Conservation Value of Oak Savannas for Birds

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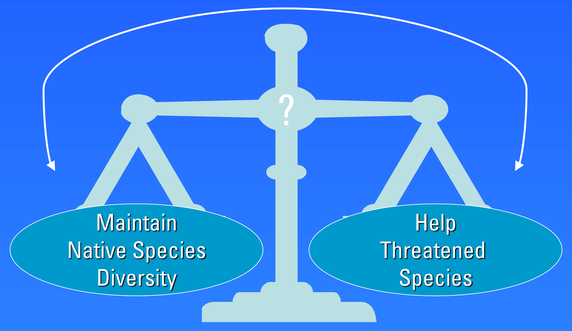
THE CONSERVATION VALUE MODEL FOR DETERMINING LANDSCAPE COMPOSITION GOALS

Managers considering restoration of landscapes often face a fundamental challenge – what should be the habitat composition of the restored landscape? We present a method, based on bird distributions, for examining an important conservation trade-off inherent in making that decision. To understand benefits of different landscape compositions, we evaluated how different proportions of five habitats – open grassland, savanna, woodland, scrub, and forest - might affect the conservation value of the Indiana Dunes landscape for birds. Two variables that resource managers typically value were examined, *Species Diversity*, a measure of avian community richness, and *Conservation Index*, the percentage of a bird species' global population occurring on a hectare of landscape, summed across all bird species present. Higher values of *Conservation Index* were associated with higher local densities of globally rarer and more threatened species. *Conservation Index* and *Species Diversity* were negatively correlated across hypothetical landscapes composed of different proportions of the five habitats. Therefore, a management trade-off existed between *Conservation Index* and *Species Diversity* because landscapes that maximized *Species Diversity* differed from landscapes that maximized *Conservation Index*. A landscape of 50% open, 22% savanna, 15% scrub, and 13% forest was represented a compromise at which *Conservation Index* and *Species Diversity* reached the same percentage of their maxima. In contrast, terrestrial habitats at Indiana Dunes National Lakeshore are currently dominated by forest. The landscape model predicts landscape compositions that correspond to tradeoffs between helping threatened species and maximizing species diversity. This tradeoff varies by season. Therefore, application of the landscape model requires a decision as to whether a particular landscape is more important as a bird breeding locale, as a migration stopover, or integrated over the entire annual cycle, and whether species diversity or helping threatened species is a greater management goal.

A Fundamental Challenge…
Which way does your management plan tip the scale?



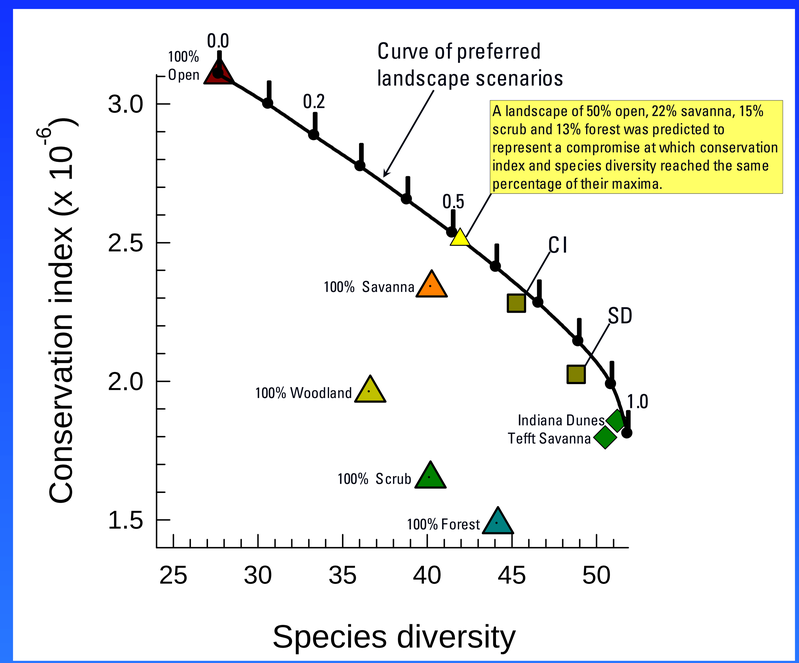
Development of restoration and management plans are often based on two major conservation goals; assisting threatened species and maximizing and maintaining the diversity of native species.

- **Q:** "What should be the habitat composition of the managed landscape?"
- **A:** A possible solution might be found somewhere in the trade-off between maintaining a species rich landscape (**Species Diversity**) and helping threatened species (**Conservation Index**)

For any combination of habitat types at Indiana Dunes, we can predict the expected density of each bird species across that landscape. Using these expected densities we can calculate

- **Species Diversity (SD)**
  - SD is a measure of the number of native bird species present at a site.
- **Conservation Index (CI)**
  - CI is a measure of how the landscape contributes to the conservation of species, especially threatened species.
  - Using available data on global population sizes of birds, we can calculate the percentage of a bird's global population occurring on a hectare of any hypothetical landscape at Indiana Dunes. The CI for a given hypothetical landscape equals the sum of these percentages across all bird species observed in this study.
  - In this study, CI increased mainly when the hypothetical landscape had relatively high densities of globally less common species.

