

APPENDIX 5: SPOT: The Spatial Portfolio Optimization Tool

The Spatial Portfolio Optimization Tool (SPOT) is a generalized computer tool for selecting a portfolio of potential conservation areas, using a flexible approach to automatically design an efficient portfolio around specific conservation goals (Shoutis 2003). SPOT analyzes a region (in this case Nebraska) by dividing it into small parcels called analysis units, then forming a portfolio by marking individual units as included or excluded from the portfolio. During the process known as simulated annealing, SPOT forms and analyzes millions of portfolios while searching for the most efficient portfolio. Each is evaluated according to three criteria:

Conservation goals. These are goals that were set for the number of occurrences of ecological communities and Tier I species populations to be included in the portfolio (see Chapter 3).

Area of portfolio. This is the total land area of the portfolio. The process works to minimize the total area by selecting analysis units with more than one occurrence of species or communities.

Fragmentation. The amount of dispersal of the analysis units selected for a portfolio. The process works to minimize the amount of fragmentation by selecting adjacent analysis units when possible.

The user can set the criteria to put more weight on different criteria. For our analyses, we put the greatest weight on meeting the conservation goals.

In a GIS, we divided the state into 13,781 equal-area hexagonal analysis units. Each unit contained 3,685 acres (~ 5.75 square miles). These units were then attributed with data from the Heritage database on known occurrences of Tier I species and ecological communities. Only records dated 1980 or later were used and for those records which had an estimated viability rating (EORank), we selected only records with an A (excellent estimated viability) or B (good estimated viability) rank. A total of 4,562 community and Tier I species records were used in the analyses.

We did a series of three runs of the analysis. In each run there were 50 iterations and in each iteration the program evaluated 1,000,000 different portfolios and selected the best fit to the criteria (i.e. met the most goals in the least amount of area with the least amount of fragmentation). Then the program would select from those 50 best fits the overall best fit and that would be the output. We used the three overall best fits together in selecting the biologically unique landscapes.

Shoutis, D. 2003. SPOT: The Spatial Portfolio Optimization Tool. 55pp., The Nature Conservancy.