The National Ecological Observatory Network (NEON)

- A national observatory to provide long-term ecological data for use by scientists, educators, & decision makers

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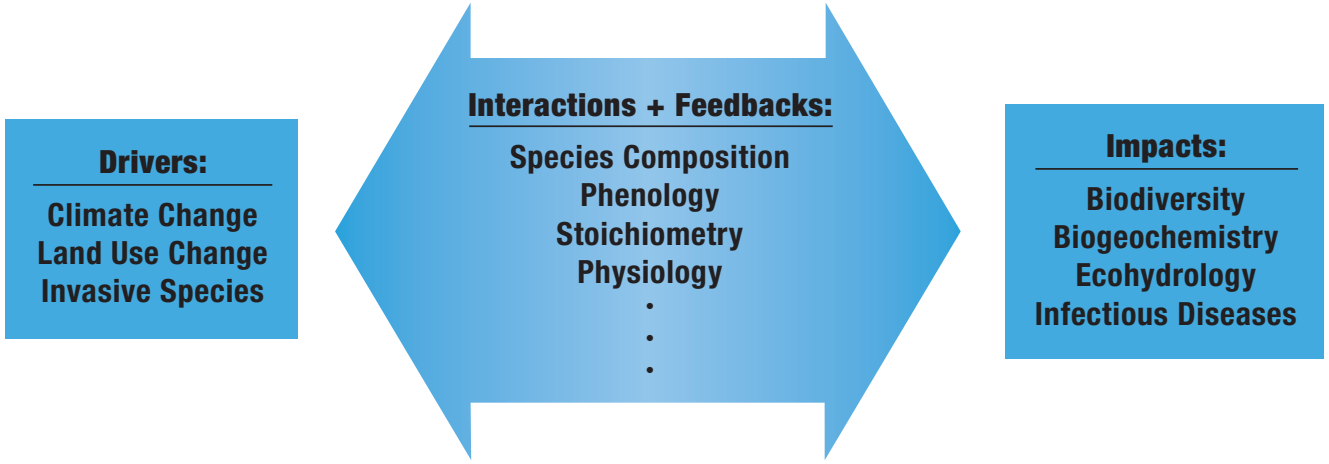
NEON, Inc.

General Information on NEON

- NEON is funded by the National Science Foundation
- NEON will cost ~$400 million to construct and ~$70 million per year to operate
- It is designed to operate for 30 years
- NEON, Inc. is a non-profit corporation contracted by NSF to design, build & operate NEON (the project)
- Construction is expected to begin in 2011 and be completed in 2016
- NEON is not a research org. or a funding agency; it is a national observatory that will collect & make available standardized environmental data.

