NEON Relocatable Site Selection Process

The selection of relocatable sites began with the identification of science themes. Themes proposed during the Request for Information (RFI) process generated a large number of conceptual and site-specific suggestions from the ecological research community. The ideas contained in the RFI responses were evaluated during a week-long workshop in Sioux Falls, South Dakota. A summary of the workshop was produced and transmitted to NEON, Inc. Several key points emerged from the Sioux Falls workshop and subsequent NEON, Inc analyses:

1. Ensure that the relocatable systems preserve the "cause and effect" paradigm. In other words, each relocatable site should include organismal collection (the Fundamental Sentinel Unit or FSU), automated measurements (the Fundamental Instrument Unit or FIU), and remote sensing (the Airborne Observation Platform or AOP).

   The relocatable systems should not be minimally configured, instrumentation-only systems (as envisioned in some early NEON discussions). This implied that FSU staff must be allocated to relocatables, and logistics must allow ready access from the domain HQ location.

2. Unlike climate change, land use and its effects are not captured in the deployment of the Wildland Core Sites (by definition). As a result, land use must be a priority for relocatable deployments.

   NEON now focuses on a few land-use types (forest management, agriculture, and urbanization) and replicates deployments in land-use types across ecoclimatic gradients.

   3. The overarching theoretical question of connectivity—the linkage of ecological processes across space—is relevant to all of the Grand Challenge questions. A number of relocatable deployments should address connectivity,

sampling hydrological and atmospheric transport (of dust and air pollution) flowpaths. They should address not only the sources and sinks of materials, but also how these sources and sinks may change with land use and other disturbance processes.

NEON, Inc. used the Sioux Falls recommendations to develop a conceptual implementation plan in a workshop in Boulder, Colorado. This plan identified specific science themes and suggested an assignment of the themes to particular ecoclimatic regions (NEON Domains) and, in some cases, specific sites. In other cases, the type of site required in the domain was identified, but not an actual location. The outcome of these two processes was released to the community in a document entitled *Research Design Basis for the NEON Relocatable Systems* (Document Number: NEONDESIGN-0001vA) available on the NEON, Inc web site. http://www.neoninc.org/documents/45

The domain site survey process identified specific relocatable sites for NEON, Inc.-community discussion. The result was a long list of potential sites that met the science theme requirements. In this phase, several theme assignments that were found to be unworkable had to be refined. For example, the Sioux Falls group recommended a core site as far South in Texas as possible for Domain 11, close to an important invasive species gateway region, along with relocatable sites to study interactions between land use and invasion. However, no core site could be located in the target region that had wildland conditions, adequate size, and secure land tenure. A core site in Northern Texas was identified and the science theme modified to address land use and woody plant expansion as a focus. These decisions were made in close communication with domain-based scientists and the final assignment of themes was reviewed in a series of conference calls. Only a few such revisions were made, and in general the Sioux Falls vision is being implemented.

Once the science theme assignments were complete, NEON, Inc. staff began to

identify specific sites. Prior to each candidate core site visit, staff communicated with each domain point of contact (POC; generally the lead RFI respondent) and requested that the POC convene a committee to discuss potential relocatable sites during the site visit. The various committees represented a wide range of institutions and scientific interests within the 20 domains. In some cases, key people outside of the domains also participated in these meetings. At those meetings that included participation by teleconference, the national strategy was discussed and a tentative plan was usually developed for relocatables. In some cases, follow-up teleconferences were needed to refine the strategy. In exceptional cases, a relatively mature strategy had been identified during the RFI process and candidate relocatable site visits were scheduled along with the candidate core site visit.

Table 3 identifies each currently planned candidate relocatable site and the science theme assigned to it. In addition to these individual science themes, several regional, multi-domain strategies are important.

1. Nitrogen deposition: Core sites along the Eastern Seaboard domains (and many of the relocatable sites in these ecoclimatic regions) represent a broad gradient for air pollution and a gradient focused on the intensity of nitrogen deposition. Relocatables in domains one and six are specifically assigned to fill out this gradient, and several other core and relocatable sites participate.
2. Permafrost. All of the core and relocatable sites in Alaska (domains 18 and 19) span a gradient from stable continuous permafrost, through discontinuous or unstable (thawing) permafrost, to permafrost-free soils. Permafrost status is a primary determinant of biological processes and community composition.
3. Land use and atmospheric transport. The core and relocatable sites in domains 10, 13, and 15 are aligned along atmospheric flowpaths. Dust produced by sources that are strengthened by land use in domain 15 (in the Western part of domain 13) is transported by prevailing westerly winds to receptor sites to the East in domains 13 and 10. Reactive nitrogen is generated by agriculture and transportation in the Front Range region of

domain 10 and transported in upslope westerly winds toward domains 13 and 15. Dust and nitrogen have dramatic effects on biogeochemistry and ecohydrology. They also influence productivity and biodiversity.

Table 3: The NEON candidate relocatable sites for the first round of deployment focus heavily on land use. Rapid climate change and invasive species are also well-represented.

