

Evaluating User Needs for Geovisualization of Pollinator Health and Ecosystems

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Abstract:

Pollinators serve a crucial role in the global ecosystem, ensuring that plants and animals can reproduce and thrive (Bascompte & Jordano, 2007). Threats to pollinators can endanger environmental sustainability and cause food security problems. Entomologists studying pollinator health and ecosystems have discovered a multitude of potential threats to bees and other pollinator species (Potts et al., 2010). Understanding those threats as well as the ecological opportunities that exist to support healthy pollinators has become a key intersection for science and public outreach. Geographic visualizations are outstanding candidates for conveying the spatiotemporal data that converge at this intersection.

Our work focuses on the design and development of *Beescape NexGen*, a new geovisualization system intended to help stakeholders understand the spatio-temporal dynamics of threats to pollinator health and to explore the opportunities that exist to improve their ecosystems. Beekeepers, agricultural growers, conservationists, and scientists form our four key stakeholder communities. We report here on a recently completed multi-part needs assessment activity with representatives from each stakeholder group. A workshop was held which featured two rounds of focus group discussion and a collaborative paper prototyping activity (Figure 1). This needs assessment builds upon our previous usability research with an early Beescape prototype (Robinson et al., 2021). The results of that previous usability study, which had focused exclusively on beekeepers as a key user group, revealed the need to step back and assess a broader set of stakeholder groups and to completely re-envision the Beescape system approach through a full redesign effort.

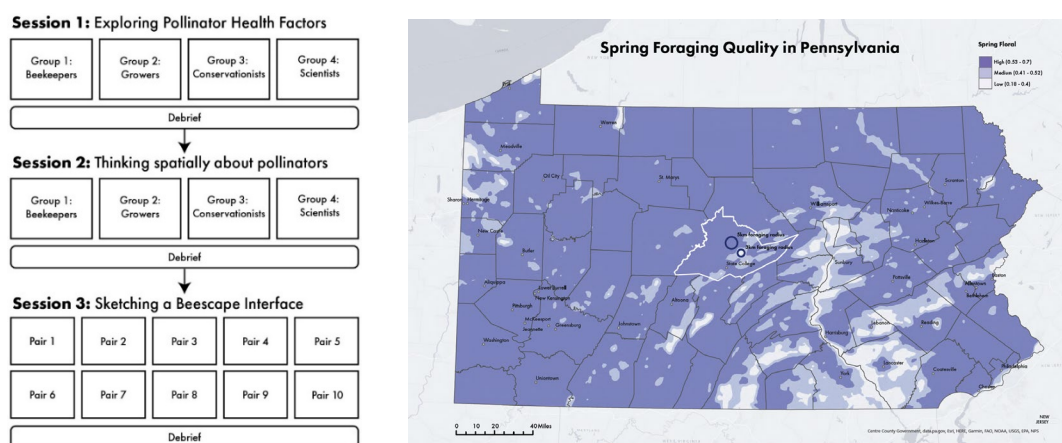


Figure 1. The structure of our needs assessment (left) and an example map designed to prompt participants in Session 2 (right).

Twenty stakeholders were engaged in our needs assessment activity to elicit analytical, informational, and interface requirements. Each stakeholder subgroup engaged in two rounds of moderated focus group discussions followed by debriefings with the entire group together. A third activity paired stakeholders to work together on sketching a prototype interface for Beescape NexGen. The first focus group prompted users to discuss, identify, and rank the greatest threats to pollinator health and the most significant opportunities for improving pollinator health. The second focus group prompted users to use a collection of nine prototypical maps that we designed for the workshop (Figure 1) to rank the importance of spatial data layers and to develop at least three questions that they would like to address using the information found on those maps. They were also prompted to tell us which spatial data layers they thought were

missing and should be included in Beescape NexGen. Finally, a paper prototyping task asked users to draw an interface that showed the answer to one of the spatial analysis questions identified in the second focus group (Figure 2).

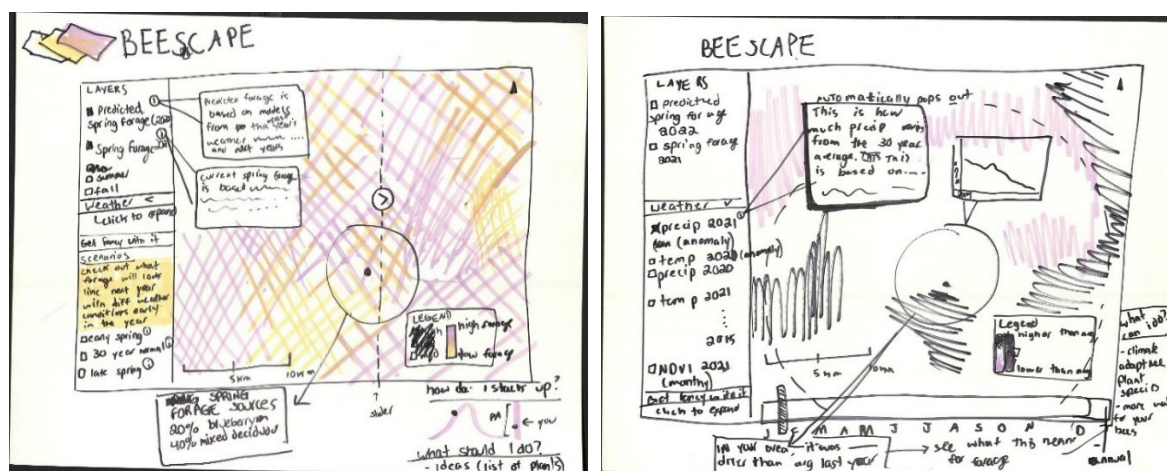


Figure 2. Sketched interface concepts developed by one pair of participants in our needs assessment activity.

Participants identified a wide range of potential threats to pollinators, with habitat loss, pests/pathogens, and pesticides/pollutants mentioned across all four groups. In addition, multiple groups highlighted communication and outreach challenges related to the contemporary media and social media ecosystems, which can make it difficult to help amateurs and professionals alike to help manage pollinator populations. Opportunities to improve pollinator health included the use of new systems to convey spatial and temporal information about the location and health of pollinators, especially in ways that allow individual stakeholders to relate the health of their local environments to other areas.

Early results from our analysis of needs assessment data in Sessions 2 and 3 indicate that Beescape NexGen will require support for predictive as well as historical data views, the ability to flexibly visualize data across very large to small scale aggregations, and to include plainly-worded explanations to help users understand modelled pollinator health layers. Users also supported the development of layer presets to enable modal engagement with different pollinator health themes, and the inclusion of a local report card that summarizes conditions for a range around a specific apiary.

Our progress on evaluating user needs in this work provides an example methodological pattern that can be applied to the design of other spatial decision support projects where several key user groups must be considered in parallel, complementing previous work to refine user-centered design to support cartographic research (Roth et al., 2017). The next steps of our work involve translating needs assessment results into a new interface to be implemented by our team. Afterward we will evaluate the Beescape NexGen prototype using tasks and metrics derived from this research.

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