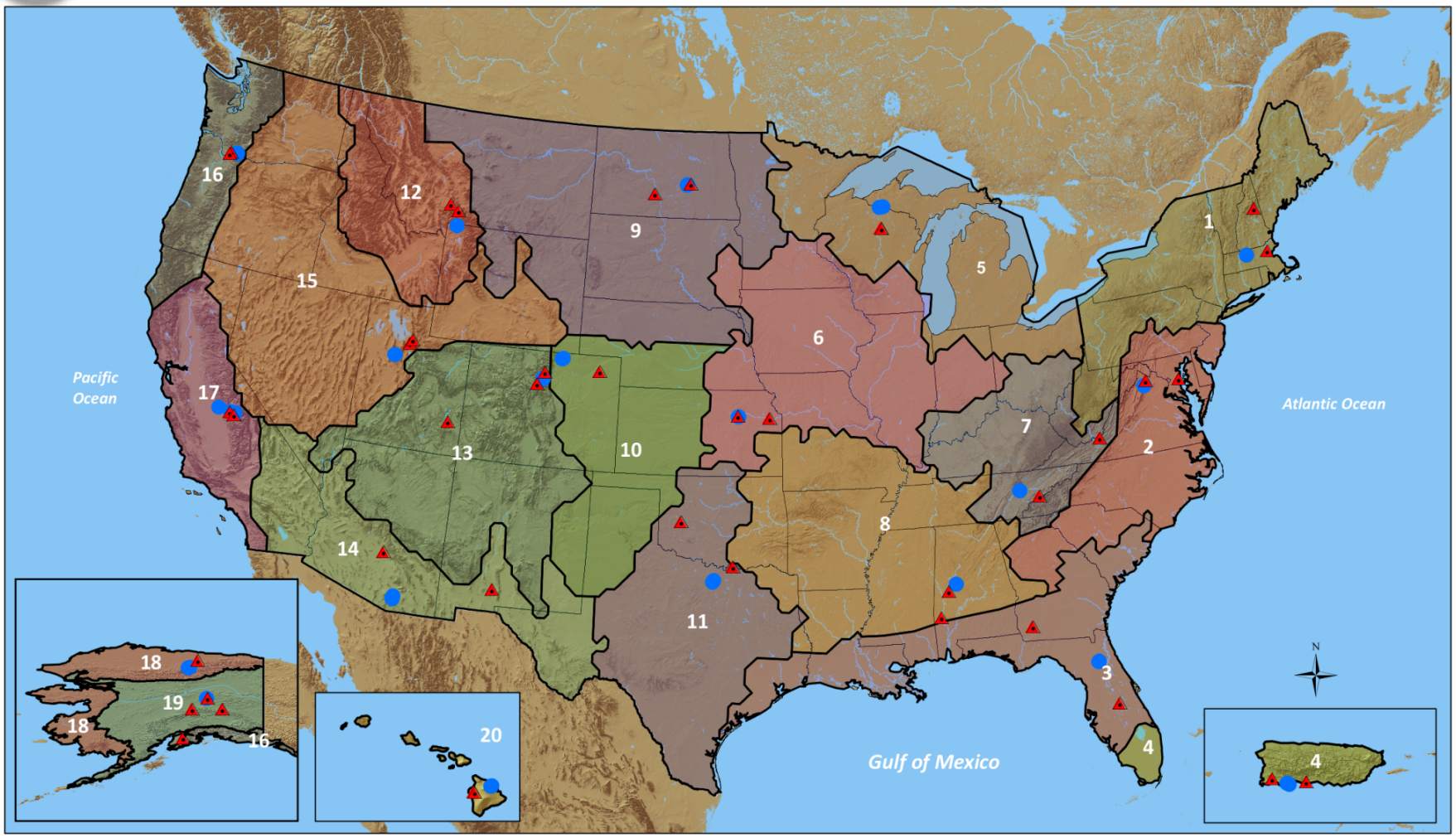
NEON Goal

The goal of NEON is to *enable understanding* and *forecasting* of the *impacts* of ***climate change***, ***land use change*** and ***invasive species*** on *continental-scale* ***ecology*** by providing data and infrastructure to support research, education and environmental management in these areas.



NEON Cause and Effect paradigm

A National Observatory:
20 Eco-climatic Domains



NEON Domains

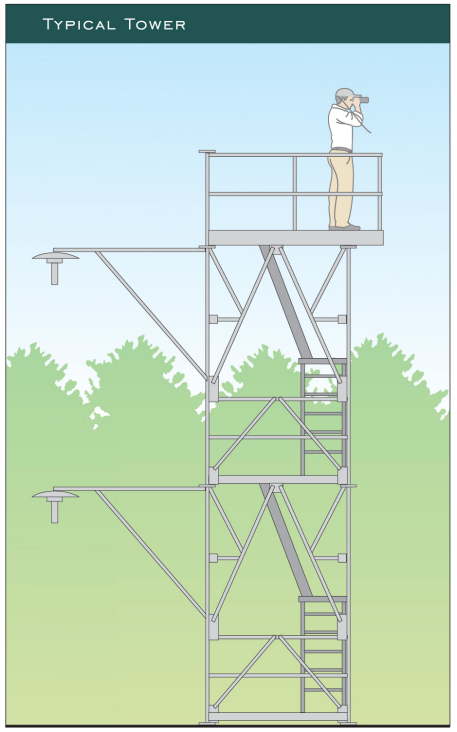
1 Northeast	5 Great Lakes	9 Northern Plains	13 Southern Rockies/Colorado Plateau	17 Pacific Southwest
2 Mid Atlantic	6 Prairie Peninsula	10 Central Plains	14 Desert Southwest	18 Tundra
3 Southeast	7 Appalachians/Cumberland Plateau	11 Southern Plains	15 Great Basin	19 Taiga
4 Atlantic Neotropical	8 Ozarks Complex	12 Northern Rockies	16 Pacific Northwest	20 Pacific Tropical

