# Understanding the Ecology Behind the Societal Benefits of Ecosystems

Ecological systems provide many socially and economically valuable benefits to society. The provision of these services involves a complex array of ecological structures and processes that vary across space and time, and are influenced by environmental conditions and management actions. Tremendous progress has been made over the last decade in the development of data and research methods to quantify ecosystem services. However, because ecological systems are so complex and varied, large gaps remain in our understanding of the *biophysical production* of benefits to society. **This call is thus focused on advancing fundamental ecological understanding of the type, quantity and interactions between ecosystem attributes and biophysical processes that are required for the production of socially-relevant ecological outputs.**
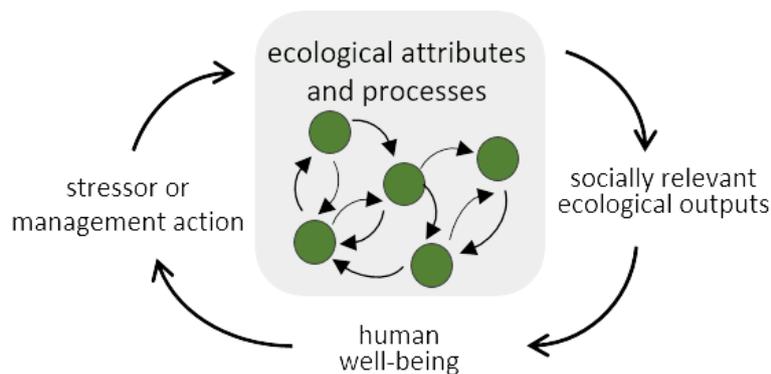
Ecological attributes include a specific type or structural characteristic of an ecosystem, a species, a functional group, etc. Ecological processes include a wide variety of pertinent ecosystem fluxes and biogeochemical transformations such as water storage or infiltration, primary production, decomposition, nutrient flux/cycling. Socially relevant ecological outputs are ecological states or outcomes that can be directly linked to economic or other social benefits (e.g., an increase in pollinators may result in higher fruit production on a farm).

Two particular research gaps motivate this theme. First is the need to better understand which ecological attributes and processes, and in what combination, lead to different ecological outputs. Second is the need to better understand which ecosystem management actions can be used to protect (or alter, if needed) specific ecological attributes and processes relevant to the production of benefits to society.

Examples relevant to this theme include synthesizing data or developing models to:

- Forecast the response of critical ecosystem attributes and/or processes to stressors or environmental change (temporal predictions);
- Determine the relationship between attributes and processes that contribute to socially relevant ecological outputs;
- Predict the effectiveness of management actions on critical ecosystem attributes and processes;

- Evaluate the scale-dependence of ecological attributes or processes relevant to socially relevant ecological outputs;
- Identify ecological outcomes amenable to eventual social benefit analysis.

Applicants are expected to include in their proposal a justification that addresses the importance of the features or processes under consideration and why the proposed synthesis effort is novel and important. Proposals focused on measuring the values of ecosystem services (e.g., using monetary or nonmonetary valuation approaches) are *not* covered by this theme. Additionally, SESYNC does not support projects solely focused on literature reviews or meta-analyses, rather the focus is on data integration, analysis and/or model development.

This theme will remain open for at least two RFP cycles.