Evolution of An Ecological Network: Case Study of Sichuan

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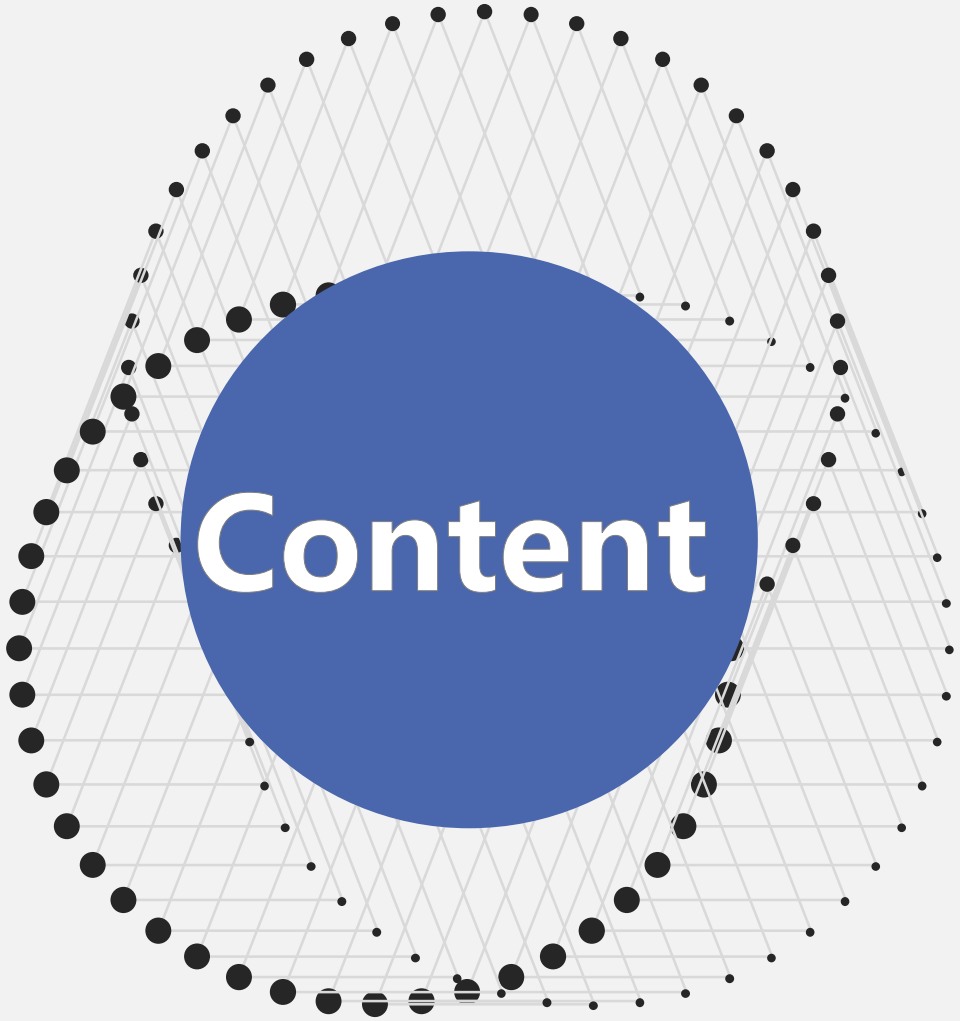


1 BACKGROUND

Ecological network: patches + corridors

Resource:

