

# Communicating the complexity of biodiversity associated with agroecosystems



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## Introduction

Biological complexity underlies healthy ecosystems.

Yet, many farm management decisions limit biological diversity and focus on maximizing a single ecosystem service (i.e., crop production).

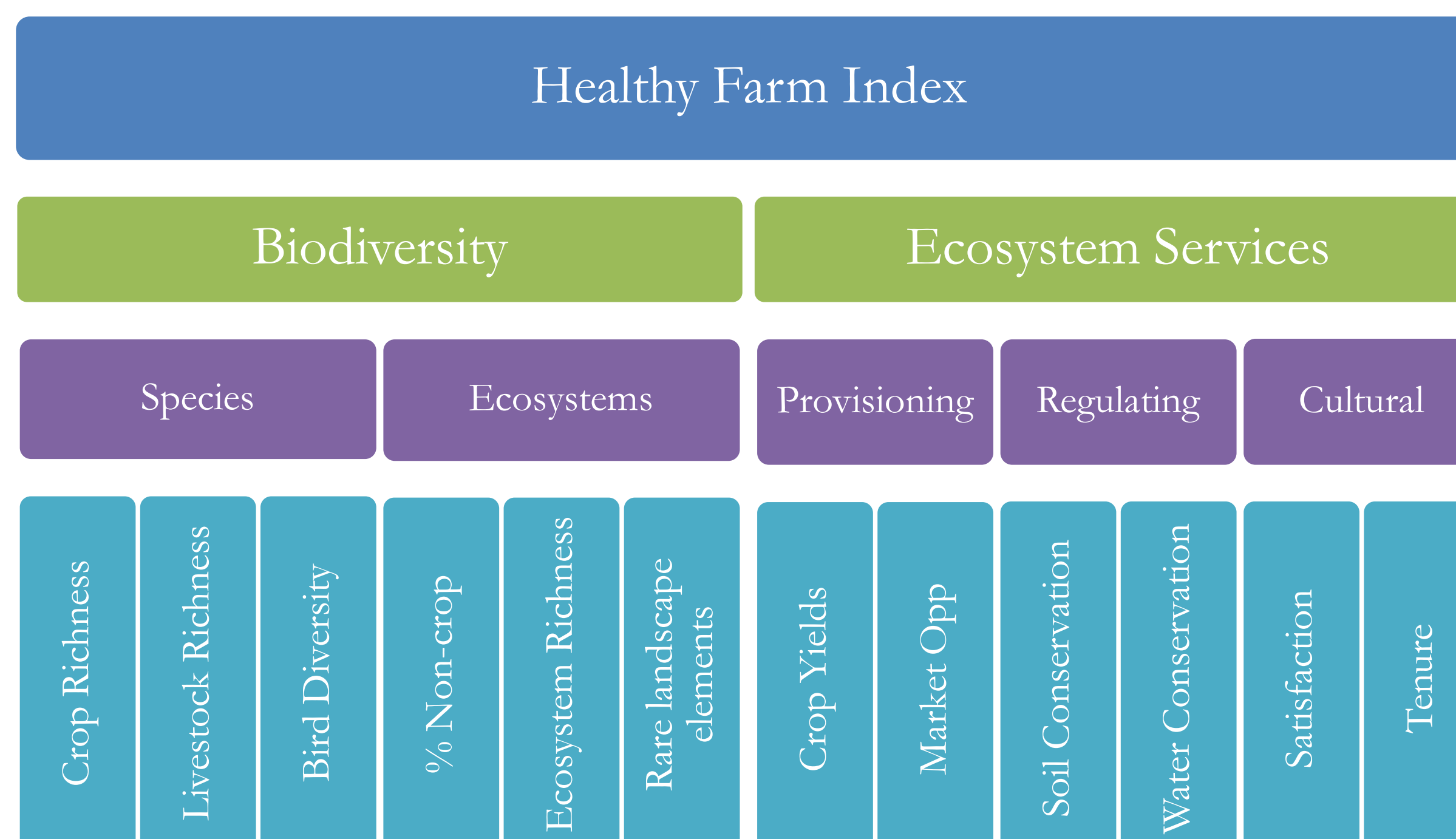
To encourage and support a more comprehensive decision-making process that integrates biological diversity and ecosystem services into farm operations, we have developed a multiple criteria farm assessment tool, the Healthy Farm Index (HFI).

