

INDICATORS OF BIODIVERSITY FOR A SUSTAINABLE MANAGEMENT OF FOREST (FORSEE)

CRITERIA 4, Indicator 4.7: Landscape

Abstract

In this study the landscape structure and composition on the Ibaizabal river basin was analysed to know the types of dominant vegetation types and the level of the landscape fragmentation. Landscape structure indices at three different levels were analysed: patches, vegetation type (EUNIS system) and landscape level. The basin has a high forest cover of 65.7 % and a small average size of patch of 0.953Ha. Coniferous and eucalyptus plantations cover more than a half of the studied area and they have the highest patch size average of $35,903 \pm 8,65$ Ha. On the other hand, the oak-mixed woodland (potential vegetation in the area), only cover the 3.65% of the basin and it has a patch size average of $1,623 \pm 0,748$ Ha. The oak-mixed is the most affected habitat because it has been substituted by plantations and grasslands.

Study area

Ibaizabal river basin, north of Spain ($43^{\circ}07'N$, $2^{\circ}51'W$).

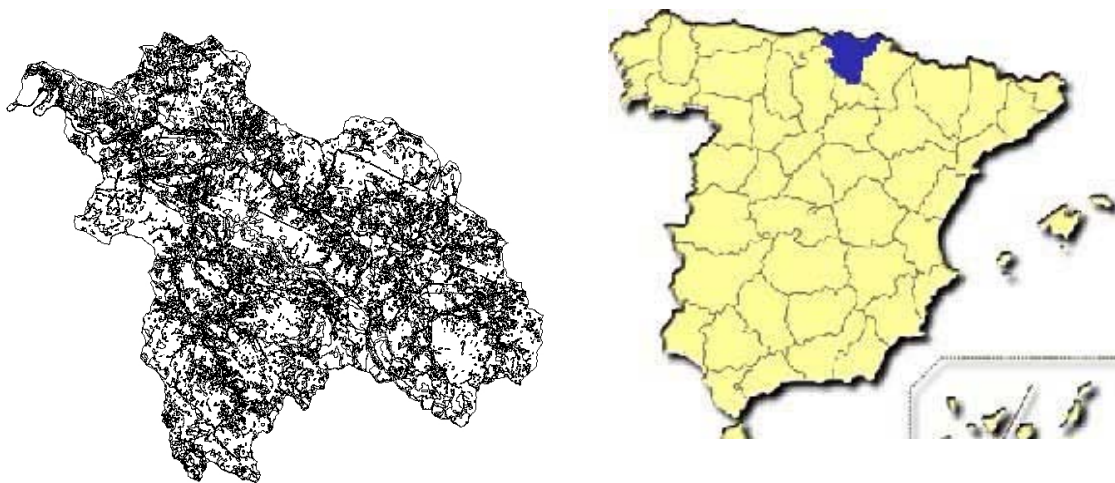


Fig 1. Map of Ibaizabal river basin and his geographical location.

The GIS database

The vegetation and topographic information was obtained from IKT centre (Gasteiz). We classified the vegetation into 15 main different types (Table 1). For this analyse we reject the patches lower than 0.2 Ha, so really we studied the 99.63% of the total area of Ibaizabal (48.320Ha).

Landscape structure

Table I.