- ✓ provide the source for the adjacent

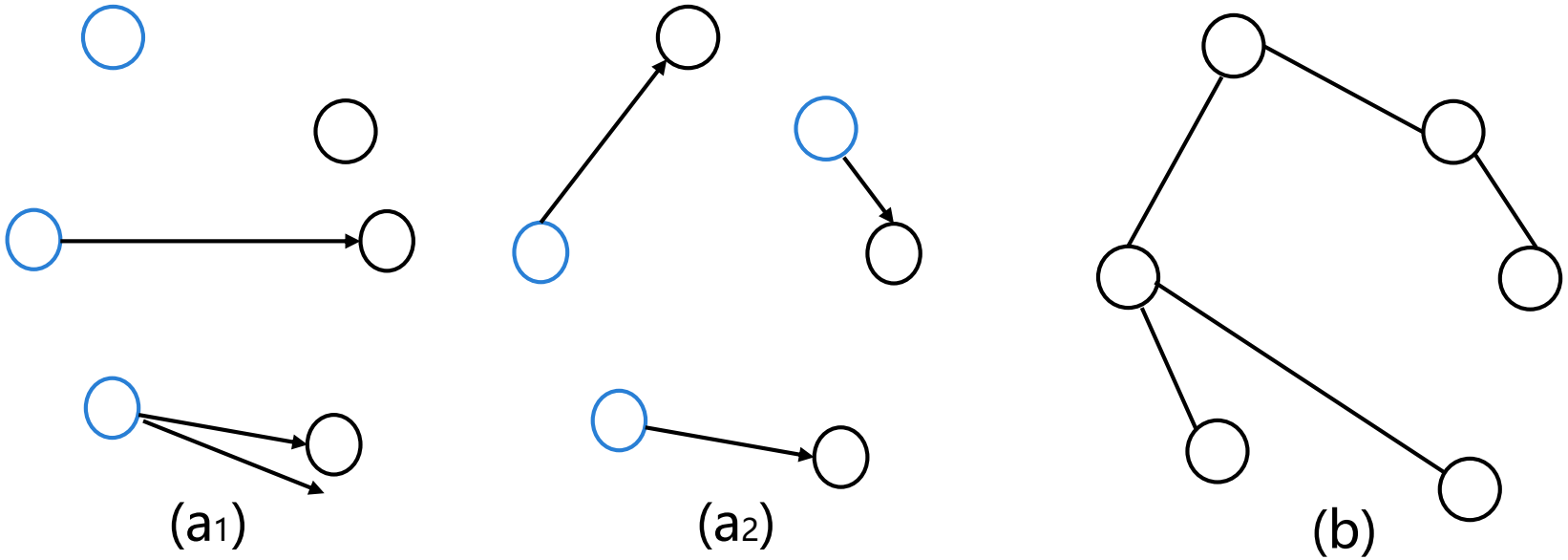
- Conduit
  - ✓ protect the biodiversity
- Barrier
  - ✓ prevent soil erosion
- Filter
  - ✓ filter contaminants

1 BACKGROUND

- Natural hazards and human activities, especially urbanization, have made large-scale habitats more fragmented and islanding.

2 RESEARCH QUESTION

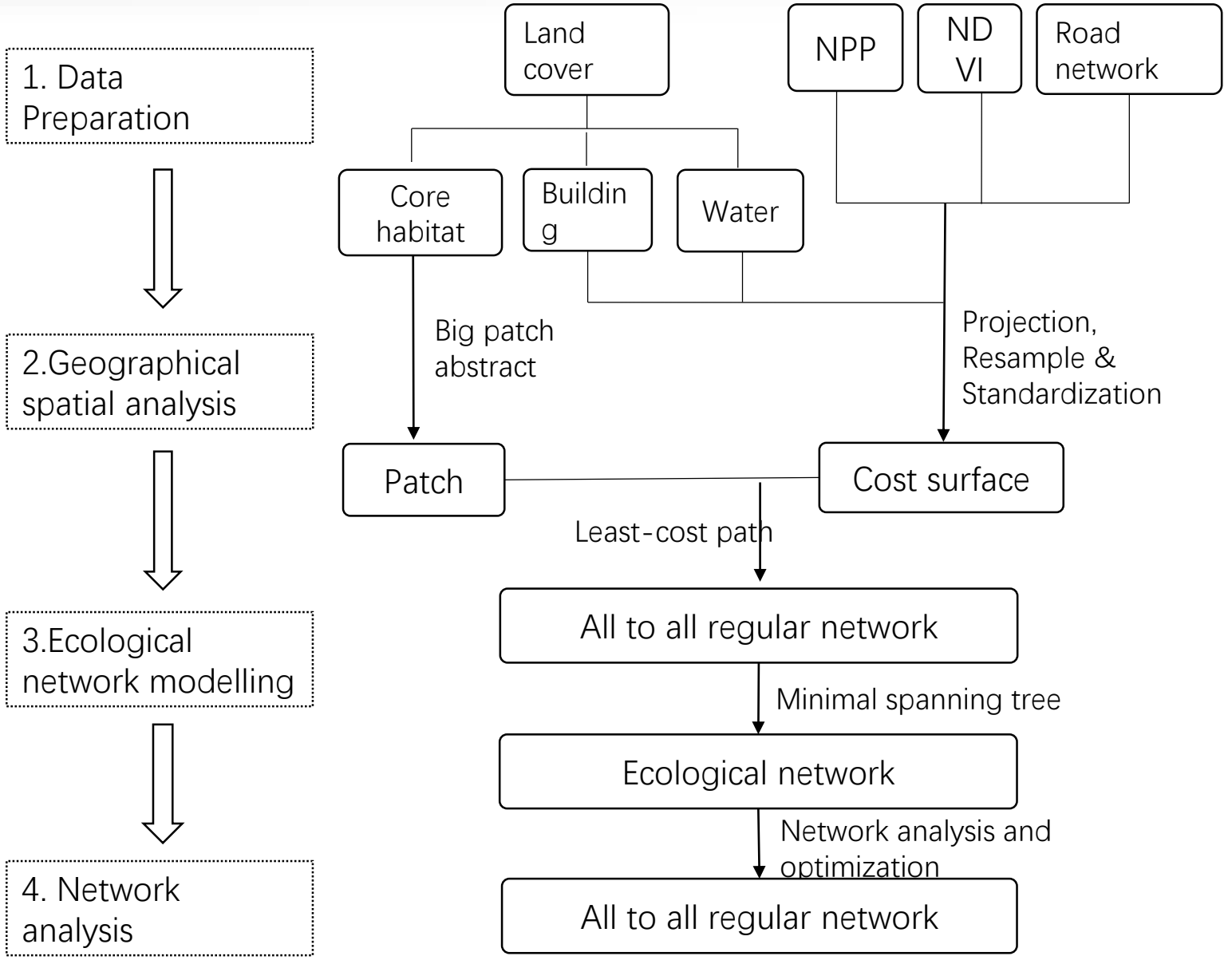
How does ecological network evolve with disturbance ?



