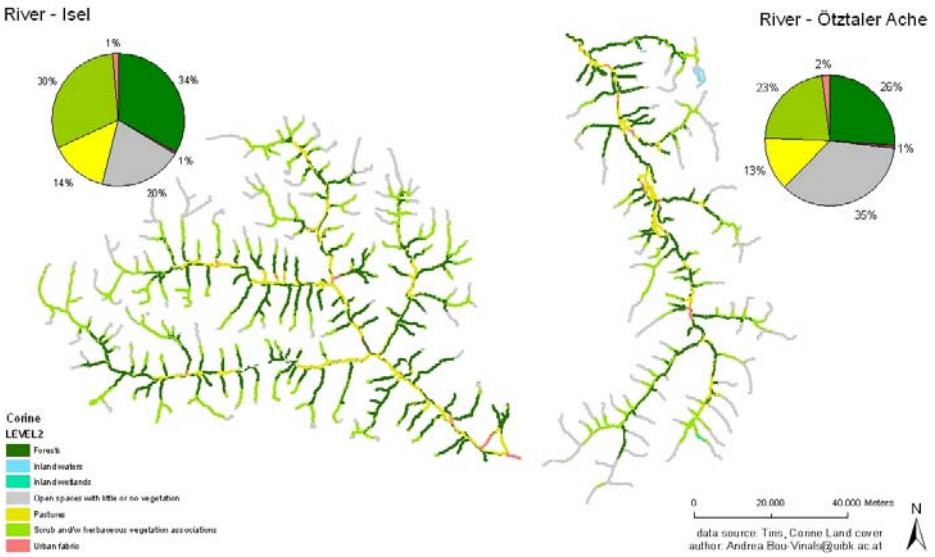
Corine landcover - riverine landscape
Ötzaler Ache/Tirol - Isel/Tirol



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Tools for the Analysis of connectivity in Riverine landscapes

Quantifying fragmentation - indices

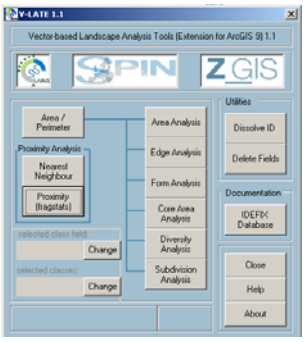
effective mesh-size

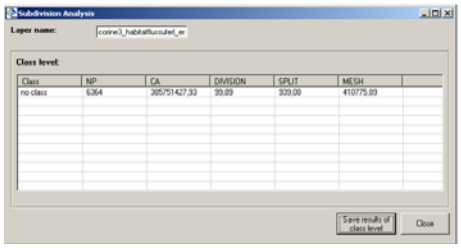
Landscape division index

degree of coherence

indizes landscape (river and riparian area) division			
splitting index S	$LDI = \frac{\sum_{i=1}^{n} p_i}{2\sqrt{\pi A_t \sum_{i=1}^{n} A_i}}$	(1-∞) m^2	Jäger_2000, Lang_2007
Splitting density s	$\frac{A_t}{\sum_{i=1}^{n} A_i^2} \cdot \frac{1}{m}$		Jäger_2000
degree of coherence C	$C = \sum_{i=1}^{n} \left(\frac{A_i}{A_t}\right)^2$	(0-1) %	Jäger_2000, Lang_2007
degree of landscape division	$D = 1 - \sum_{i=1}^{n} \left(\frac{A_i}{A_t}\right)^2$	(0-1) %	Jäger_2000, Lang_2007
effective mesh size (meff)	$m = \frac{A_t}{S} = \frac{1}{A_t} \sum_{i=1}^{n} A_i^2$	(0-A)	Jäger_2000
Net product N	$N = \sum_{i=1}^{n} A_i^2$		Jäger_2000
edge-effect (TE, ED)			Lang_2007

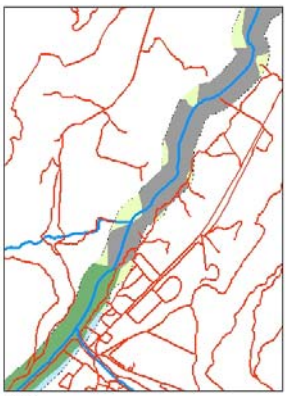
Software tool V-late *(LANG, S., TIEDE, D., 2003)* for calculation of Fragmentation-indices (Division index – eff.meshsize)