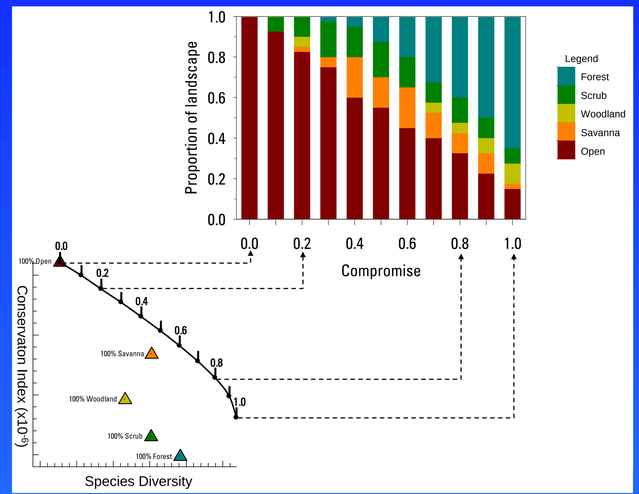
Preferred Landscape Scenarios Along The CI-SD Curve…



The Conservation Index (CI) – Species Diversity (SD) Curve

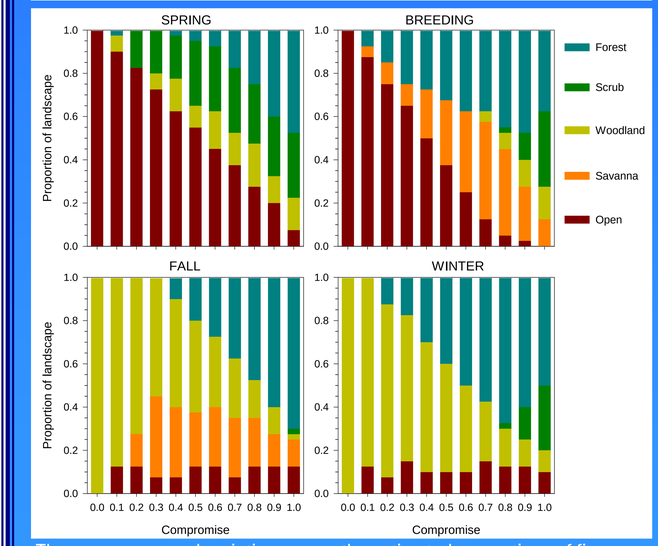
- Each light gray point on the graph above is a landscape scenario containing different percentages of each of 5 habitats: open, savanna, woodland, scrub and forest, totaling 100%. The habitat percentages were incremented by 2.5% yielding 135,751 different scenarios.
- For each landscape scenario, we calculated the density of 129 bird species across the entire landscape.
- Given these 129 densities, we calculated *Species Diversity* (SD) and *Conservation Index* (CI) (how well the landscape assisted the conservation of the most threatened species) for that scenario.
- Some of the landscapes are preferable from a management perspective. These preferred landscapes occur along the Curve of Preferred Landscape Scenarios. These landscapes are preferred because, for any landscape not on the curve, you can increase SD without decreasing CI or increase CI without decreasing SD.
- There is a trade-off between CI and SD that forces the question "Should managers prefer landscapes that promote a high CI or a high SD or some intermediate solution?"
- You can see, for example, the landscape at Indiana Dunes today does a relatively good job of promoting SD but a poorer job of promoting CI.

Landscape Compositions and Compromise



Landscape compositions vary as a function of compromise between Conservation Index (CI) and Species Diversity (SD). Each point along the Curve of Preferred Landscape Scenarios (Curve of PLS) represents a degree of compromise between CI and SD. Each point along this curve represents a different habitat composition. For example, a compromise of 0.8 along the Curve of PLS represents a compromise favoring SD over CI. The 0.8 point corresponds to a landscape composed of: 32.5% Open, 10% Savanna, 5% Woodland, 12.5% Scrub, and 40% Forest.

Seasonal Variations

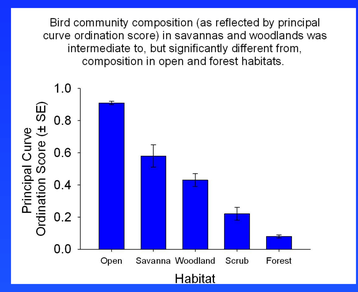


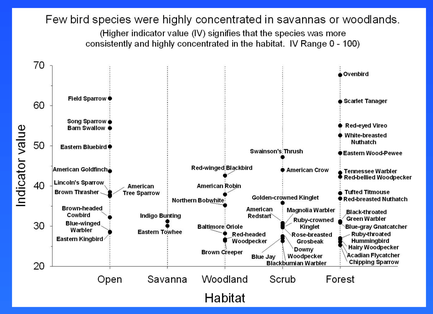
There was seasonal variation among the estimated proportions of five habitats in the landscape as a function of position along the Curve of Preferred Landscape Scenarios (compromise). Thus, for example, a compromise at which CI and SD are at the same percentage of their maximum values corresponds to Table 1 (left).

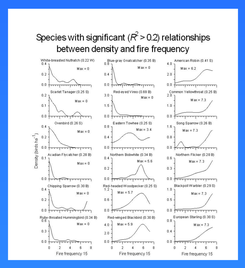
	Spring	Breeding	Fall	Winter
Open	0.50	0.25	0.10	0.10
Savanna	0	0.48	0.25	0
Woodland	0.20	0	0.48	0.50
Scrub	0.23	0	0	0
Forest	0.08	0.28	0.18	0.40

Table 1

Bird Community Trends







Community Trends

We related fire frequency, vegetation cover in five vertical strata, dead tree density, and tree height to seasonal densities of 72 bird species distributed across an open-forest gradient in northwest Indiana.

- About one-third of the species did not exhibit statistically significant relationships with any combination of the vegetation characteristics.
- For 40% of the remaining species, models best predicting species density incorporated tree density.
- Therefore, management based solely on manipulating tree density may not be an adequate strategy for managing bird populations along this open-forest gradient.
- When 15-year fire frequency was added to vegetation characteristics as a predictor of species density, it was incorporated into models for about one-quarter of species, suggesting that fire may modify habitat characteristics in ways that are important for birds but not captured by the structural habitat variables measured.