Source: Jung et al, sustainability, 2014

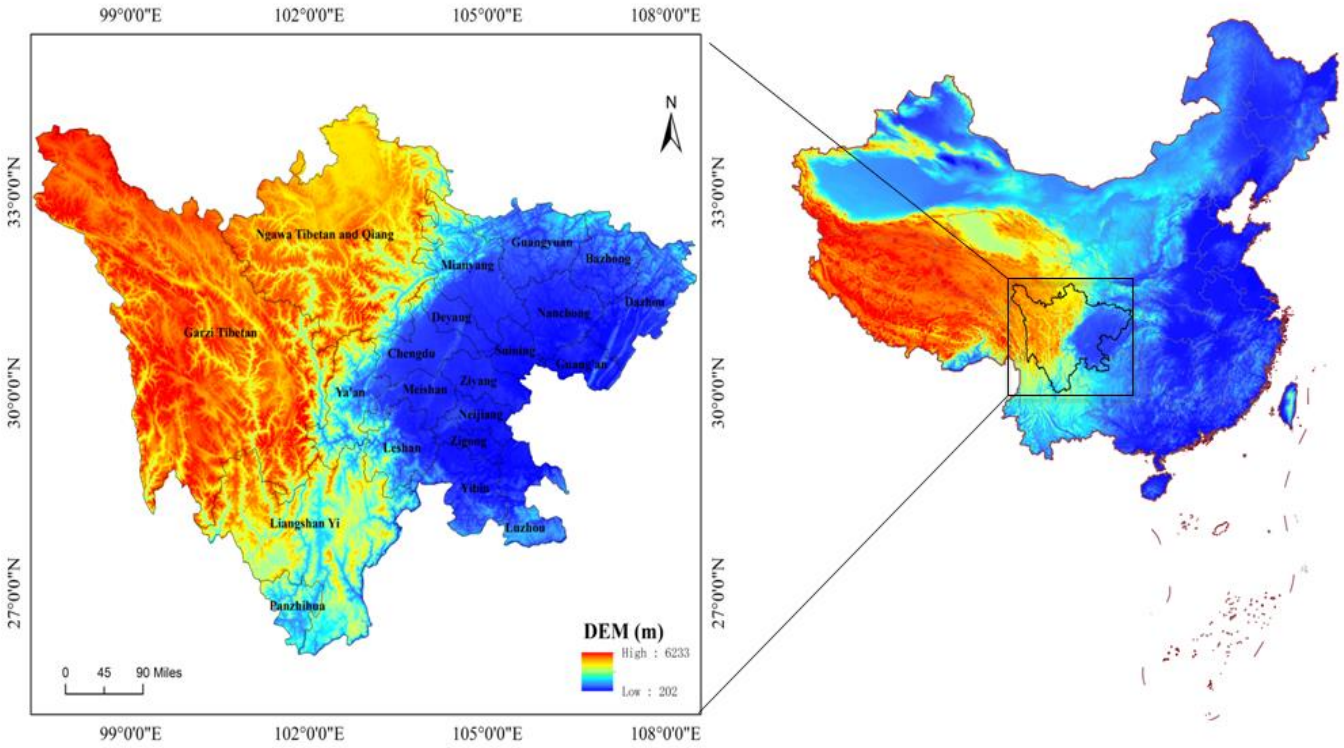
3 DATA AND METHODOLOGY

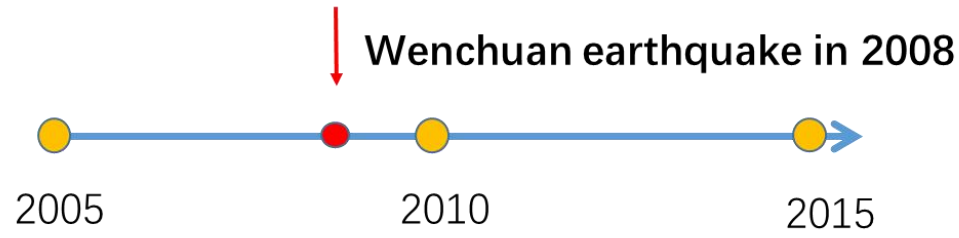
- Global land cover dataset, 30-meter: 2005, 2010, 2015
- MODIS-based NDVI: 2005, 2010, 2015
- MODIS-based NPP: 2005, 2010, 2015