With the Healthy Farm Index, we provide a user-friendly farm-scale assessment tool to engage landowners and provide a more accurate measure of farm complexity for landowners and policy makers.

Collected indicators in the HFI fall into five categories within biodiversity and ecosystem service. Within these categories we have identified and applied 15 indicators representing 12 indicator groups (Figure 1).

Here we present the results from initial assessment on 16 organic farms in two regions of Nebraska and Kansas.

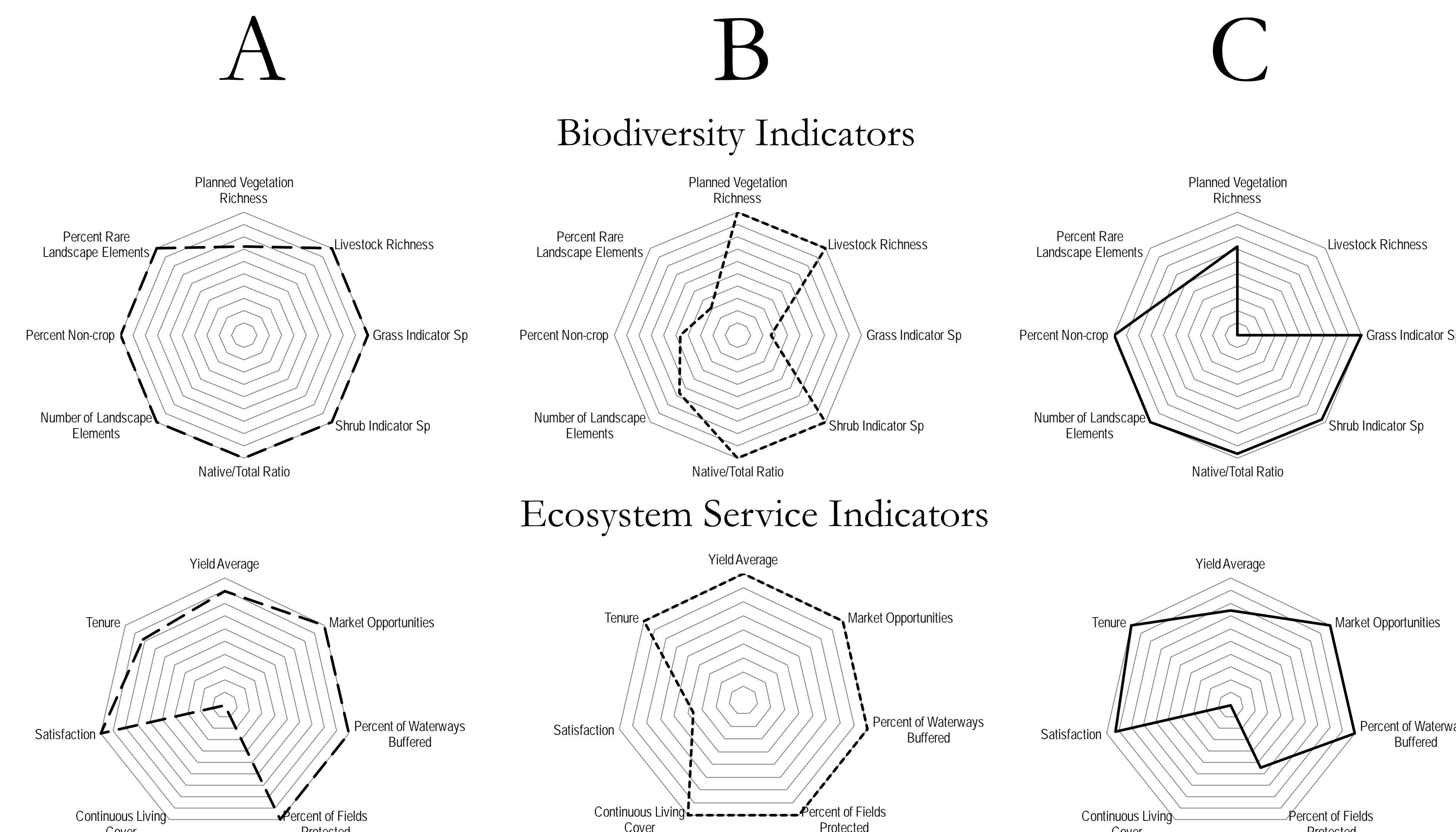
## Figure 1. HFI Framework



## Farm Scores

Outputs of the index provide information to farmers in two forms. First, spider plots (Figure 2) can be