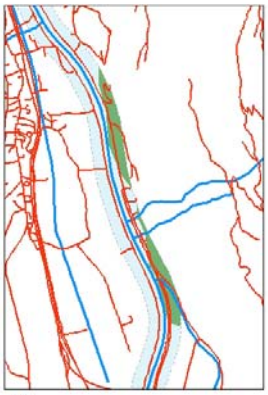


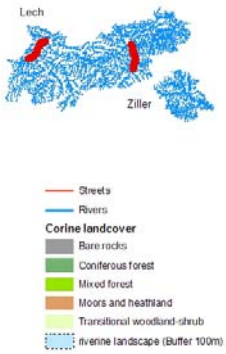
Fragmentation of Riverine Landscapes - Lech, Ziller/Tyrol
effective mesh-size (km²)

River Lech



River Ziller





Lech

Area riverine landscape (km²)	6,24
Number of Habitat types	5
Number of Patches	13
Class Area	3,62
coverage (%)	57,95
Streets (km)	46
Division Index (%)	49
eff. Mesh-size (km²)	1,85

Ziller

Area riverine landscape (km²)	6,05
Number of Habitat types	3
Number of Patches	9
Class Area	0,15
coverage (%)	2,50
Streets (km)	94
Division Index (%)	82
eff. Mesh-size (km²)	0,03

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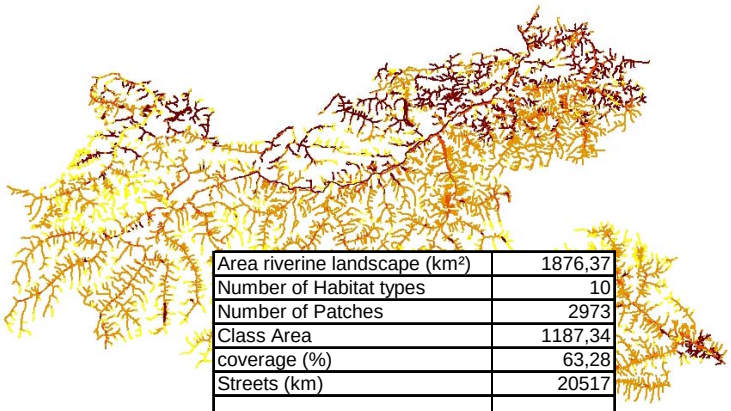

Area riverine landscape (km²)	1876,37
Number of Habitat types	10
Number of Patches	2973
Class Area	1187,34
coverage (%)	63,28
Streets (km)	20517
Division Index (%)	99,73
eff. Mesh-size (km²)	3,16

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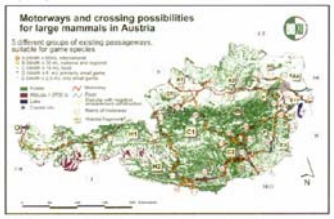
Characterising barriers

Tab. 1: Conjunction between the barrier value and their verbal description

Barrier value	Verbal description of the barrier
1.0	Absolute barrier, no traversing possiblity
0.8	Hard conquerable barrier
0.6	Conquerale barrier (large agricultural field with low vegetation)
0.4	Easy conquerable barrier (agricultural fields with high vegetation
0.2	Very easy conquerable barrier
0	Landscape element without barrier function

Woess_2001



Map 2: Spatial distribution of forests and barriers in Lower Austria (VÖLK et al., 2001)

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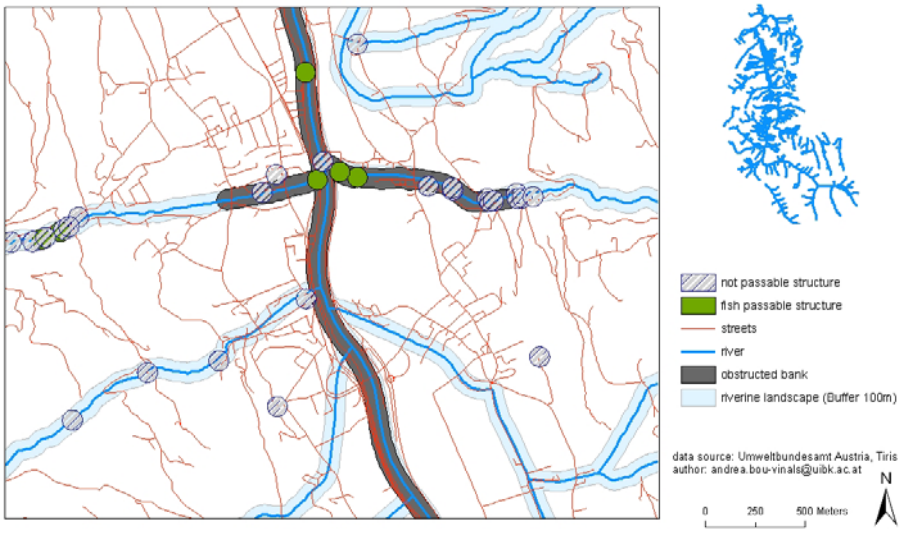
Define potential barriers