- National dataset of Geographical Information



4 RESEARCH AREA

- Sichuan Province, China
- Wenchuan Earthquake 2008
- Rapid urbanization process
- 2005, 2010, 2015





5 RESULT ANALYSIS

1.spatial distribution pattern of patches

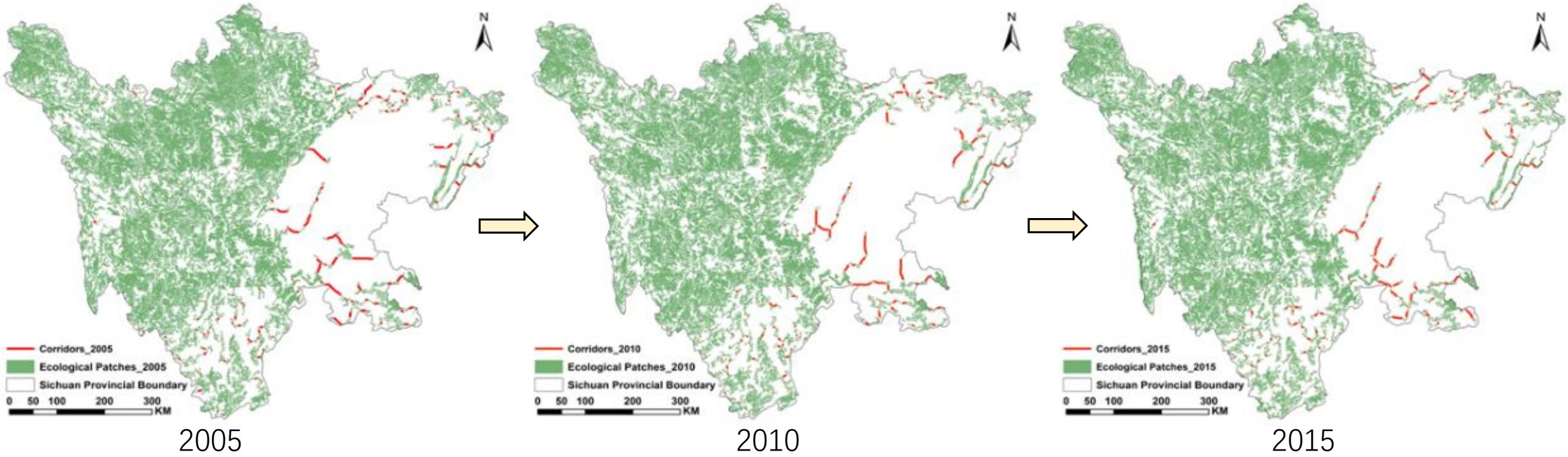
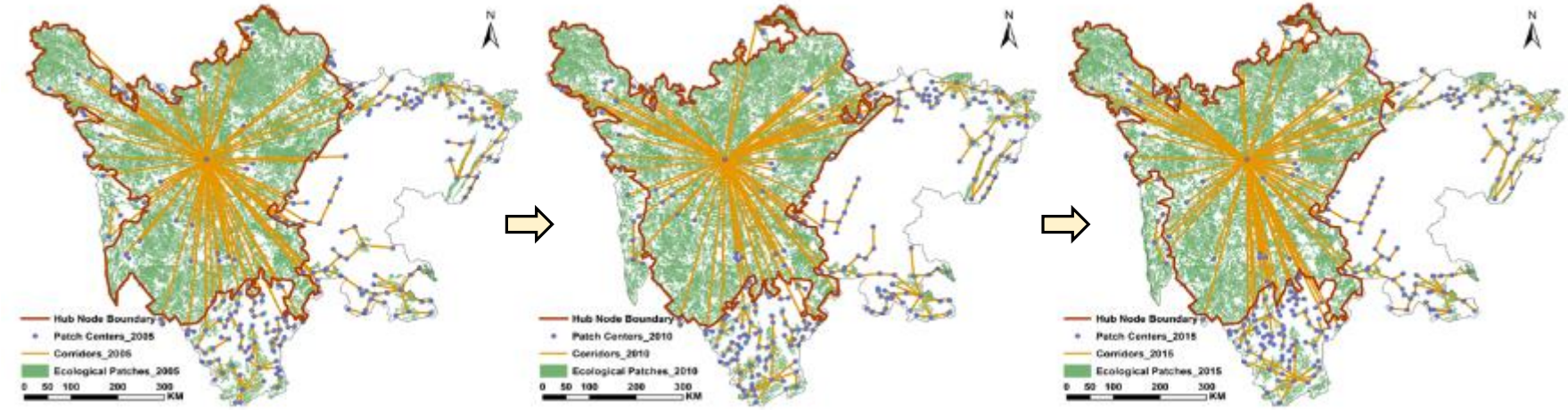