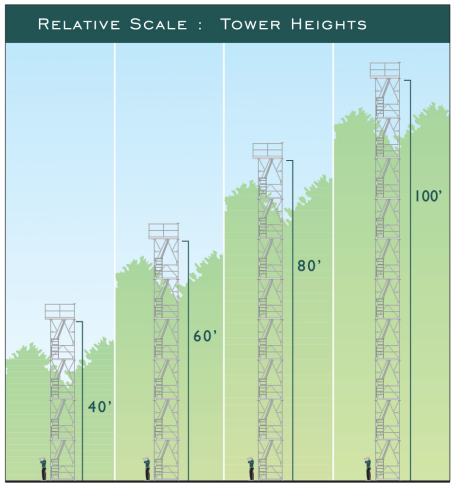
NEON Deployment

- Headquarters (incl. CI, labs, etc.) - Boulder
- 20 Domains
  - 20 Core sites (wildland)
  - 40 Relocatable sites (~ every 5 yrs) (land-use sites)
  - Environmental & biological data from each site (automated instrumentation & human observers)
- 10 Mobile laboratories
- 3 Airborne Observation Platforms
- Land Use Analysis Package
- STREON Experiment (10 sites)

Automated Data Collection

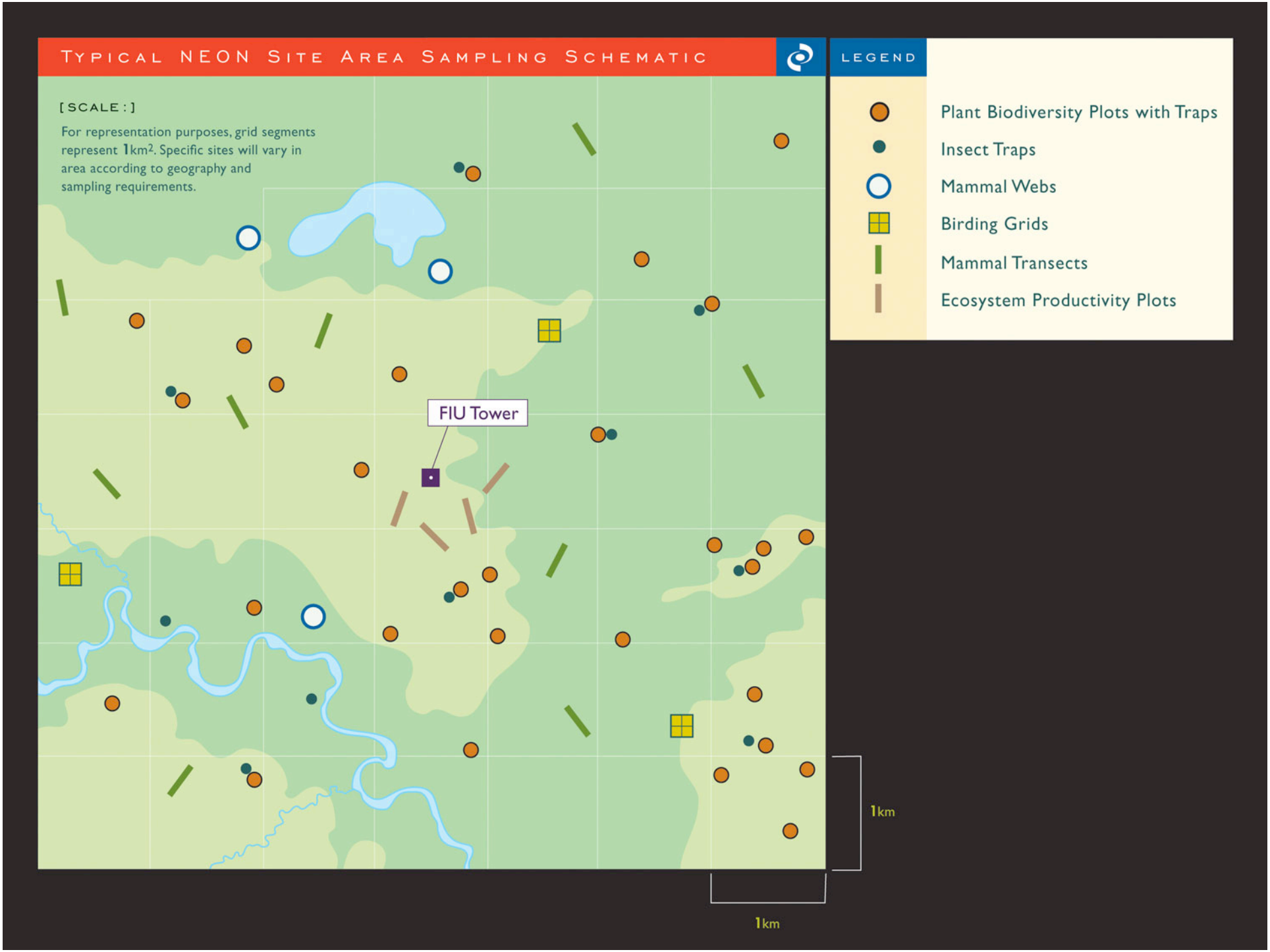