used to identify and discuss strengths and weaknesses regarding individual indicators. Of the three farms shown below, variation in biodiversity and ecosystem service scores is evident. Composite scores (Table 1) for biodiversity, ecosystem services and the final HFI are valuable for comparison between farms and tracking change over time.

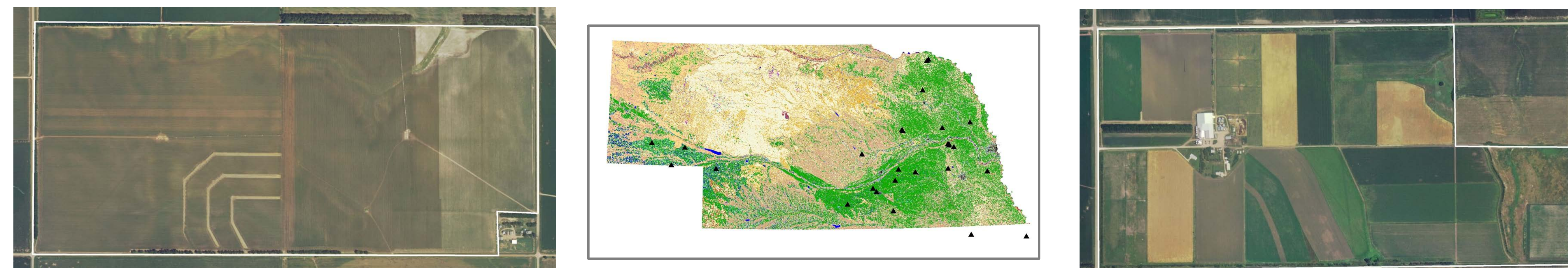
**Figure 2.** Spider plots from three farms



**Table 1.** Composite index values across farms

Region	HFI			Biodiversity Composition			Ecosystem Service		
	Median	Max	Min	Median	Max	Min	Median	Max	Min
Western Corn Belt	0.85	0.95	0.63	0.86	0.96	0.47	0.81	1.00	0.69
Central Great Plains	0.79	0.92	0.61	0.78	0.97	0.48	0.80	0.99	0.74

