Designed Experiments for transformational learning: Forging new opportunities through the integration of ecological research into design

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A simultaneous movement is underway in both landscape architecture and ecology to reframe the relationship of science to practice. Designed experiments provide an approach to integrate research experiments into designed projects in order to refine our understanding of sustainability and resilience, fill knowledge gaps and frame issues of uncertainty.

Learning Objectives
• Apply scientific knowledge and scientific assessments as a driver of the design, operations and maintenance.
• Re-conceptualize experiments from an instrument to obtain results addressing hypotheses, to a multifunctional landscape.
• Learn how scientific research can inform shaping strategies for urban vegetation and hydrology.
• Learn ways of improving communication among multiple parties via interdisciplinary strategies.
• Learn about effective monitoring strategies to support designed landscapes and inform Sustainable Sites.

Session Outline
1. Designed Experiments
   1. What defines them?
   2. What makes them different/distinct from the traditional design process?
2. Why is this approach needed?
   1. Why isn’t traditional design enough anymore?
   2. What are the true benefits of this approach?
3. What are the most common misconceptions about the designed experiment approach?
   1. What are the most often-cited reasons for why this approach won’t work?
   2. Are these reasons and misconceptions the same across countries?
4. Case study examples
5. Beginning your own experiment
   1. How can mainstream designers begin to incorporate some of the distinguishing features of designed experiments into their own practice?
   2. Where do they begin?
MillionTreesNYC Reforestation Plan

- NY-CAP was established to assess the impacts of urban afforestation on soil health, urban tree performance and native recruitment. Planting occurred in the fall 2010.
- 1,296 individual trees were assessed in August 2011, 2012 & 2013, 2014 and 2015. Woody seedling recruitment was assessed in 2012.
- Data analysis occurred at the plot (i.e. stand) scale and species (i.e. individual) scale. Plot treatments explore the impact of differences in species richness, vegetative structure and soil amendment on plant performance and survival.
- The role of environmental stressors such as pollution, drought, vandalism, pests and disease are assessed for their impact on the health and survival of planted species.
- Tree performance metrics include root collar diameter (shifting to dbh), height, biomass volume estimate. Health metrics and woody recruitment (adapted from the USFS tree-rating methodology) focusing on tree vigor, drought stress, pest incidence, chlorosis class, and evidence of vandalism.
Orongo Station, Gisborn, New Zealand.

- The design initiated in 2002 has led to the establishment of an 86-acre Tuatara reserve - an endangered species of reptile - and an aggressive reforestation program.
- Data has been collected throughout the process and has been instrumental in the release of six Tuatara on the property.
- Using innovative audio attraction systems, a gannet and gray-faced petrel colony has likewise been established due to its symbiotic relationship with the reptile.
- Further monitoring will provide a template for establishing complex restoration ecology initiatives within designed landscapes.

Seven Ponds, Albemarle County, VA.

- A 15 year client collaboration has produced several initiatives on the property, including the installation of warm-season native meadow, pond/hydrological restoration and wildlife habitat creation.
- A BioBlitz provides data for the quantify the efficaciousness of interventions and shaping of futures initiatives.
Washington Stormwater Center, Puyallup, WA.

- Designed and constructed In situ campus monitoring of a parking lot with test cells to compare flow control and water quality of porous asphalt and pervious concrete.
- A grid of rain gardens was built to compare treatment performance of plant palettes and maintenance regimes. A gallery of soil mesocosms was built in order to compare the performance of various soil mixtures.

TEKLAB: A Living Laboratory for Traditional Ecological Knowledge, Tukwila, WA.

- A matrix of cultural gardens compares ecological performance of conventional park maintenance vs. traditional ecological knowledge.
- We compared practices such as prairie burning, camas bulb digging and tule harvesting.
Qiaoyuan Park: The Adaptation Palettes, Tianjin, China (ASLA Award of Honor, 2010).

- Through regenerative design and by changing topography and water levels, the natural process of plant adaptation and community evolution is introduced.
- The approach transformed a former deserted shooting range used as a garbage dump into a low-maintenance urban park.

Houtan Park: Landscape as a Living System, Shanghai, China (ASLA Award of Excellence, 2010).

- Built on a brownfield of a former industrial site on Shanghai’s Huangpu riverfront.
- The park’s constructed wetland, ecological flood control, reclaimed industrial structures and materials, and urban agriculture are integral components of an overall restorative design strategy to treat polluted river water and recover the degraded waterfront.