- Climatic/atmospheric variables – to NOAA CRN standards where possible
- Sensible and latent heat
- Carbon cycle fluxes
- ^{13}C in CO_2, ^{18}O in H_2O
- NO_y
- Soil moisture and temperature
- Soil CO_2 flux
- Root growth





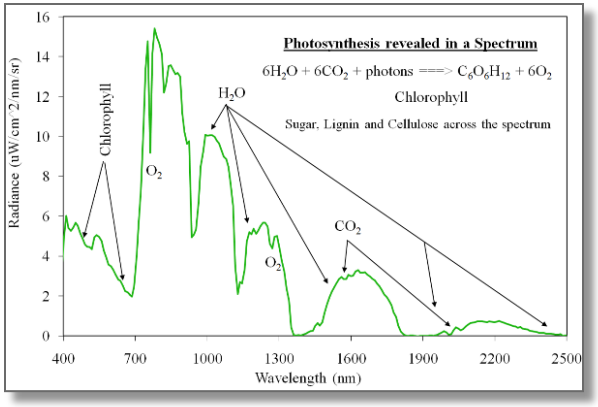
Data on Organisms & Ecosystems

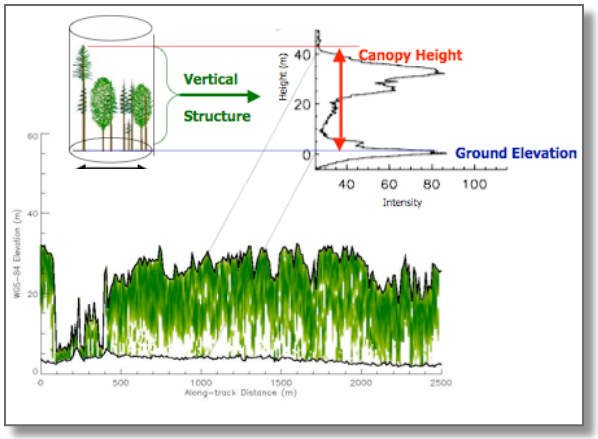
- Biodiversity in terrestrial & aquatic biota
- Population Dynamics
- Productivity
- Phenology
- Infectious Disease
- Biogeochemistry
- Microbial Diversity and Function
- Ecohydrology

