

6th Annual RISE Symposium
Research Insights in Semiarid Ecosystems

Updates on Santa Rita and NEON

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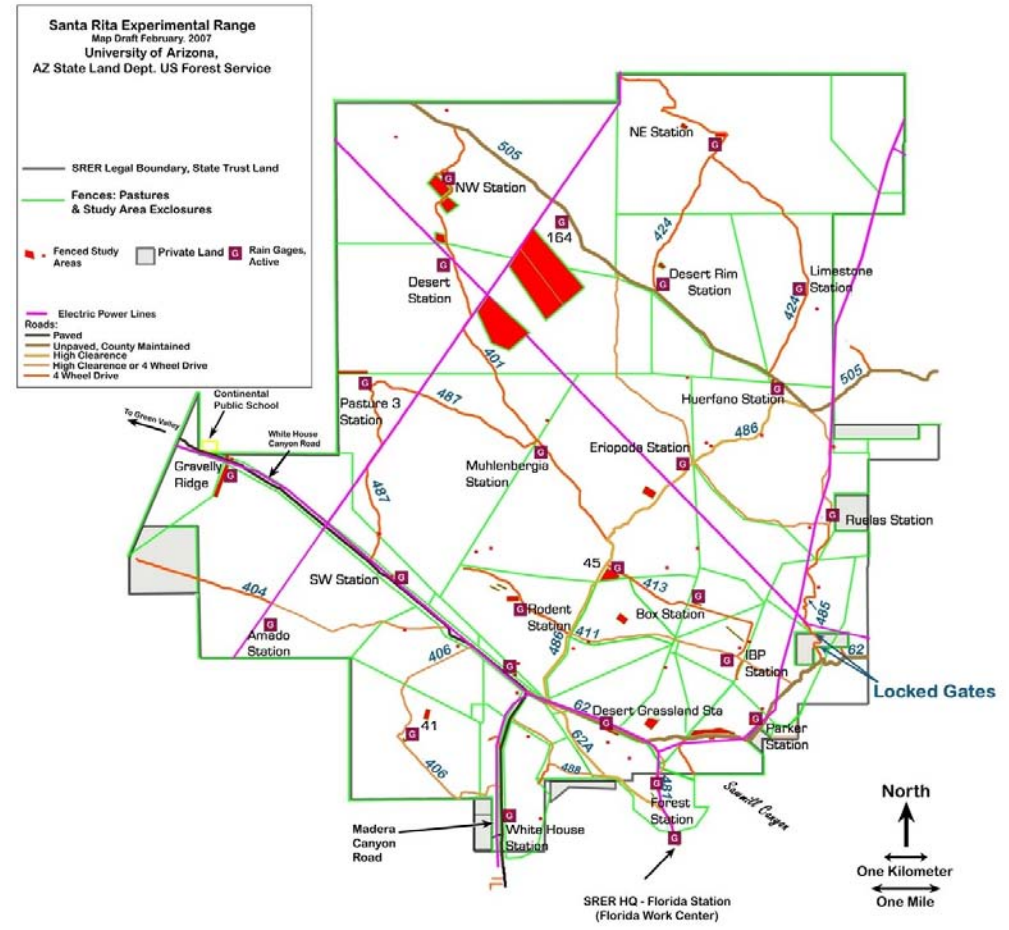
Updates on Santa Rita and NEON

Dry Summer:
~60% of mean, patchy distribution

Grazing Assessment and Plan:
November 2009-October 2010

Buffelgrass:
~500 ha treated in August

Melendez Fire:
Pasture 1



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NEON Goals:

NEON Design: locations and Observation Platforms

NEON Data Management and Availability:

