Terrestrial Ecosystem Science

Environmental System Science
Principal Investigator Meeting
Potomac, MD

May 1-2, 2018

Daniel B. Stover, Ph.D.

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Climate and Environmental Science Division
(FY 2018 Funding Levels)

- Research Programs ($320M)
  - Atmospheric Sciences Research Area ($98 M)
  - Earth & Environmental System Modeling Research Area ($92M)
  - Environmental Systems Science Research Area ($112M)
    - Terrestrial Ecosystem Science ($41M)
    - Subsurface Biogeochemical Research ($26 M)
    - Environmental Molecular Sciences Laboratory Scientific User Facility ($45 M)
  - Climate Data Informatics/Management ($8 M)

Terrestrial Ecosystem Science (TES) Program

Goal: The TES program seeks to improve the representation of terrestrial ecosystem processes in Earth system models, thereby improving the quality of Earth system and environmental model projections and providing the scientific foundation of solutions for DOE's most pressing energy and environmental challenges.

Approach: A model-inspired fundamental research approach focusing on processes and ecosystems that are:

- Globally/regionally significant;
- Climatic or environmentally sensitive;
- Insufficiently understood or inadequately represented in predictive models

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Collaborative interactions as an Environmental Systems Science group with the Subsurface Biogeochemistry Research (SBR) Program.

TES Program Update

- FY-14 NASA ROSES Joint Solicitation - $8.2M over 3 year
  - 10 awards, Jointly supported with NASA, USDA, and NOAA
- FY-15 ESS Annual University Solicitation - $9.7M over 3 years
  - 185 Pre-apps, 117 full applications, 11 awards
- FY-16 ESS Annual University Solicitation - $6.0M over 3 years
  - 16 awards, 184 full application
- FY-16 Early Career Research Program – Tropical Forest Ecology
  - 19 full proposals; 3 awards: Mayes (ORNL), McFarlane (LLNL) and Cusack (UCLA)
- FY-18 ESS Solicitation - $5M anticipated
  - Panels and decisions coming soon
  - Topic areas: Linking above and belowground traits and processes; Terrestrial-aquatic Interfaces; Disturbance
- Office of Science Graduate Student Research
  - Provides support for Ph.D. student to pursue parts of graduate research at DOE labs
- FY-18 Small Business Innovative Research (SBIR)
  - Compact, low power celiometers, 1 Phase II awards

New Awards/Honors/Recognitions in the TES Portfolio

- **2017 AGU Fellows**
  - Susan Hubbard, LBNL (NGEE-Arctic)
  - Rich Norby, ORNL (NGEE-Tropics, Spruce, FACE synthesis)
  - Margaret Torn, LBNL (NGEE-Arctic, LBNL TES SFA, AmeriFlux)

- **2018 ESA Fellows (current and recent TES PI's)**
  - Zoe Cardon, Marine Biological Lab
  - Jeff Dukes, Purdue University
  - Yiqi Luo, Northern A

- **2017 AGU Section Awards**
  - J. Elliott Campbell, University of California, Merced (Global Environmental Change section Early Career Award)
  - Pierre Gentine, Columbia University (Global Environmental Change section Early Career Award)
  - James Ehleringer, University of Utah (Excellence in Earth and Space Science Education Award)

NGEE-Arctic's 2017 Data Awards

Most Downloaded

Victoria Sloan et al. 2014. Soil Temperature, Soil Moisture and Thaw Depth, Barrow, Alaska, Ver. 1. Next Generation Ecosystem Experiments Arctic Data Collection, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA. http://dx.doi.org/10.5440/1121134

Modeler's Choice

Colleen Iversen et al. 2014. Plant Root Characteristics and Dynamics in Arctic Tundra Ecosystems, 1960-2012. Next Generation Ecosystem Experiments Arctic Data Collection, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA. http://dx.doi.org/10.5440/1114222.

Early Career Contributor

Shawn Serbin submitted and documented **nine** different collections during 2017, two which are now publicly available and seven available to NGEE Arctic investigators only.

