

## **NEON Fundamental Instrument Unit: Long-term environmental monitoring from in situ points to continental scale**

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The Fundamental Instrument Unit (FIU) is a NEON science sub-system designed to integrate the ecological drivers, responses and interactions among the ecosystem-level soil-plant-atmosphere continuum, and enable automated consistent observations in situ from the points on the tower or in the soil to the continental scale at 60 sites over the observatory life time of 30 years. Consistent sampling and measuring will act uniformly as one single integrated observatory enabling multiple scales of inference. FIU instrumentation will be located within each of the 20 NEON Domains at i) Core wildland sites designed to anchor studies that enable the spatial scaling and answer the Grand Challenge areas (such as long term climate change and land use change), and at ii) two Relocatable sites designed to assess ecologically significant (response) gradients within the domain boundaries (such as permafrost gradient at north slope, and snow-water gradient at south-west pacific area). FIU instrumentation will be automated with at continual temporal coverage, 24/7/365. The FIU sub-system dovetails with the other NEON sub-systems in an overall nested design covering the time and space scales, from seconds to decades, and sub-meter to continent, respectively, all contributing toward a continental-scale observatory. The choice of measurements and design have been rigorously reviewed to maximize utility to the community, traced to our high-level data products, defined to enable answering our Grand Challenge questions. 95 different measurement types will be made by >14,000 sensors on the tower or below ground across the whole country. Typical site layout of facilities and instrumentation is presented in this poster. Lower level data products generated from the sensors and higher level integrated data products include climate parameters, such as temperature, precipitation, wind vector and velocity, energy balance components, wet and dry deposition, etc, that can have long term impacts on processes of atmosphere, hydrosphere, geosphere and biosphere. All data will be freely available to scientist, policy decision maker, and citizens to enhance the understanding and education of climate change and other ecological issues.