Fig.1 Distribution of ecological patches and network

- **The overall spatial distribution pattern of ecological patches remains stable;**
- **Ecological patches clustered in the northwestern Sichuan, but there is a huge vacant area in the east.**

5 RESULT ANALYSIS

2.Properties of ecological networks



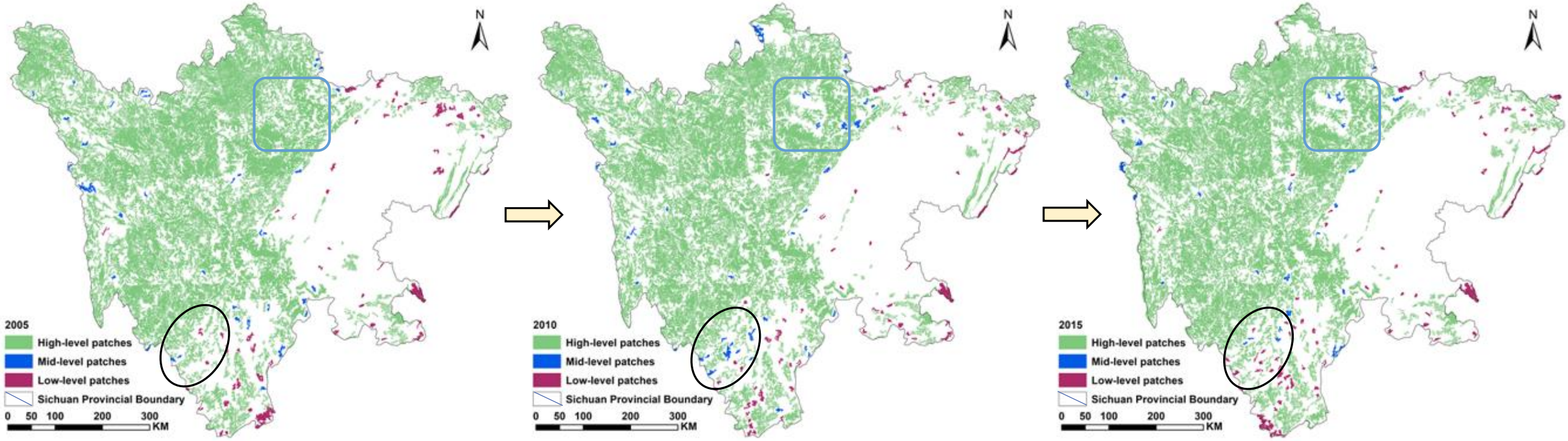
2005 2010 2015

	2005	2010	2015
Number of patches (nodes)	228	248	231
Core patch size (km^2)	160320	153243	153313

