

# LINK: ArcGIS Tools for Conservation Planning

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## What Is LINK?

LINK is a set of Environmental Systems Research Institute (ESRI) ArcGIS tools designed to analyze habitat patterns across a landscape. LINK is the latest product from a series of Decision Support Systems (DSS) that uses species habitat matrices to model potential species habitat and habitat diversity. What sets LINK apart from its predecessors is that it uses raster data sources. Raster data sources allow LINK to model habitat over a much larger area than its vector based ancestors.

LINK's main purpose is to make comparisons of conservation potential between management units and the surrounding landscape. LINK does this by summarizing potential species richness, habitat diversity, and habitat composition.

## How Does LINK Work?

There are three main data sources needed to run a LINK Query. These data sources include matrices, source layers, and zonal layers (Figure 1). LINK relates values contained in a matrix to a raster data layer, called a source layer, to generate indices of potential habitat. The program summarizes indices of potential habitat using a zonal layer. You can generate several analytical products of potential habitat with a single LINK Query. A user can query for an individual species or a group of species.

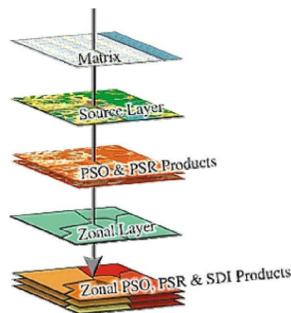


Figure 1. LINK documents and products

The matrix related to the source layer has habitat suitability scores ranging from 0 (little to no value as habitat) to 100 (prime habitat). For each cover type within the source layer there is a corresponding column within the matrix (Figure 2). The Relationship Manager allows the user to create an association between matrices and source layers, and between source layers and zonal layers.

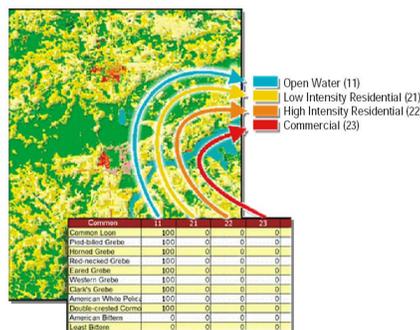


Figure 2. LINK matrix/source layer relationship

The source layer is a raster spatial data layer that contains landscape information for the species listed in the matrix. The source layer must be an integer ESRI Grid (e.g. National Land Cover Dataset). A zonal layer is an ESRI Shapefile used to divide the landscape into units of comparison. Counties within a state or management units within a refuge are examples of zonal layers.

The zonal layer is not required to run a LINK query but summarizing habitat information by counties, for example, helps to illustrate the distribution of habitats across a state. The use of a zonal layer provides a unit by unit evaluation of potential habitat within the area of interest.

## Example LINK Query

In this example, A LINK Query is performed to evaluate potential habitat of breeding birds of management concern in the state of Minnesota. We also compare the potential habitat within individual counties and determine which county offers the best habitat and which county has the poorest habitat for our target bird species. Figure 3 shows the progression of windows to perform this particular query. The user selects the matrix and query field values, then the source and zonal layer, and finally the output products and query parameters.

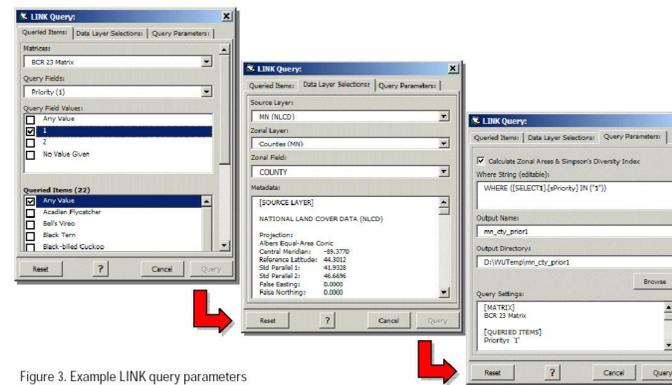


Figure 3. Example LINK query parameters

The program produces several types of products. Potential Species Richness (PSR) and Potential Species Occurrence (PSO) products are created in tabular, graphical, and GIS Grid data layer formats. The PSR value equals the total count of queried species with a matrix score > 0 for each land cover type. The PSO value equals the average matrix score of all of the species queried for each source layer classification. Figure 4 demonstrates how PSR and PSO are created. An area-weighted Mean PSO Score is also calculated; this metric summarizes habitat quality for each queried species over the entire extent of the source layer.

