Hot spot analysis applied to identify ecosystem services potential in Lithuania

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Hot spot analysis are very useful to identify areas with similar characteristics. This is important for a sustainable use of the territory, since we can identify areas that need to be protected, or restored. This is a great advantage in terms of land use planning and management, since we can allocate resources, reduce the economical costs and do a better intervention in the landscape. Ecosystem services (ES) are different according land use. Since landscape is very heterogeneous, it is of major importance understand their spatial pattern and where are located the areas that provide better ES and the others that provide less services. The objective of this work is to use hot-spot analysis to identify areas with the most valuable ES in Lithuania. CORINE land-cover (CLC) of 2006 was used as the main spatial information. This classification uses a grid of 100 m resolution and extracted a total of 31 land use types. ES ranking was carried out based on expert knowledge. They were asked to evaluate the ES potential of each different CLC from 0 (no potential) to 5 (very high potential). Hot spot analysis were evaluated using the Getis-ord test, which identifies cluster analysis available in ArcGIS toolbox. This tool identifies areas with significantly high low values and significant high values at a p level of 0.05. In this work we used hot spot analysis to assess the distribution of providing, regulating cultural and total (sum of the previous 3) ES. The Z value calculated from Getis-ord was used to statistical analysis to access the clusters of providing, regulating cultural and total ES. ES with high Z value show that they have a high number of cluster areas with high potential of ES. The results showed that the Z-score was significantly different among services (Kruskal Wallis ANOVA =834. 607, $p<0.001$). The Z score of providing services (0.096 ± 2.239) were significantly higher than the total (0.093 ± 2.045), cultural (0.080 ± 1.979) and regulating (0.076 ± 1.961). These results suggested that providing services are more clustered than the remaining. Ecosystem Services Z score were significantly correlated, regulating vs total (0.98, $p<0.0001$), regulating vs cultural (0.97, $p<0.0001$), cultural vs total (0.96, $p<0.0001$), providing vs total (0.69, $p<0.0001$), regulating vs providing (0.56, $p<0.0001$) and providing vs cultural (0.56, $p<0.0001$). According to these results, ES distribution potential showed a similar pattern, especially regulating, cultural and total. This an evidence that the the areas that showed high and low significant regulating and cultural ES clusters are similar. The spatial distribution of these clusters is very high, which may be attributed to the landscape diversity and fragmentation.