Fig.2 schematic diagram of ecological networks(with boundary of the core patch)

- **Scale-free, with the same core patch;**
- **Local variation:**
  - **①The location of the core patch is unchanged, but the size varies.**
  - **②The number of nodes (patches)**

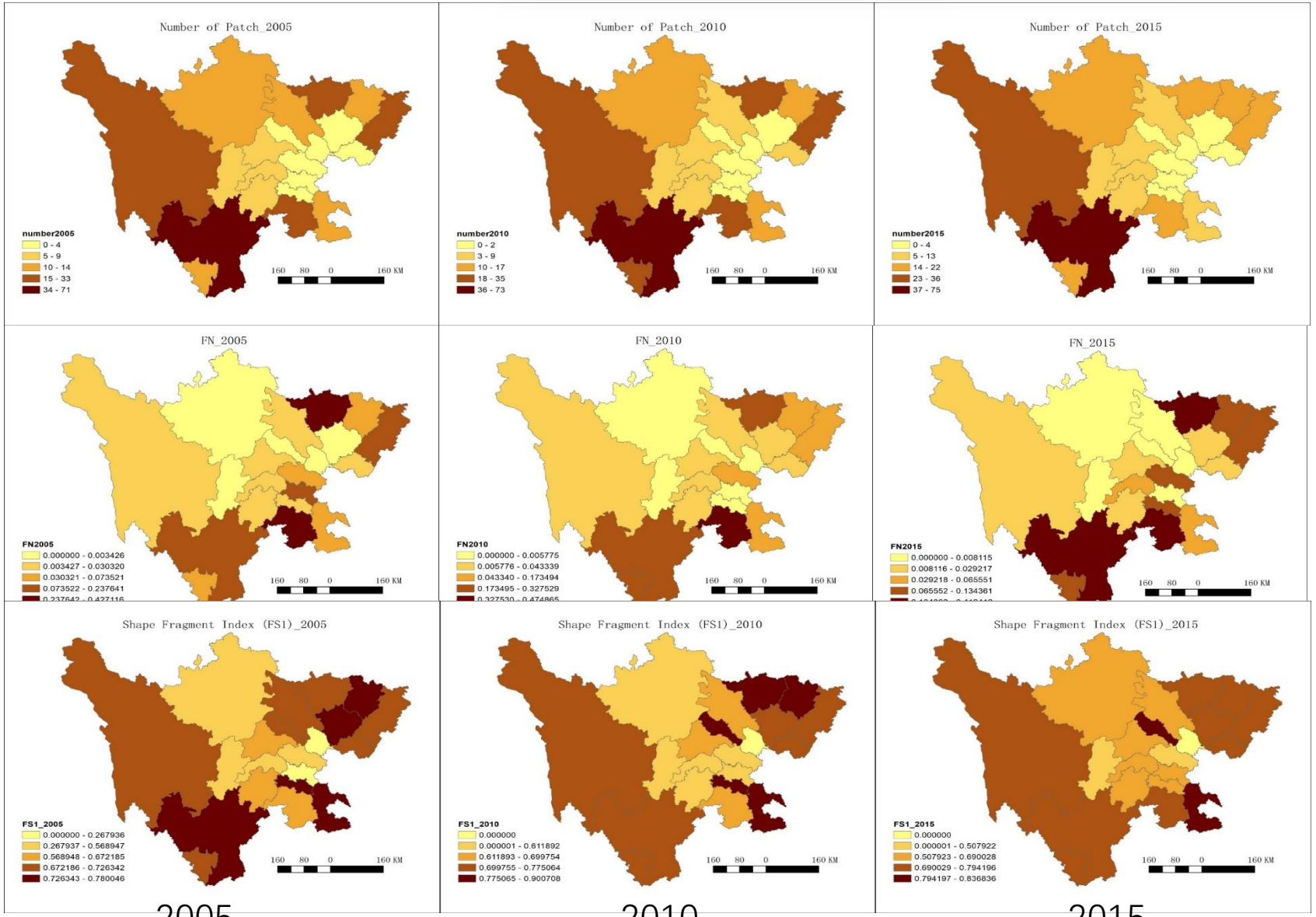
3.Topological importance-based patch categorization



2005 2010 2015

Fig.3 Distribution of 3 topological importance level patches(with typical local change circled)

