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土地整理对项目区生境景观连接度的影响

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摘 要:

GIS Conefor26 10

IIC *PC* 45.58% 39.03%

关键词: ; ;
中图法分类号: F301.24; S154.1 **文献标识码:** A **文章编号:** 1000-2324(2015)05-0682-06

Effect of Land Consolidation on the Habitat Connectivity in the Project Area

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Abstract: Habitat landscape connectivity is one of important index for measuring biodiversity conservation and landscape function sustainability. The landscape connectivity approach based on graph theory used in land consolidation effect analysis is able to take organism individual and its behavior into consideration. In this paper, we take a land consolidation project area, where is located in Shuanglong village, Zhuzhen town of Nanjing, as a study area. The GIS and Conefor 26 software are employed to calculate the landscape connectivity metrics and patch important value. Ten distance thresholds including 10 m, 50 m, 100 m, 200 m, 500 m, 700 m, 1000 m, 1500 m, 2000 m, 3000 m that reflecting the spatial diffuse capability of different species were selected for analyzing the habitat landscape connectivity change before and after land consolidation respectively. The situation of with and without ditches before and after land consolidation was considered as well to compare the landscape structure and function changes. Then we test the contribution of each habitat patch to landscape connectivity and identify the variation range and spatial scope of important habitat patch due to land consolidation project. The results show: (1) Integrated index of connectivity (*IIC*) and probability connectivity (*PC*) index were decreasing by 45.58% and 39.03% for land consolidation. And the consolidation shows a negative impact on habitat connectivity. (2) The increasing ditch network due to the consolidation can improve the connectivity at lower distance threshold range. (3) The habitat patch with larger area size will always contribute a lot to connectivity. (4) The connectivity approach based on graph theory can used to measure landscape structure connectivity and function connectivity and to test landscape fragmentation and identify the stepping stones for species. Therefore the approach is good for ecological effect evaluation for land consolidation, and can provide a guide for planning the composition and configuration of habitat or ecological land in a land consolidation project area.

Keywords: Land consolidation; habitat connectivity; habitat

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1 研究区域概况

32°28′52.8"N—32°31′23.7"N 118°36′14.3"E—118°38′39.9"E

941.6 mm 15.6

635.9 hm^2

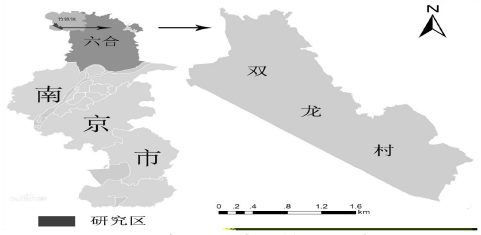

图 1 研究区域地理位置示意图

Fig.1 Location of study area

2 研究方法

2.1 数据及处理

/ Arcgis10.0 Conefor26

2.2 距离阈值的选择

[13-15]

30000 m 50~1000 m

10 m 50 m 100 m 200 m

500 m 700 m 1000 m 1500 m 2000 m 3000 m 10

2.3 沟渠网络特征指标选取

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,

表 1 沟渠网络特征指标说明
Table 1 Index characteristics of ditch network

Index	Formula	Definition	Meaning	Threshold
	D = Li/A			m/hm^2
	γ= L/Lmax=L/3(V-2) (V≥3,V N)			0 1
	α=(L V+1)/(2V 5) (V≥3,V N)			0 1

2.4 景观连接度指数选取

IIC *PC*

2.4.1 综合连接度指数(*IIC*)

$$ICC = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\frac{a_i \bullet a_j}{1+nl_{ij}}}{A_l^2}$$

: n a_i a_j i j nl_{ij} i j

A_l $0 \le IIC \le 1$ $IIC=0$ $IIC=1$

2.4.2 概率连接度指数(*PC*)

$$PC = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} a_i \bullet a_j \bullet p_{ij}^{*}}{A_L^2}$$

: n ; a_i a_j i j p_{ij} i j

A_L *PC*

2.4.3 路径数(*NL*)

2.4.4 组分数(*NC*)

2.4.5 斑块重要性值

$$dI\ (\%) = 100\ \frac{I - I_{remove}}{I}$$

I I_{remove}

3 研究结果

3.1 土地整理项目区沟渠结构特征分析

表 2 项目区土地整理前后沟渠特征变化

Table 2 Changes of ditch characteristics before and after the land consolidation in project area

Treatment	(m) Length	(m) Average width	(hm^2) Area	(m/hm^2) Density	Connectivity	Circuity
	24760.56	9.29	23.01	38.94	0.46	0.19
	99476.21	3.60	35.80	156.43	0.58	0.37

2 3

56% 26%

95% 9.29 m

3.60 m 61% 7 m 2/3 3 m

3.2 土地整理项目区生境斑块景观连接度变化分析

3 4

表 3 整理前后生境斑块景观连接度变化（含沟渠）

Table 3 Habitat connectivity changes before and after the land consolidation in different dispersal distances (with ditches)