Domain Number	**Domain Name**	**Site Name**	**Science Theme**
1	Northeast	Bartlett Experimental Forest	Nitrogen deposition
1	Northeast	Burlington, MA	Land use/ Urbanization
2	Mid-Atlantic	Smithsonian Environmental Research Center	Invasive species
2	Mid-Atlantic	Blandy Experimental Farm	Invasive species
3	Southeast	Disney Wilderness Preserve	Land use/ Forest management
3	Southeast	Jones Ecological Research Center	Land use/ Forest management
4	Atlantic Neotropical	Lajas Experimental Station	Land use/ Agriculture
4	Atlantic Neotropical	Ponce Metro	Land use/ Urbanization
5	Great Lakes	Steigerwald Land Services	Land use/ Forest management
5	Great Lakes	Tree Haven	Land use/ Forest management
6	Prairie Peninsula	The University of	Land use/ Agriculture

		Kansas Field Station	
6	Prairie Peninsula	Konza Prairie Biological Station (Agricultural Lowland)	Land use/ Agriculture
7	Appalachian/Cumberland Plateaus	Mountain Lake Biological Station (SW Virginia)	Nitrogen deposition
7	Appalachian/Cumberland Plateaus	Great Smoky Mountains National Park, Twin Creeks	Biodiversity
8	Ozarks Complex	Armistead Selden Lock	Ecohydrological connectivity
8	Ozarks Complex	Choctaw National Wildlife Refuge	Ecohydrological connectivity
9	Northern Plains	Dakota Coteau Field School	Land use/ Agriculture
9	Northern Plains	Northern Great Plains Research Laboratory	Land use/ Agriculture
10	Central Plains	North Sterling, CO	Land use/ Agriculture
10	Central Plains	Rocky Mountain National Park	Nitrogen & dust deposition
11	Southern Plains	Klemme Range Research Station	Invasive species
11	Southern Plains	University of Oklahoma Biological Station	Invasive species
12	Northern Rockies	Bozeman, MT (MOR)	Land use/ Urbanization
12	Northern Rockies	Loch Leven, MT	Land use/ Urbanization

13	Southern Rockies	Moab, Canyonlands Ecological Research Site	Dust sources
13	Southern Rockies	Fraser Experimental Forest	Nitrogen & dust deposition
14	Desert Southwest	Jornada LTER	Climate change
14	Desert Southwest	Phoenix CAP LTER	Land-use/ Urbanization
15	Great Basin	Murray, Utah	Land use/ Urbanization
15	Great Basin	Red Butte Canyon	Land use/ Urbanization
16	Pacific Northwest	Good Seed Unit 2	Land use/ Forest management
16	Pacific Northwest	Thyme Unit 1	Land use/ Forest management
17	Pacific Southwest	Soaproot Saddle	Climate change/ Rain-snow transition
17	Pacific Southwest	Upper Teakettle	Climate change/ Rain-snow transition
18	Tundra	2nd Pump Station, Polygonal Tundra	Climate change/ Permafrost
19	Taiga	Well Drained Black Spruce Forest, Delta Junction, Non-permafrost	Climate change/ Permafrost
19	Taiga	Black Spruce Forest, Erickson Creek, Permafrost Gradient	Climate change/ Permafrost
19	Taiga	Eight Mile Lake, Healy Alaska, Alpine Tundra,	Climate change/ Permafrost

		Thermokarsting	
20	Pacific Tropical	PuuWaaWaa-invaded	Invasive species
20	Pacific Tropical	PuuWaaWaa-uninvaded	Invasive species

For a given NEON domain, data from core sites represent a baseline or control point for ecological conditions that can be compared to potentially non-baseline conditions at the relocatable sites. These types of comparisons provide critical information that can be used to characterize impacts, especially those due to the land-use change and invasive species drivers that cannot be characterized using only wildland sites. Analysis strategies for relocatable data are discussed in the appendices.

Future relocatable site strategy process

While the exact process for future relocatable decisions is still being decided, it will likely be similar to the process used in other NSF facility decisions. First, there will be an opportunity for the community to put forward ideas for future deployments. Community input will be requested on science theme priorities (including new science themes as new questions emerge) and on candidate sites to address those themes. A series of workshops similar to the one held in Sioux Falls will review, prioritize, and refine the ideas received. Then NEON, Inc. will be tasked with developing an implementation plan based on the science themes, priorities, and site information emerging from the community input process.

The NEON, Inc. implementation plan will identify specific sites and their scientific role and provide an evaluation of cost, schedule, environmental compliance issues, and maintenance and operation costs. It will also provide an assessment of feasibility, cost, maintenance and operations impact, and environmental compliance and permitting issues, as well as any other impacts on network

operations. NEON, Inc. will conduct an internal review of the implementation plan via its Science, Technology, and Education Advisory Committee (STEAC) and will prepare a program plan, budget, and deployment proposal for the NSF. NSF will make a decision reflecting the scientific issues, cost, risk, and logistics. Once the implementation plan is agreed to by NSF, NEON, Inc. will implement the new deployment and integrate the new sites into the network.