6 DISCUSSION



2005 2010 2015

Landscape Changes based on Municipal Administrative Regions

$$FN_i = \frac{NF_i - 1}{MPS_i}$$

NF_i: *Number of patch of* ith *administrative region*

MPS_i: *Mean patch size of* ith *administrative region*

$$FS1 = 1 - \frac{1}{MSI}$$

MSI: Mean Shape Index

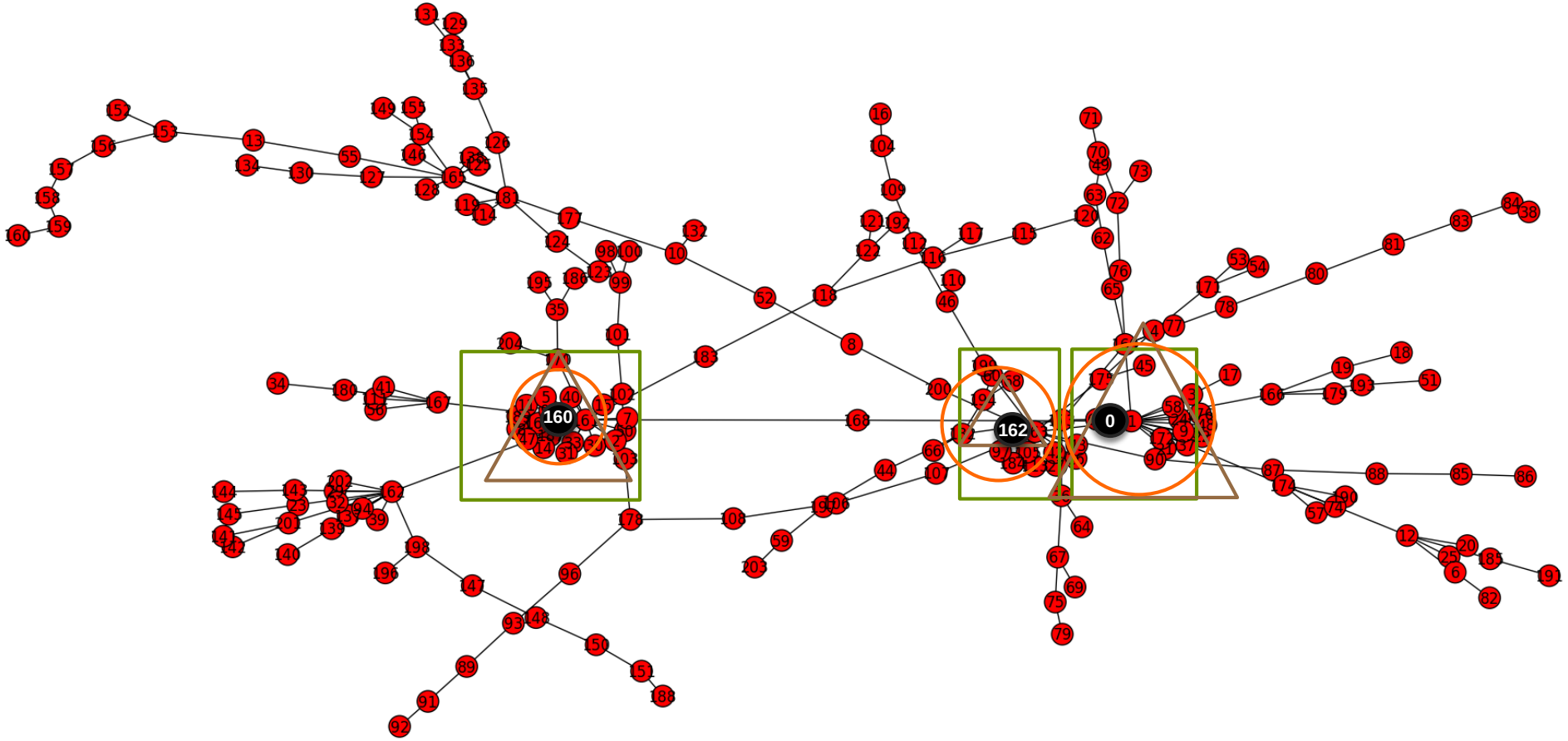
6 DISCUSSION

Degree

Betweeness

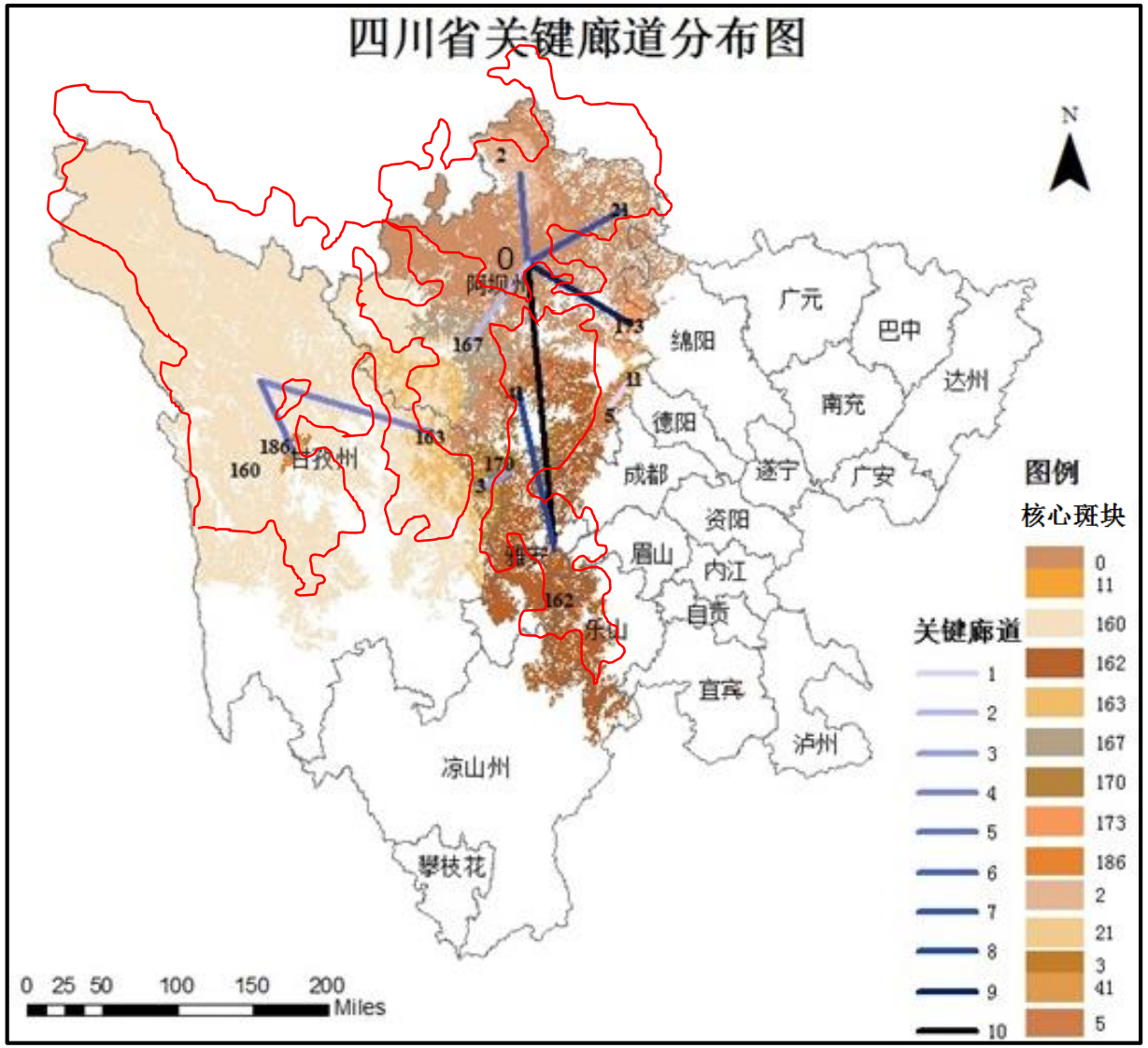
Closeness

排序	斑块号	度	斑块号	介数	斑块号	接近数
1	160	22	0	14899	0	0.309
2	0	15	162	11936	160	0.304
3	162	14	160	10036	162	0.283



6 DISCUSSION

Critical corridors+ Core patches → Core area of an ecological network



Corridor	关键性	Patch	面积(km^2)
(0,162)	10	160	95930.8
(0,173)	9	0	39729.9
(162,41)	8	161	26348.4
(0,21)	7	162	23513.4
(0,2)	6	163	6592.31
(160,186)	5	164	4167.62
(160,163)	4	1	4074.25
(3,170)	3	165	3979.78
(0,167)	2	2	3860.27
(11,5)	1	166	3753.23

- North west
- 最关键廊道： (0,162)
- 最核心斑块：斑块0

6 FUTURE RESEARC

The different damage mechanism of natural hazards and human activities

Model validation – field study

The recovery process of an ecological network

Thank you!

Questions?

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