VEGETATION	Total Area (Ha)	Area %	Patch number	Patch size (H)	Fractal Dimension	Shortest Patch Distance (m)	Patch density	Proximity index (500m)
Aquatic habitat	83,44	0,17	58	1,439 ± 0,283	1,534 ± 0,010	653 ± 163,518	0,120	81,7 ± 21,6
Birch woodlands	12,40	0,03	10	1,239 ± 0,262	1,363 ± 0,022	1519 ± 539,833	0,021	0,1 ± 0,1
Urban area	3687,46	7,66	925	3,986 ± 2,770	1,376 ± 0,001	133 ± 5,445	1,921	89479,9 ± 52480,5
Bushes	2916,72	6,06	1209	2,413 ± 0,365	1,403 ± 0,002 a	150 ± 4,271	2,511	1181,9 ± 655,2
Grassland	7891,19	16,39	1434	5,503 ± 0,373 b	1,369 ± 0,001 b	63 ± 3,509	2,979	6624,9 ± 3746,7
Beech woodlands	1435,98	2,98	291	4,935 ± 0,824 c	1,358 ± 0,002	123 ± 12,877 c	0,604	333,0 ± 107,5 c
Coniferous plantations	25095,94	52,13	699	35,903 ± 8,656 c	1,353 ± 0,002	49 ± 2,291	1,452	49395,5 ± 11699,7
Deciduous plantations	1081,69	2,25	325	3,328 ± 0,619	1,359 ± 0,003	352 ± 22,305	0,675	225,1 ± 62,8
Mediterranean Wood.	947,96	1,97	201	4,716 ± 0,893 bc	1,374 ± 0,004 bef	148 ± 35,034 e	0,418	1144,9 ± 879,7 e
Bank woodlands	490,53	1,02	247	1,986 ± 0,167 cd	1,479 ± 0,004	169 ± 16,425 ce	0,513	211,4 ± 62,8
Cultures and garden	596,94	1,24	655	0,911 ± 0,058	1,365 ± 0,002	196 ± 10,534	1,361	29,2 ± 10,5
Rocky place vegetation	804,98	1,67	97	8,299 ± 2,339 ce	1,387 ± 0,006 aehj	162 ± 25,310 cf	0,201	260,8 ± 98,5 c e
Oak-mixed woodlands	1754,84	3,65	1081	1,623 ± 0,748 e	1,391 ± 0,002 h	137 ± 4,677 f	2,245	32,0 ± 4,8
Young deciduous wood	1301,92	2,70	722	1,803 ± 0,113 de	1,376 ± 0,002 fj	208 ± 8,486	1,500	21,8 ± 3,2
Without vegetation	40,38	0,08	38	1,063 ± 0,198	1,372 ± 0,011	1367 ± 186,77	0,079	0,2 ± 0,1

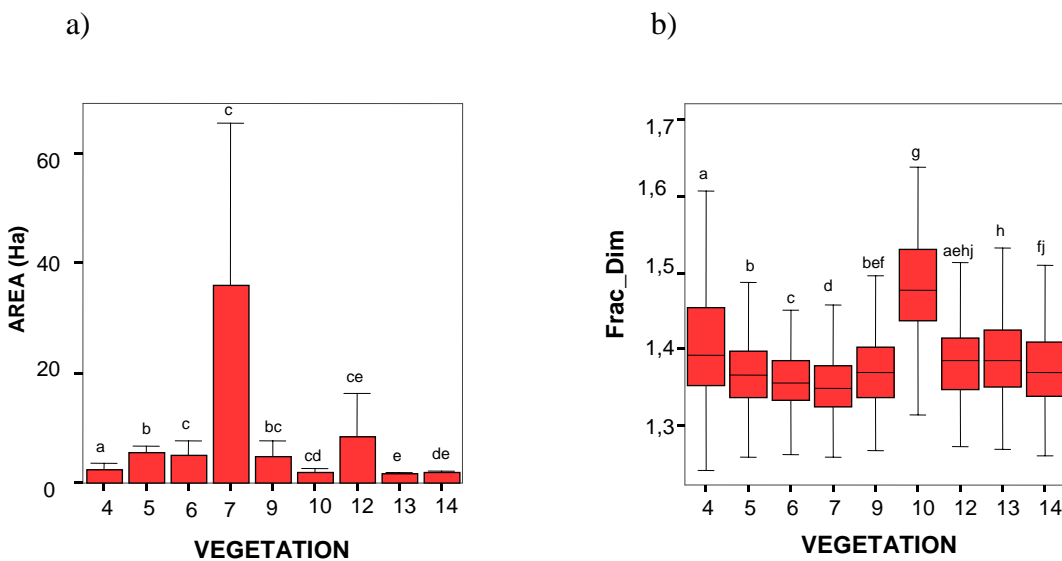
Table II.

