Getting creative to sustain research infrastructure

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Take a moment to think about how infrastructure affects your day, whether it's the transit system that enables your travel or the electrical grid you rely on every time you flip a light switch. We may not always recognize the value and importance of infrastructure, but it is an essential part of our daily lives.

Biological research infrastructure – such as databases, collections, and field stations – is similarly important to science. These resources enable research, education, and decision making for a diverse community, and imagining modern science without them is akin to imagining life without electricity. Until now, in the US, research infrastructure has largely been grant-funded by single government agencies. Many of these agencies are facing substantial budget pressure, stimulating concern over long-term resource maintenance and development. To ensure sustainability, infrastructure projects need to diversify their funding strategies; grants can't do it all anymore.

Consider some projects that began with National Science Foundation (NSF) startup funding. VegBank (www.vegbank.org) allows users to search, analyze, and archive vegetation plot data. The National Center for Ecological Analysis and Synthesis (www.nceas.ucsb.edu) uses data to address issues in ecology and encourages the application of science to management and policy. The National Evolutionary Synthesis Center (www.nescent.org) uses information, concepts, and knowledge to address emerging questions in evolutionary science. These projects provide invaluable resources and services to the scientific community, and would leave a gaping hole behind if they ceased to exist.

At a recent Ecological Society of America (ESA) workshop on *Strategies for Sustainability of Biological Infrastructure*, sponsored by NSF and facilitated by the Meridian Institute, a group of infrastructure project managers and directors identified serious obstacles to keeping vital resources like these around for the long term. Funders typically prefer to support new initiatives and don't always view infrastructure maintenance and development as a priority, while users can be averse to fees if they are accustomed to free access. Furthermore, when projects implement new financial strategies, revenue streams may become less predictable, making long-term planning, expansion, and improvement of infrastructure value and facilities a challenge.

Infrastructure leaders are working to address these issues. Field stations are delving into ecotourism ventures and databases are soliciting input on new services and membership schemes. NatureServe, a non-profit organization that provides information about imperiled species and ecosystems, employs a variety of funding strategies. NatureServe's first business plan was based on charging users for data but was modified based on user feedback; they now provide services and products based on core datasets. Users are more receptive to paying for these services and this makes the data provided even more valuable. In many cases, users will include a modest contribution to data infrastructure within service agreements to enhance sustainability. NatureServe also spreads costs across its 82 member institutions, making the burden more manageable for everyone, and some institutional users provide financial support for data-delivery infrastructure to meet critical information needs.

Sustainability is more than merely preserving existing content and services; it means being able to constantly adapt and develop the resource, increasing its value to the user community. Workshop participants identified some keys to sustainability, such as diversifying revenue streams, ongoing stakeholder engagement, and having a clear value proposition that defines who benefits from infrastructure, how they benefit, and how much. It is important, however, to remember that what works for one project may not work for another.

Keeping resources sustainable will require infrastructure leaders and users to communicate openly and think creatively. Users: if you wish your online data repository did something differently, or if you have ideas for a new service, tell someone. Rather than immediately protesting new fee structures, consider the real value of infrastructure and why a fee is being considered, and even suggest what you would be willing to pay for and how much you could pay. Resource managers: listen to your users carefully, because their ideas and feedback could be the key to your sustainability. Be willing to share your successes and failures, so that others can learn from your experiences, and have a thorough understanding of your costs and value. Change is necessary; biological research infrastructure cannot rely on grants and contracts alone, and nor can it afford to be taken for granted. ESA is planning follow-up initiatives to enhance infrastructure sustainability, including potential workshops and training opportunities, so please send us your ideas (jill@esa.org). It's time to get creative, to ensure that these valuable resources can continue supporting science and fostering innovation.