## Participating Farms

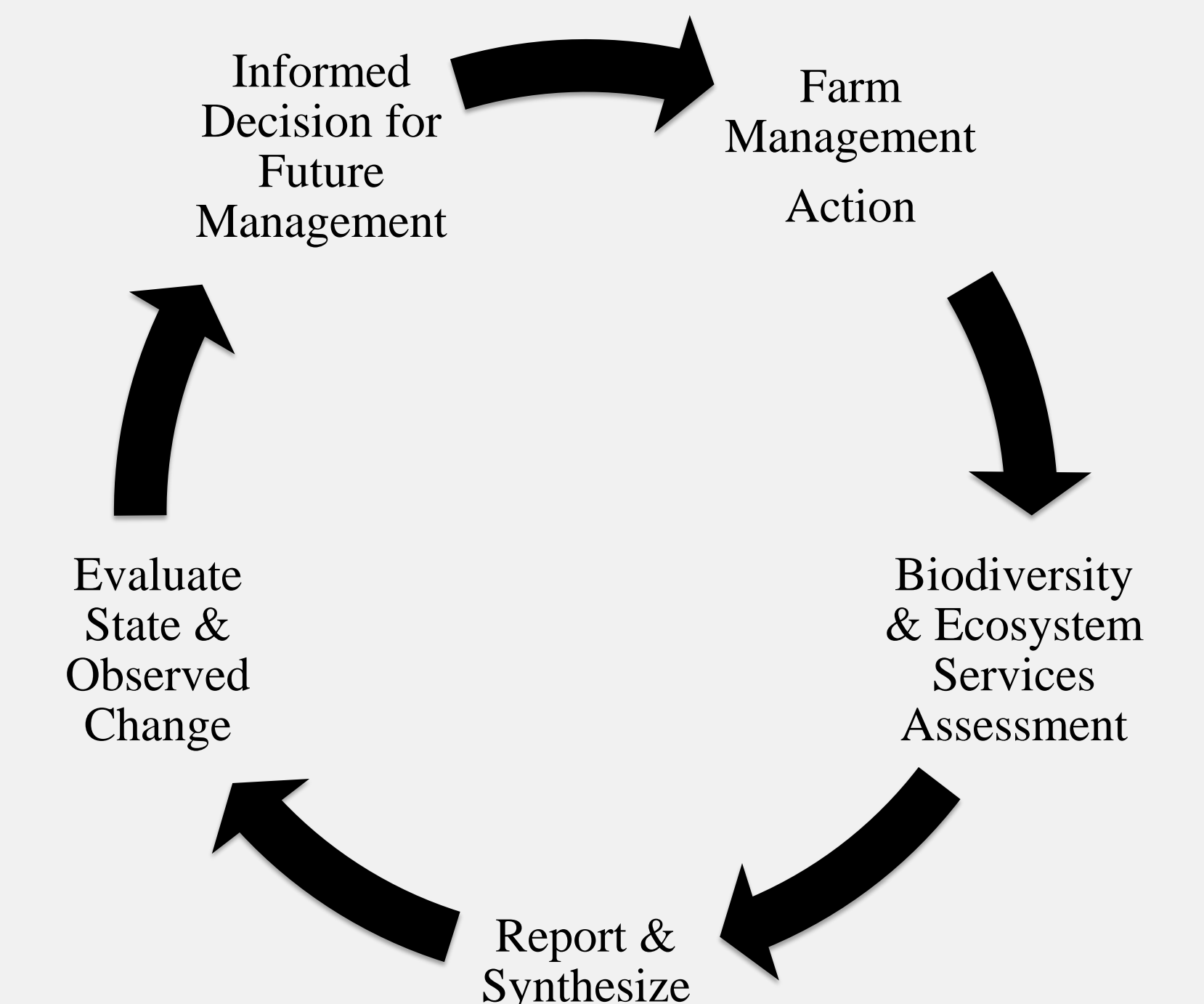


Spectrum of heterogeneity

## Discussion

Annual application of the Healthy Farm Index by farmers can serve as a means to formalize the ongoing adaptive management processes inherent in many operations (Figure 3). Furthermore, gathering and aggregating data and insight from applied practices across individual farms can improve predications related to biodiversity and ecosystem service patterns in agroecosystems.

**Figure 3. Adaptive Management with the HFI**



Ultimately, given that planetary thresholds of multiple ecological processes are being crossed and that solutions remain unclear, increased awareness and involvement of local landowners in conservation and management of biodiversity and ecosystem services will serve to complement global progress.

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