Threshold	*IIC*			*PC*			*NC*			*NL*		
	Ago	Later	Change percentage	Ago	Later	Change percentage	Ago	Later	Change percentage	Ago	Later	Change percentage
10	0.0071	0.0059	-16.9	0.0055	0.003	-45.45	130	40	-69.23	76	203	167.11
50	0.0136	0.008	-40.97	0.0115	0.0094	-18.32	29	9	-68.97	224	387	72.77
100	0.0168	0.0085	-49.13	0.0174	0.0142	-18.41	1	1	0.00	434	591	36.18
200	0.0196	0.0091	-53.46	0.025	0.0188	-24.78	1	1	0.00	908	999	10.02
500	0.0224	0.0105	-53.32	0.0361	0.0232	-35.8	1	1	0.00	2799	2428	-13.25
1000	0.0247	0.012	-51.4	0.043	0.025	-41.74	1	1	0.00	6607	5171	-21.73
1500	0.0265	0.0129	-51.15	0.046	0.0257	-44.03	1	1	0.00	10018	7626	-23.88
2000	0.027	0.0138	-49.04	0.0476	0.0261	-45.25	1	1	0.00	12573	9432	-24.98
3000	0.0283	0.0143	-49.35	0.0494	0.0264	-46.5	1	1	0.00	16968	12430	-26.74

表 4 整理前后生境斑块景观连接度变化（不含沟渠）

Table 4 Habitat connectivity changes before and after the land consolidation in different dispersal distances (without ditches)

Threshold	*IIC*			*PC*			*NC*			*NL*		
	Ago	Later	Change percentage	Ago	Later	Change percentage	Ago	Later	Change percentage	Ago	Later	Change percentage
10	0.0019	0.0016	-15.79	0.0018	0.0016	-11.11	183	64	-65.03	61	21	-65.57
50	0.0023	0.0018	-23.34	0.002	0.0017	-16.46	81	43	-46.91	210	58	-72.38
100	0.0033	0.0019	-43.71	0.0023	0.0018	-23.4	13	30	130.77	428	86	-79.91
200	0.0077	0.002	-74.22	0.0029	0.0019	-34.86	1	14	1300.00	967	170	-82.42
500	0.0117	0.0043	-63.59	0.0055	0.0023	-57.89	1	2	100.00	3578	428	-88.04
1000	0.0151	0.0053	-64.54	0.0102	0.0031	-69.86	1	1	0.00	9139	977	-89.31
1500	0.0168	0.0058	-65.66	0.0142	0.0039	-72.57	1	1	0.00	13984	1617	-88.44
2000	0.0181	0.0063	-65.02	0.0174	0.0047	-73.19	1	1	0.00	17581	2225	-87.34
3000	0.0191	0.0066	-65.65	0.0218	0.0059	-73.05	1	1	0.00	23832	2953	-87.61

3 4 *IIC*

(*PC*)

IIC *PC* *IIC* *PC*

NC

1 100 m 200 m 1

100 m 1 1000 m 1
200 m

3.3 土地整理前后生境斑块重要性变化分析

PC (*IIC*) ,

dPC>10 2<*dPC*≤10 0.5<*dPC*≤2
0.1<*dPC*≤0.5 *dPC*≤0.1 Gis
, 500 m

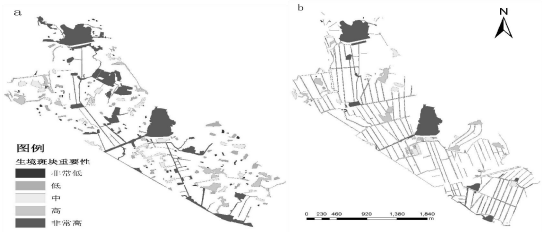

图 2 距离阈值为 500 m 时土地整理前后斑块重要性分布图（含沟渠）

Fig.2 Distribution of the important patches under 500 m thresholds before and after land consolidation project (with ditches)

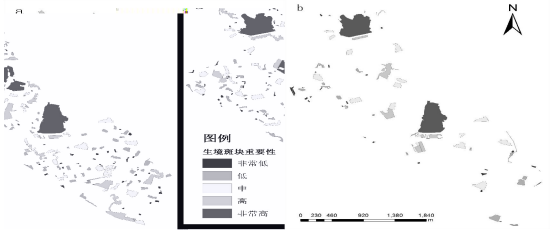

图 3 距离阈值为 500 m 时土地整理前后斑块重要性分布图（不含沟渠）

Fig.3Distribution of the important patches under 500 m thresholds before and after land consolidation project (without ditches)

500 m “ ” “ ” 15
21 107.44 hm^2 72.62 hm^2 73.08%
58.57% “ ” 18
30 hm^2 74.77% 9
43%

“ ” “ ”

4 结论与讨论

4.1 结 论

(*IIC*) 45.58%
39.03%
1

2

“ ”

4.2 讨 论

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“ ”

[16]

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