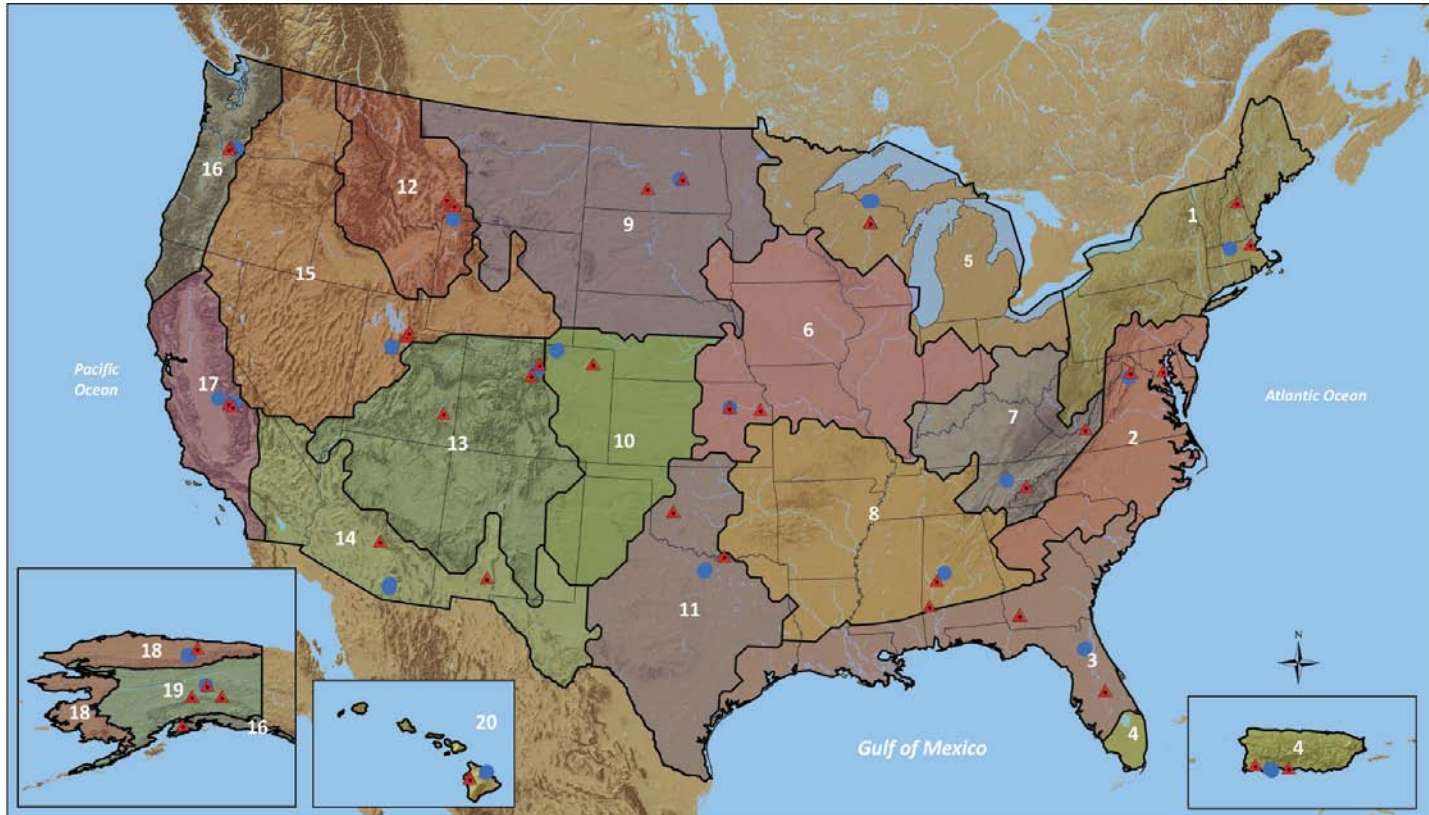
NEON Timeline:

NEON GOALS

- Measure drivers and responses for 30 y (**multi-discipline**)
- Use consistent and coordinated techniques
- Meter to continental scales with extrapolation (**multi-scale**)
- Accessible data and data products
- Poised to forecast future conditions with or w/out actions

Continental Scale Design

- 20 Domains based on clustering of climate variables, including: degree days, PPT (growing season and total), growing season length