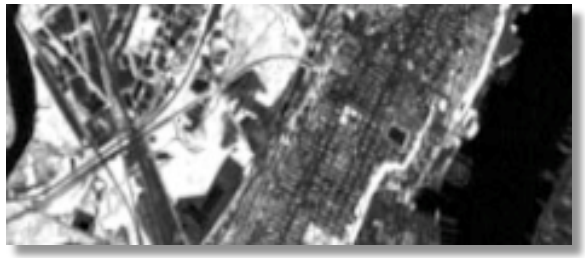

TYPICAL NEON SITE AREA SAMPLING SCHEMATIC
[SCALE:]
For representation purposes, grid segments represent 1km². Specific sites will vary in area according to geography and sampling requirements.
FIU Tower
LEGEND
Plant Biodiversity Plots with Traps
Insect Traps
Mammal Webs
Birding Grids
Mammal Transects
Ecosystem Productivity Plots
1km
1km

Airborne Remote Sensing – for scaling

- Spectroscopy
  - Vegetation biochemical & biophysical properties
  - Cover type & fraction
- LiDAR altimetry
  - Vegetation structure
  - Sub-canopy topography
  - Biomass
- High resolution imagery
  - Land use & land cover
- 3 identical platforms



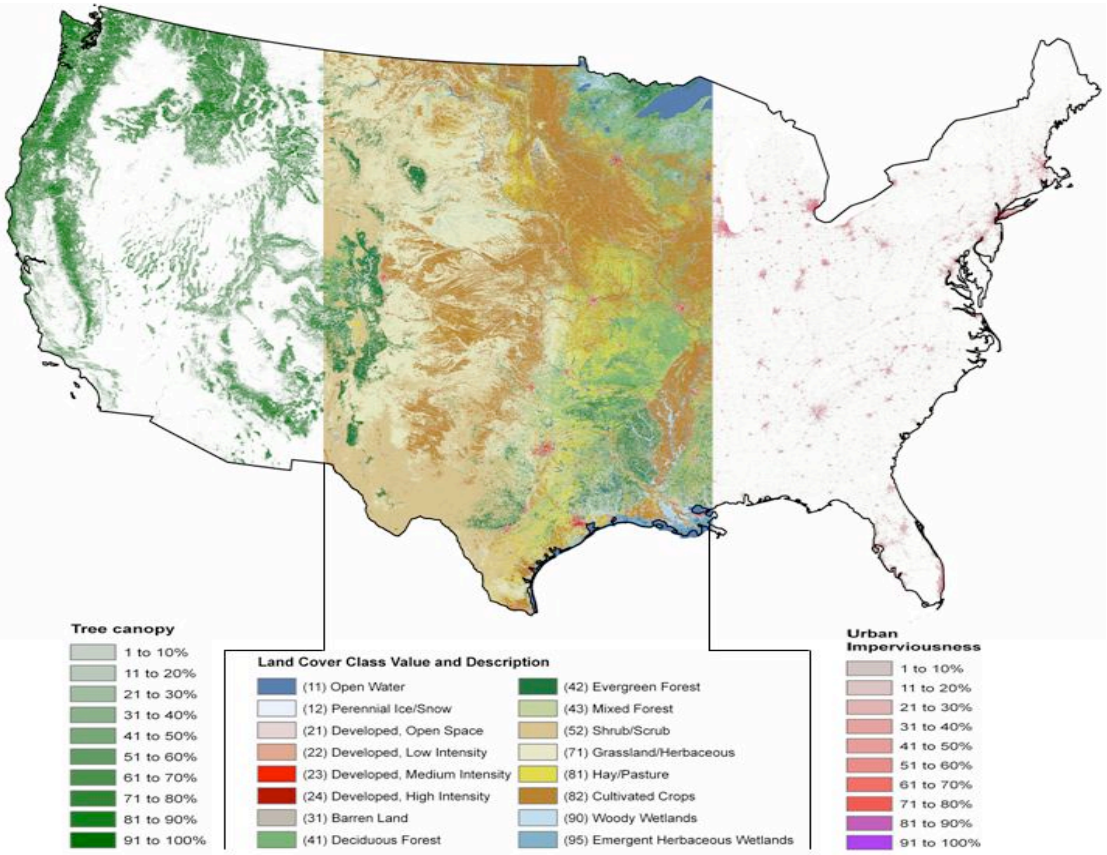




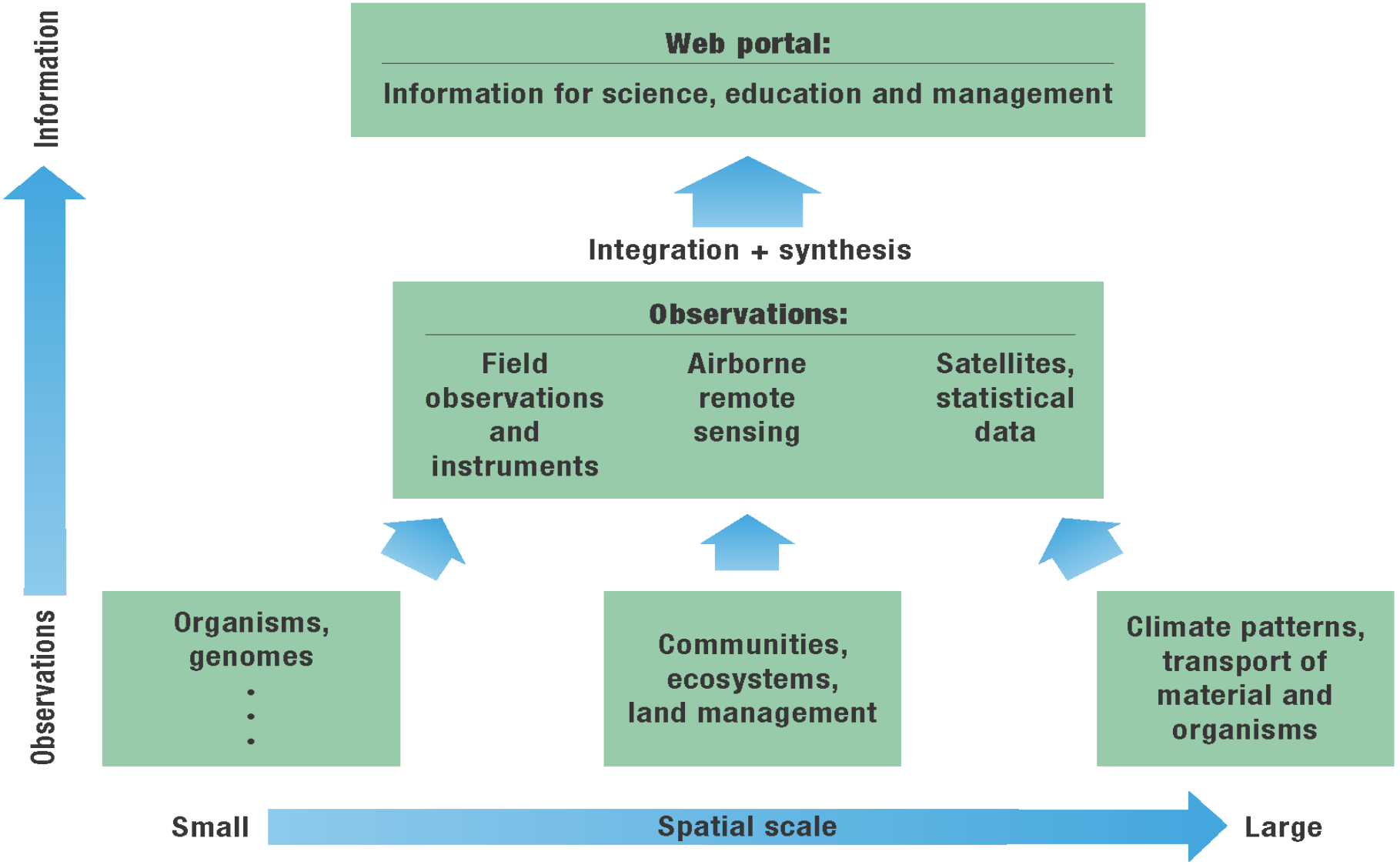
GIS, Geographic, Statistical Data

Not collected by NEON:

- Continental coverage
- Land cover
- Land use
- Vegetation biophysical properties
- Geographic data including census data
- User interface to facilitate geographic analysis by the non-specialist



