• Questions?

• Topic 3: Science Update
Aquatic Site Visits

- Visited all aquatic array and STREON sites
- Variation in morphology, flow, debris, impacts
- Engineering and Aquatic teams will refine site specific instrument installations
Aquatic Prototype

Rating and re-aeration curves for D15 (Utah) August 2010

- Prototype
  - Draft protocols
  - Alternate pump technology
  - Procurement interactions

- Draft equipment lists
- Revise protocols
- Late start, repeat spring 2011
Aquatic Prototype

Goal: produce procedures, protocols and training plan for 2011 contractors

- Revising protocols
- Include diagrams, photos
- Training plan & video

Procedure:

Equipment:
- 50 or 100 meter long measuring tape
- Stakes to anchor meter tape to stream bank.
- Flow meter
- Flow rod
- Discharge data sheets
- Pencils
- Proper wading attire

Figure 5: Correctly assembled wading rod adjusted to 60% depth

Procedure to Measure Discharge in Wadeable Streams:

1. Make sure the top-setting wading rod is attached properly to the wading rod base. This step should already be done unless this is the first use of the rod. See manual.
2. Attach flow bolt to the mounting shaft on the wading rod, using the thumbscrew.
3. Make sure the current meter is set to measure velocity in meters per second (m/s). The current meter should be set to average velocities over a 30 second time period to get the most accurate velocity reading. See current meter manual to adjust.
4. Stretch meter tape perpendicular to stream flow. Anchor meter tape to trees or stakes on the stream banks. You DO NOT need to have the 0 mark on the meter tape at the stream edge.
5. Divide the stream into 20–25 increments. Increments can be evenly spaced (if the channel is uniform) or aggregated in the areas of the most flow (Figure
• >93% sequencing success with our fresh material; DNA barcoding will therefore be a useful tool to optimize biodiversity assessment during Observatory operations

• Museum-archived beetle specimens will serve as useful material for building DNA barcode libraries

• Results presented by Gibson et al. at ESA 2010 Annual Meeting
• Field collections for beetles and mosquitoes complete. Testing field methods and collecting material for DNA barcoding

• 8,916 mosquito individuals collected from 13 species

• ~250 expert morphological ground beetle IDs still required

• all DNA barcoding still required
2010 Beetle sampling: Field & Lab

Plant Biodiversity Plots showing Insect Pitfall Traps
- Main biodiversity plot
- Litter plot (0.5 m²)
- Biomass plot (1 m²)
- Soil sampling
- Annular plot (17.95 m radius)
- Sapling/shrub biomass (2.07 m radius)
- Herb cover (1 m²)
- Mosquito CO₂ trap, 2 m off ground
- Mosquito gravid trap, on ground
- Insect pitfall trap

Sample collection in the field

Specimen preparation in the lab
Prototyped different collection methods meant to attract blood-fed mosquitoes.
Soil Microbe Prototype: Questions

- What functional and phylogenetic groups occur in soils and how do they vary in time and space?

- How does biogeochemical function vary with phylogenetic diversity?

- How do microbial community structure and function change with land use practices?

- Which microbial functions are most sensitive to changes in climate and land use?

- Presented by Gallery et al. at ESA 2010 Annual Meeting
1. 16S/18S rRNA 454 pyrosequencing (Fierer lab, U. Colorado-Boulder)
   - Genomic DNA extracted from 408 soil samples from 4 domains
   - Prototyping primer sets for compatibility with 454 platform
2. *nif-H* functional gene assay (Tiedje Lab, Michigan State)
   - Issues with gene detection in 50% of samples
   - PCR & trouble-shooting underway
3. Soil biogeochemistry (Balser Lab, U. Wisconsin-Madison)
   - 363 extractions completed for chemical assays (SOM, C:N, CEC)
   - Preparation for PLFA (lipid) extraction underway
4. Metagenomic analyses of NEON core sites (Argonne Natl. Labs)
5. Metadata development and standardization
FIU Eddy Covariance Prototype

- Lower maintenance costs
- Savings in secondary standards
FIU Site Characterization

- Tower-measurement height ($Z_m$) shall be in the well-mixed surface layer above the roughness sub-layer

- Determination of $Z_m$:
  
  i) canopy height $\leq 1.75 \text{ m}$ (e.g., grasslands, shrublands, tundra)
  
  $6 \text{ m above ground}$

  ii) forested or more structurally complex ecosystems
  
  $$Z_m \approx d + 4(Z-d)$$

$Z_m$: Tower-measurement height
$Z$: Aerodynamic canopy height $\approx$ mean canopy height
$d$: Zero plane displacement height
$Z_0$: Aerodynamic roughness length $z_0 = (Z_m - d) \cdot \left(\frac{u}{\nu_m k}\right)^{-1}$
$U$: Horizontal wind speed, free flow
FIU Site Characterization
FIU Atmospheric Site Characterization
FIU Soil Array Characterization

Poster presented by E. Ayres et al. at ESA 2010 annual meeting, paper in preparation.
AOP Pathfinder Flight

• Collect a combined LiDAR and spectrometer dataset to support development of NEON data processing algorithms
• Prototype ground calibration and biophysical sampling in the field for data validation and scaling

• NEON Core site, Domain 3
• Mosaic of wetlands, mixed forests, swamps, marshes and lakes
FSU in the field

Measuring vegetation structure

Measuring plant species diversity

Interacting with UF stakeholders

Photo credits: John Hayes
AOP Payload Instrumentation

**Spectrometer concept**

- Vacuum Chamber
- Fiber-Feed
- On-Board Calibrator
- Telescope
- Shutter Window (Not Shown)
- Diameter = 20"
- Cryocooler (2K)
- Thermal Radiation Shield (2K)
- Height = 30"

**Optech ALTM Gemini system**

- Waveform digitizer
- GPS/IMU integrated with LiDAR system

**Applanix camera**
Partnered with NASA and NCALM

- NASA supported NEON pathfinder deploying the JPL AVIRIS on a Twin Otter aircraft
- NCALM deployed the Optech waveform LIDAR on a Piper Chieftain
AVIRIS raw, single channel imagery. Wavy lines are from uncorrected aircraft pitch, roll & yaw motion during image acquisition.
NCALM LiDAR 3D Point Cloud Image (preliminary)
Cascade of multi-scaled information from observations through analyses to users

Web portal:
Information for science, education and management

Observations:
- Field observations and instruments
- Airborne remote sensing
- Satellites, statistical data

Models

Organisms, genomes
Communities, ecosystems, landscapes
Climate patterns, transport of material and organisms

Small  Spatial scale  Large
NEON Level 1 Data Products

Remote Sensing and Geographic: 8%
Instrument: 15%
Field: 22%
Lab: 55%

Lab Breakdown:
- Taxonomic: 9%
- Isotopic: 18%
- Genetic: 16%
- Disease: 4%
- Chemical: 54%
• Adapt the NCAR Community Land Model for carbon, water, and energy analysis
  – Board and NSF guidance: put more emphasis on modeling
  – Produce gridded continental analyses from NEON and other observations
  – Dream team of three young scientists with joint support from NCAR
  – Partnered with NSF FORCAST RCN
• Questions?

• Topic 4: Education Update