Classification of barriers have to be adapted for every key species / taxa

e.g. Fish – *Cottus gobio*

- passable barriers (power station with fish pass)
- non passable barriers (waterfalls, power station without a fish pass)
- potential barriers (falls, streets, constructed bank)

Map of potential barriers River Ziller, Tyrol, Austria



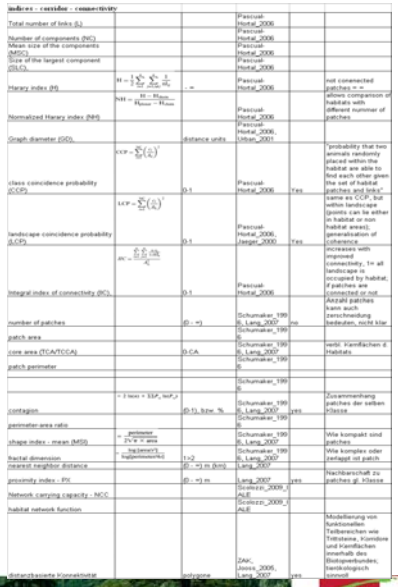
Habitat connectivity

proximity index

class coincidence probability index

landscape coincidence probability

contagion



Define potential corridors

Literature research on potential habitats

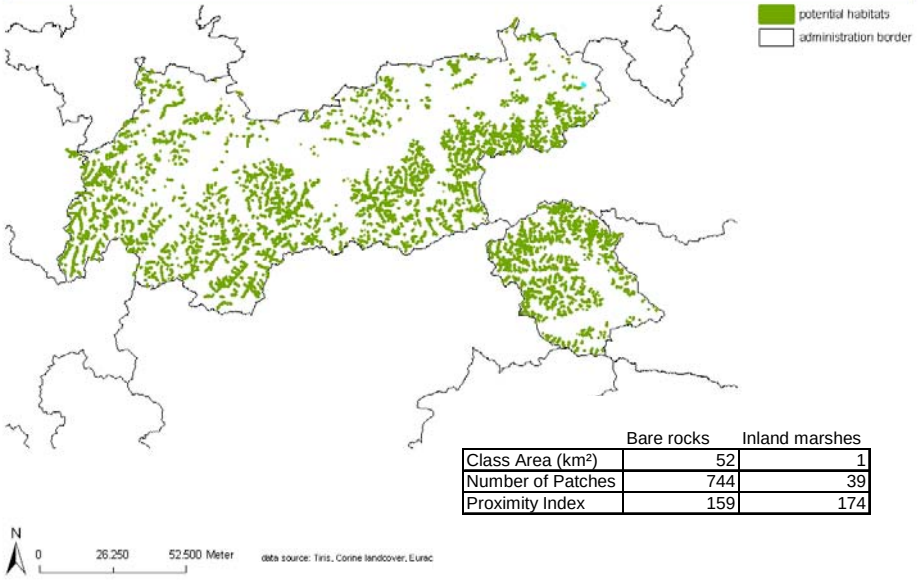
e.g. Common Sandpiper - *Actitis hypoleucos*

- o Gravel
- o rocky bank
- o marshes

Define the habitats with Corine land cover types
selection of the types and clip it with riverine landscapes

Calculate proximity index (Buffer = dispersal distance species)

Potential Habitats of the Common Sandpiper, Tyrol/ Austria



	Bare rocks	Inland marshes
Class Area (km²)	52	1
Number of Patches	744	39
Proximity Index	159	174

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Outlook

- Quantitative analysis of habitat connectivity by applying representative indices (e.g. class coincidence probability, proximity index, contagion index)
- Define habitats including Temperature, elevation,…
- Overlay/intersect results of fragmentation and barrier analysis as well as distribution maps and migration routes of focal species
- Definition of potential corridors for each focal species and/or taxon in the pilot regions
- Visualise the corridors – map in ArcGis

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