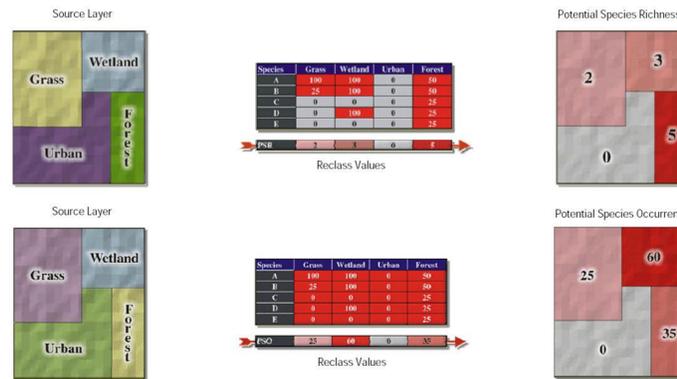


Figure 4. Calculating Potential Species Richness and Potential Species Occurrence

The Potential Species Occurrence by Zone table summarizes the habitat values for Minnesota by mean PSO score (Figure 5). In this example, the county with the lowest mean PSO score for priority 1 bird species is Wilkin County. The county with the highest mean PSO score is Pine County.

COUNTY	ACRES	MIN	MAX	RANGE	MEAN	STD	SUM	VARIETY	MAJORITY	MINORITY	MEDIAN
Wilkin County	479,258	0	37	37	6.02	7.61	12,973,300	11	4	21	4
Faribault County	459,315	0	37	37	6.42	7.09	13,256,700	10	4	2	4
Traverse County	374,681	0	42	42	6.92	8.72	11,651,600	12	4	21	4
...	...	...	...	...	...	...	...	...	...	...	...
Koochiching County	2,012,410	0	37	37	28.64	8.19	259,194,000	11	32	0	32
Kanabec County	342,221	0	37	37	29.08	9.94	44,753,800	11	32	12	32
Pine County	920,295	0	42	42	29.32	9.01	121,343,000	12	32	0	32

Figure 5. Potential Species Occurrence by Zone

Several ESRI Grid GIS data layers are created. Figure 6 shows the PSO and PSR products. Wilkin County is highlighted in western Minnesota and Pine County is highlighted in eastern Minnesota. The dark purple and dark red areas represent high values for PSR and PSO, respectively.

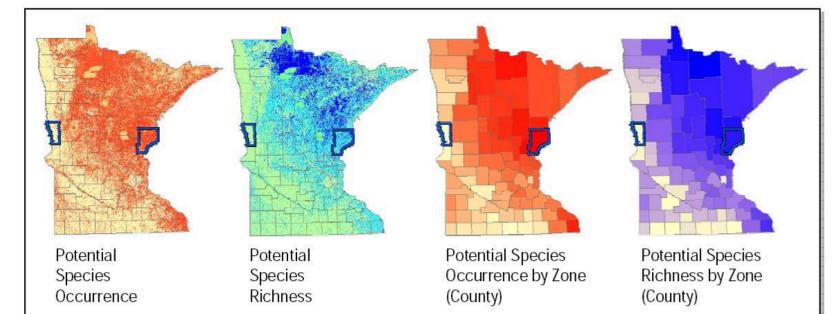


Figure 6. Output GIS data layers

PSO and PSR values can also be compared between the different land cover classes. Figure 7 shows a sample output of a PSO and PSR by grid class table.

Grid Value	Grid Value Description	Acres	# Of Species Queried	Potential Species Richness	Mean Potential Species Occurrence	Sum Of Potential Species Occurrence
91	Woody Wetlands	7079338	20	11	32	640
71	Grasslands/Herbaceous	17865	20	10	42	840
81	Pasture/Hay	6453445	20	10	37	740
51	Shrubland	277504	20	9	21	420
41	Deciduous Forest	8551787	20	8	32	640
92	Emergent Herbaceous Wetlands	3127539	20	8	29	580

Figure 7. Potential Species Occurrence and Potential Species Richness by Grid class

## Summary: LINK

- Designed to operate within the ESRI ArcGIS 9.X platform with the Spatial Analyst extension
- Uses raster-based land cover as the primary GIS source data layer
- Most applicable to relatively large geographic areas (e.g., States, Counties, Regions)
- Produces output products depicting Potential Species Occurrence and Potential Species Richness
- Produces summaries by zone or management unit
- To receive a copy of LINK on DVD-ROM, send an email containing your shipping address, version of ArcGIS, and version of operating system to [tfox@usgs.gov](mailto:tfox@usgs.gov)