NEON Domains

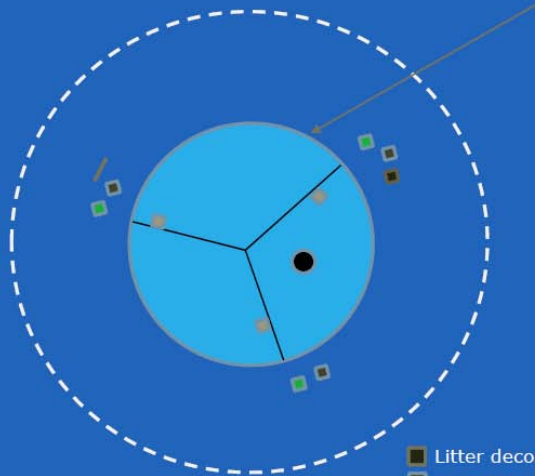
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|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
|  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 |

| Platform | Scale (ha) | Drivers/ Response | Variables |
|--------------------------------------------------------------------|-----------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Fundamental Sentinel Unit (FSU)</i> Organisms | $10^{-4} - 10^1$ | Largely response | Field: species abundance, diversity, phenology Lab: chemistry, isotopes, genetics/genomics |
| <i>Fundamental Instrument Unit (FIU)</i> Towers and Soil | $10^0 - 10^3$ | Drivers and Responses | Drivers: Temp, Humidity, Wind, PPT, Insolation, CO ₂ , O ₃ , NO _x Responses: fluxes of C, H ₂ O, energy |
| <i>Airborne Observation Platform (AOP)</i> | $10^{-5} - 10^5$ 300 km ² | Largely responses | Vegetation and Land Cover LiDAR, Visual Camera and Insolation upward Repeated annually at peak growing season |
| <i>Land Use Analysis Platform (LUAP)</i> | $10^0 - 10^5$ | Drivers and Responses | Land use Practices crops, fertilization, grazing, irrigation, human densities |

| | | | |
|-------------------------------------------------------------|------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| <p>Fundamental Sentinel Unit (FSU) Organisms</p> | <p>$10^{-4} - 10^1$</p> | <p>Largely response</p> | <p>Field: species abundance, diversity, phenology Lab: chemistry, isotopes, genetics/genomic</p> |
|-------------------------------------------------------------|------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------|

Vegetation Plot Design

168 m² plot



- Litter decomposition plot (1 m²)
- Litterfall plot (1 m²)
- Biomass plot (1 m²)
- Soil Sampling (point sample)
- Annular plot (17.95 m radius)
- Downed Woody Debris (7.32 m)
- Herb cover (1 m²)
- Sapling/shrub biomass (2.07 m radius)

National Forest Service Inventory and Analysis Program (Fraye and Furnival 1999)

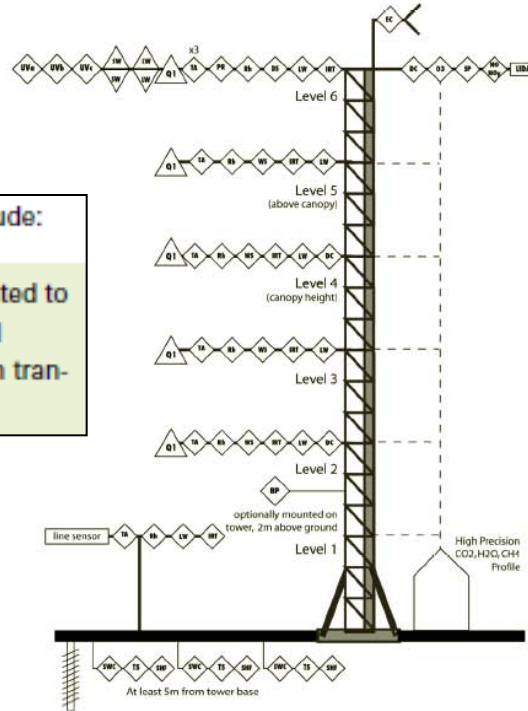
Examples of investigations that would use the FSU include:

- Studying *Peromyscus* demography and disease prevalence as a function of climate, productivity, and insect abundance, Forecasting future mosquito communities in response to climate change, and
- Examining the effect of climate change on nitrogen export in small streams.