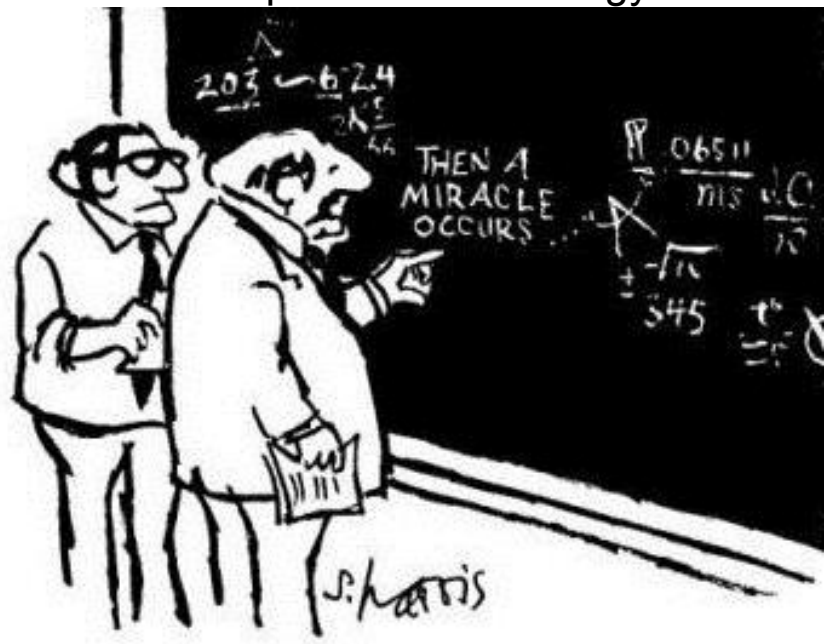
Early Career Awards

Daniel Hayes
ORNL/University of Maine
Arctic Ecology

Daniela Cusack
UCLA
Tropical Forest Ecology

Melanie Mayes
ORNL
Tropical Forest Ecology

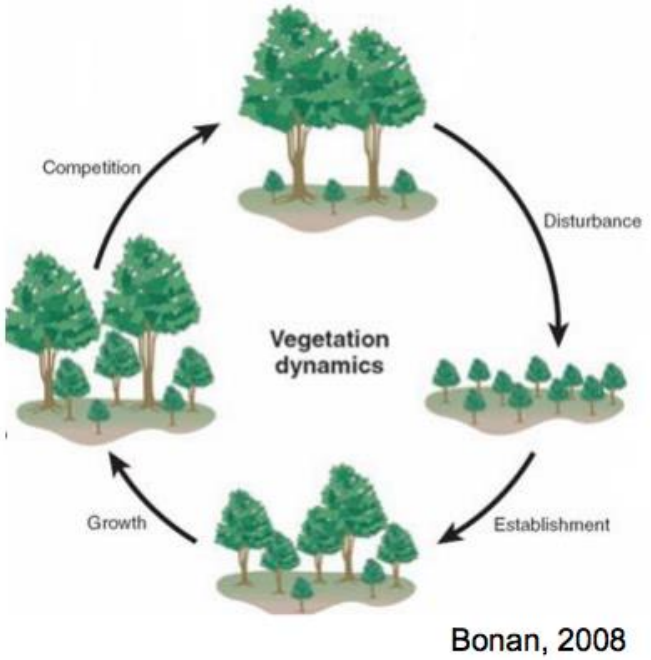
Rebecca Neumann
University of Washington
Belowground Ecology



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Karis McFarlane
LLNL
Tropical Forest Ecology