Cascade of multi-scaled information from observations through analyses to users



Low and High Level Data Products

Low level Products

Winds, CO2 concentration, H2O vapor concentration

Human observers, canopy photography

Small mammal species ID, small mammal age, small mammal gender

Flux assimilation model

Image analysis calibration

Mark-recapture model

High Level Products

Carbon and water fluxes and parameters: GPP, R_A, R_H, WUE, A_{max}

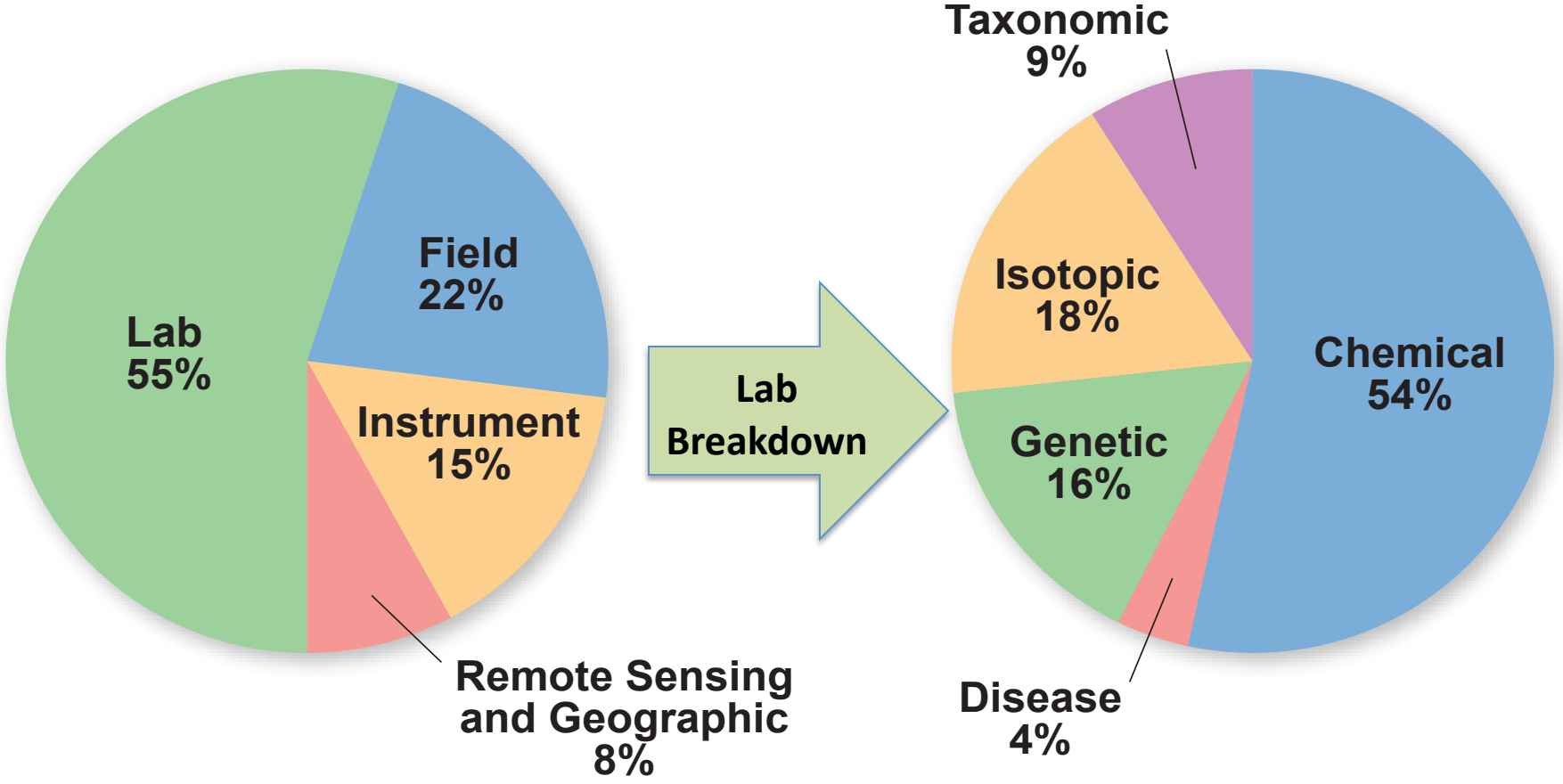
Plant phenology

Population parameters: abundance, survival, recruitment, fecundity

539 primary observations

118 summary variables

NEON Data Products



NEON Education & Public Engagement

NEON's education mission is to enable society and the scientific community to **use** ecological information and forecasts to understand and effectively address critical ecological questions and issues.

Goals

- Promote and facilitate public understanding of ecological science (i.e., *ecological literacy*)
- Educate next generation of ecological scientists
- Enhance diversity in the ecological research and education communities
- Provide tools for students, educators and decision makers to use NEON data to make informed decisions about ecological issues

NEON Educational Programs

- Web portals
- Citizen science projects
- Professional development opportunities
- Research and internship opportunities for undergraduates
- Competitive field and analysis course for graduate students
- NEON museum projects
- Postdoctoral research opportunities
- Workshops, seminars and courses

NEON Opportunities for Scientists and Educators

- Data (178 Terabytes per year)
  - Data will be **accessible** and **usable** by scientists, educators, students, decision makers, and general public; free and without delay