Multi-Discipline and Multi-Scale Measures

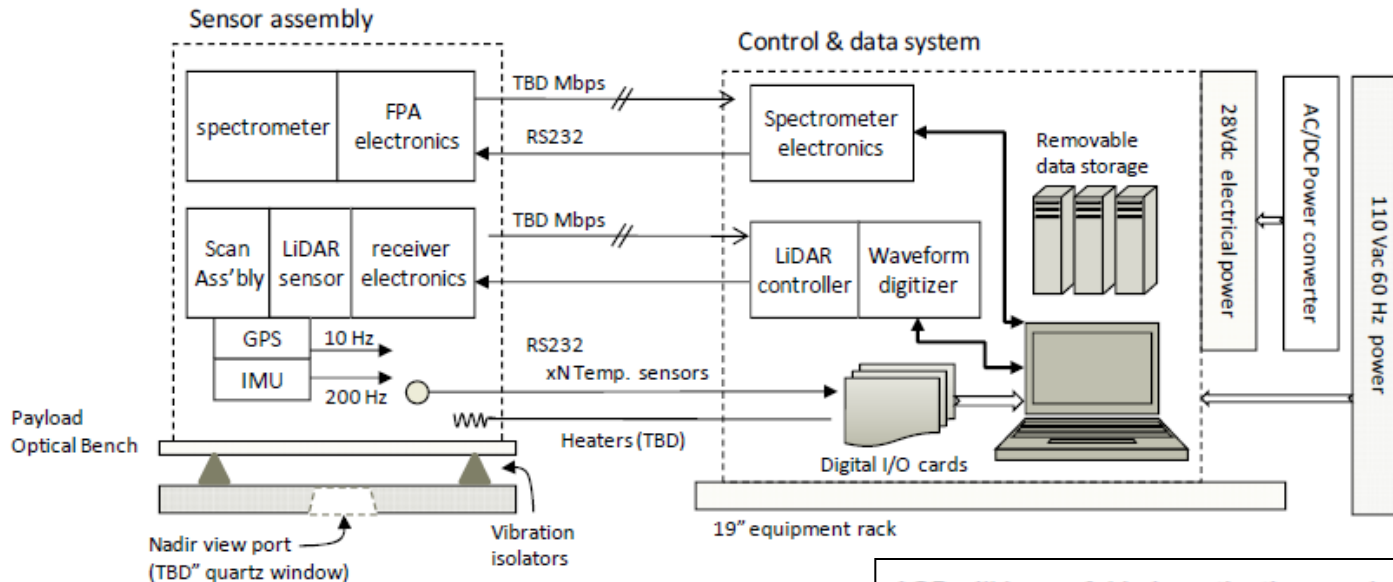
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|---------------------------------------------------------------------|---------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Fundamental Instrument Unit (FIU) Towers and Soil</p> | <p>$10^0 - 10^3$</p> | <p>Drivers and Responses</p> | <p>Drivers: Temp, Humidity, Wind, PPT, Insolation, CO₂, O₃, NO_x Responses: fluxes of C, H₂O, energy</p> |
|---------------------------------------------------------------------|---------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- Research topics that would use FIU observations include:
- Interannual variability in ecosystem productivity related to large-scale oscillations in the general circulation, and
 - Biological consequences of changes in the snow-rain transition of the Sierra Nevada.