Total area	Patch number	Mean PatchSize (Ha)	Patch Density (100Ha)	PR Richness	H' Div. Shannon	SIDI Div. Simpson	SHEI Equitativ Simpson	IEI Vegetation richness
48142,363	7992	6,024 ± 0,835	1,107	15	1,677	0,687	0,619	0,737

Data analyses

For the statistical analyse we included only nine types of vegetations (Fig.2). We compared between different vegetations the patch size, fractal dimension, shortest patch distance and proximity index with Mann-Whitney non parametric test.

Results



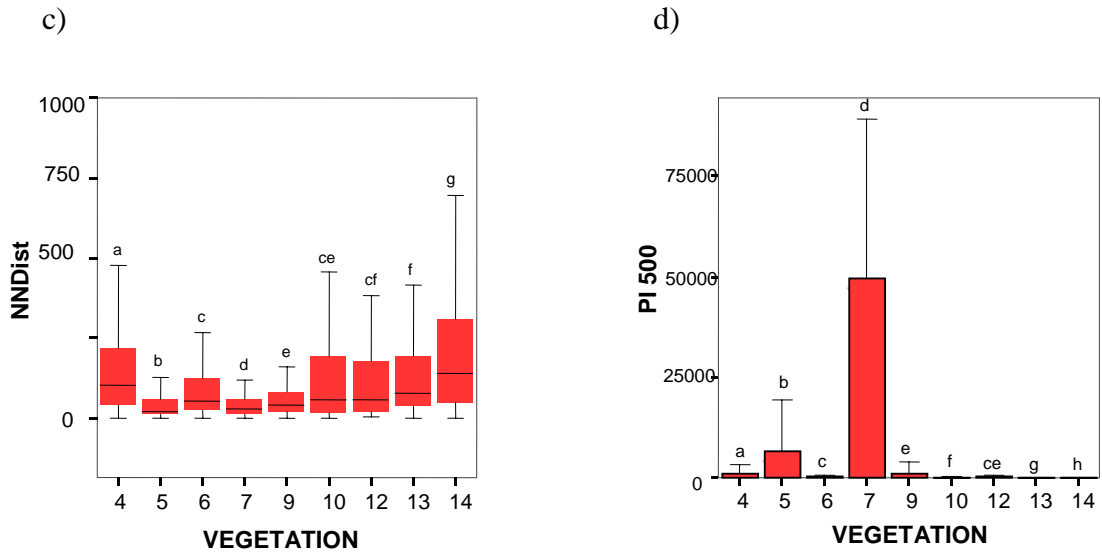


Fig. 2. a) Patch size and standard error. b) Fractal dimension and standard error. c) Shortest patch distance and standard error. d) Proximity index and standard error. The vegetation types are: 4 = Bushes; 5 = grassland; 6 = beech woodlands; 7 = coniferous plantations; 9 = Mediterranean woodlands; 10 = bank woodlands; 12 = rocky places vegetation; 13 = oak and mixed woodlands and 14 = young deciduous woodlands.

Isolation

Table III. Dispersión index (Rc) and Fragmentation index (F) for the diferents vegetation types.

Vegetation	Rc	F
Aquatic habitat	0.501	1658.19
Birch woodlands	0.201	23974.79
Urban area	1.623	32.07
Bushes	2.402	16.58
Grassland	1.197	28.06
Beech woodlands	0.475	348.17
Coniferous plantations	0.451	152.83
Deciduous plantations	1.512	97.99
Mediterranean Woodlands	0.394	608.06
Bank woodlands	0.551	353.65
Cultures and garden	1.695	43.35
Rocky place vegetation	0.208	2387.00
Oak-mixed woodlands	1.953	22.81
Young deciduous woodlands	1.981	33.66
Without vegetation	0.687	1843.71