  - New data products will be developed based on community inputs
- Deployments
  - Mobile Deployment Platform
  - Airborne Observing Platform
- Educational Resources
  - Web portals
  - Learning experiences and programs
  - Partnerships
- Bioarchive
  - ~130,000 samples per year (species and substrates)
- Experiments (in addition to STREON)
  - Externally funded experiments using NEON sites and infrastructure

NEON Development History

- Pre-2006: 10 years of planning & workshops
- November 2006: Conceptual Design review
- Early 2007: Selection of NEON Core wildland sites
- Fall 2007: First NEON Inc employees
- Spring 2008: Permanent NEON Project Manager appointed
- November 2009: Final design review – 8000 pgs of documentation
- January 2010: President includes funding for NEON in FY 2011 budget request to Congress
- April 2010: National Science Board gives NSF Director authority to provide funding for NEON

Recent & Ongoing Activities

- Site characterization - aquatic/ terrestrial teams
- Prototyping biological sampling protocols
- Prototype tower in Sterling, CO, testing environmental sensitivity of construction
- Instrument comparisons (e.g., IRGAs, pumps)
- AOP Pathfinder flight over NEON site in Florida coordinated with on site ground truthing/ sampling
  - NASA flew JPL AVARIS; NCALM flew Optech LIDAR
- Modeling initiative for gridded continental analyses of carbon, energy & water (high level data products)
- Prototyping education products - web widgets; Project BudBurst (citizen science)

NATIONAL ECOLOGICAL OBSERVATORY NETWORK

The National Ecological Observatory Network is a project sponsored by the National Science Foundation and managed under cooperative agreement by NEON, Inc.

For more information (video, downloadable documents, etc.), see:

www.neoninc.org

or email lpitelka@neoninc.org