

The Grand Challenges:

- The ecological implications of climate change
- The relationships between biodiversity, species composition, and ecosystem function
- The impacts of land use and habitat alteration
- The ecology and evolution of infectious disease
- The causes and consequences of invasive species
- The ecological implications of biogeochemical cycles
- Hydroecology

4a. Should the NEON grand challenges be prioritized for MAREO?

- We do not want to exclude any of the grand challenges—they are all important. Nevertheless, to set up the infrastructure to support the NEON grand challenges, it is important to phase in the challenges in a prioritized order. The priority list is:
 - Lower order/boundary conditions:
 - 1. Land-use change
 - 2. Biogeochemical cycles
 - 3. Climate change
 - 4. Higher-order conditions (e.g., invasive species, biodiversity).
 - Please note: the higher-order conditions are critically important and the MAREO infrastructure must support research on these topics. The lower-order conditions, however, are fundamental to infrastructure to support that higher-order research.

4b. What contrasts and overlaps are likely to exist between regional and national questions and interests?

- Although the MAREO region will suffer some of the grand-challenge processes to a greater degree (perhaps land-use change) and others to a lesser degree (perhaps temperature change), it will experience all of the grand-challenge problems. Every place in the US will experience the grand-challenge problems to some degree. A special feature of MAREO will be the human impacts; the region's biggest contribution to NEON may be to an end member for many of these impacts.

4c. How will this difference affect regional versus national infrastructure requirements?

- The MAREO sites and their associated infrastructure should be designed around overlapping environmental gradients; that is, the large regional watersheds with their estuary-to-mountaintop gradients, urban-to-rural gradients, other natural landscape gradients, and other developed-to-less developed landscape gradients. Many other NEON regions will not have these environmental gradients so starkly defined, so they probably will not need to or want to build their infrastructure around these phenomena. If they do, then we have an excellent basis for comparison across the nation.

4d. How should the social dimensions, educational dimensions, and outreach of NEON be implemented at the regional and national levels?

- Education and outreach should focus on letting scientists and stakeholders know about the MAREO and NEON data so that they will use it. The “build it and they will come” mentality does not work. Another way to make NEON work will be to promote the policy implications of our research and to engage the relevant policy makers from the very beginning of the process. Thus, we should be engaging stakeholders—especially policy makers and educators—now. As much as we are asking the scientists, we should be asking stakeholders, “What can MAREO or NEON do for you?”

4e. How can our infrastructure be designed to simultaneously address multiple grand challenges?

- It is possible and desirable to design the MAREO network so that the regional large watersheds and their embedded environmental gradients encapsulate most of the grand challenge questions. Thus, the spatial design is critical: if done carefully, it will facilitate answering the grand challenge questions.