Multi-Discipline and Multi-Scale Measures

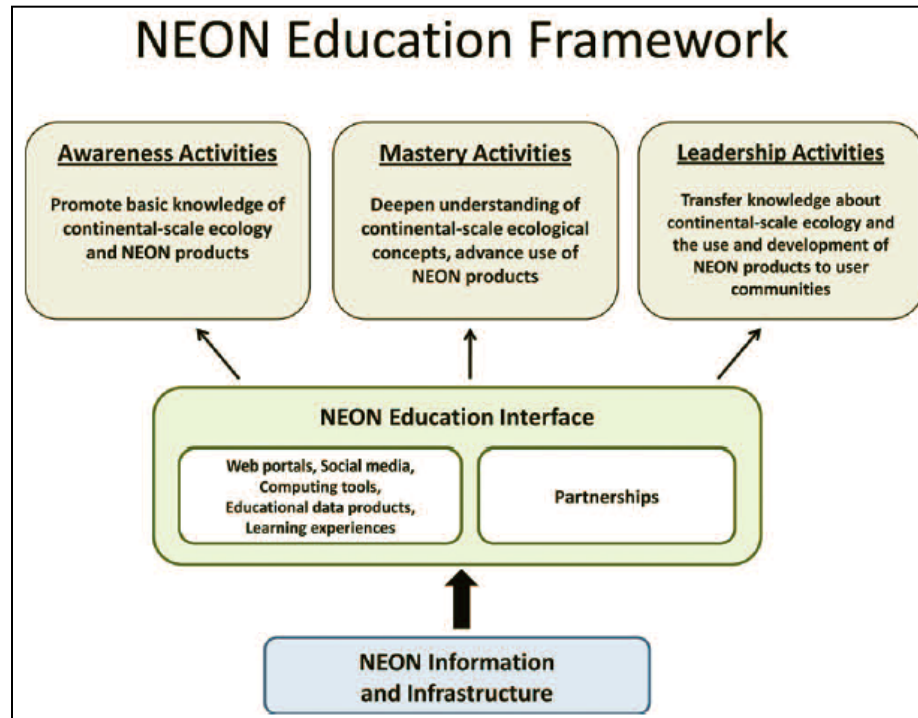
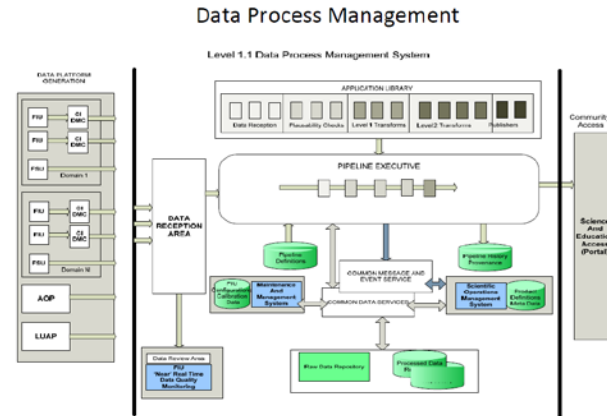
| | | | |
|---------------------------------------------------|-----------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <p>Airborne Observation Platform (AOP)</p> | <p>$10^{-5} - 10^5$ 300 km²</p> | <p>Largely responses</p> | <p>Vegetation and Land Cover LiDAR, Visual Camera and Insolation upward Annually at peak growing season</p> |
|---------------------------------------------------|-----------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------|



AOP will be useful in investigations such as:

- Thermokarst melting effects on trace gas emissions and vegetation composition in the Arctic,
- Dust transport in the southwestern United States and its impact on snowmelt in the Rocky Mountains, and
- Identification and tracking of invasive plant species in Hawaii at regional scales to address changes in biodiversity.

- 200 sensors types
- 15,000 sensors
- 2000 plots
- 60 sites
- Petabyte of data year⁻¹



Status of NEON in Fall 2009

Environmental Assessment Next 3-5 months

Construction begins Fall 2010

All Domains operational in 2015

| TASK | 2011 | | | | | 2012 | | | | 2013 | | | | 2014 | | | | 2015 | | | | | | |
|-----------|------|---|---|---|--------|-----------|-------------------|---|-----------|-----------|-----------|---|--------|------|-------------------|---|---|------|---|---|---|---|--|-------------|
| | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | | |
| Domain 11 | | | | | | | | | FCC Start | | | | Office | | FSU Site Accepted | | | | | | | | | Operational |
| Domain 12 | | | | | Office | FCC Start | FSU Site Accepted | | | | | | | | | | | | | | | | | |
| Domain 13 | | | | | | | | | | | FCC Start | | Office | | FSU Site Accepted | | | | | | | | | Operational |
| Domain 14 | | | | | | | | | | FCC Start | | | Office | | FSU Site Accepted | | | | | | | | | Operational |

Desert Southwest: Santa Rita, Jornada, and CAP LTER