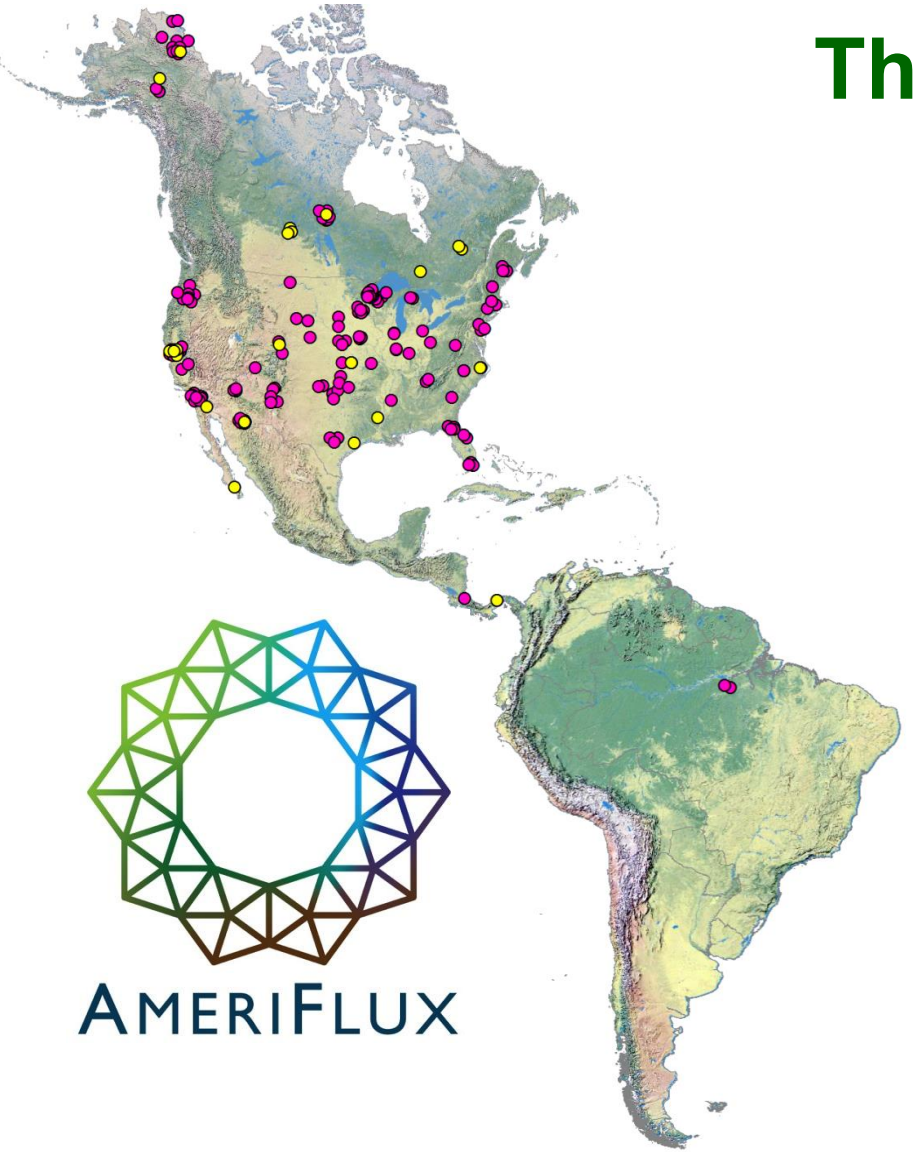
Dynamic Vegetation and Disturbance Workshop



Bonan, 2008

- March 15-16 (Gaithersburg, MD)
- Workshop organizers
  - Lara Kueppers (LBNL)
  - Jim Clark (Duke)
- Workshop Goals
  - Identify key uncertainties in current dynamic vegetation models that inhibit our ability to adequately represent vegetation in Earth System Models (ESMs)
  - Identify and prioritize research directions to improve models, including forest structural change and feedbacks and responses to disturbance.
- Report expected to be released in early June

The AmeriFlux Network



AMERIFLUX

<u>Celebrated its 21 years of serving the community!</u>

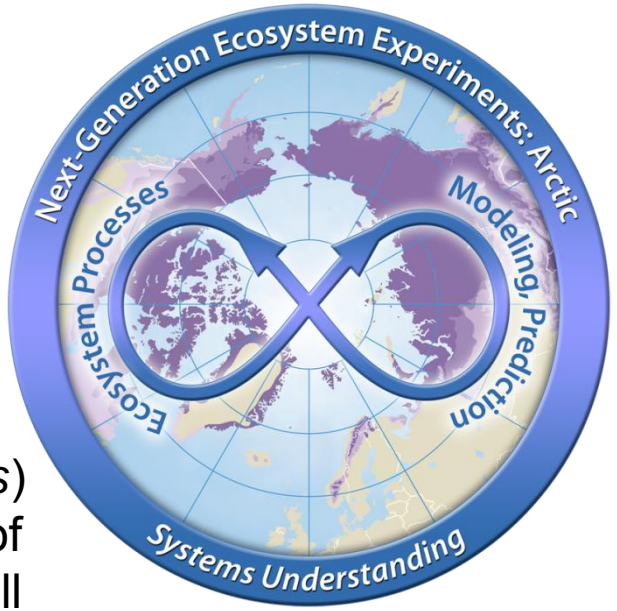
329 registered Sites in the Network

- >160 actively submitting sites
- >108 new or rejoined sites
- QA/QC site visits
- 3 Rapid Response Systems deployed
- 2015 Fluxnet release (1500 site years and 28,000 unique downloads)
- Next PI meeting will be in Bloomington, IN (October)
- Decadal Synthesis Workshop: (LBNL in August)

- New collaborations with NEON
  - Now registered as AF sites
  - MOA
  - Ongoing discussion about data processing and other collaborations

4750 members
1654 New in the past year
6913 unique downloads since 2015

NGEE – Arctic



Goal: Advance the predictive understanding of the structure and function of Arctic terrestrial ecosystems in response to climate change.

Objectives:

- Development of a process-rich ecosystem model, extending from bedrock to the top of the vegetative canopy, in which the evolution of (*Arctic ecosystems*) in a changing climate can be modeled at the scale of a high resolution Earth system model (ESM) grid cell (i.e., approximately 30x30 km grid size).

Approach:

- Collaborative effort among DOE National Laboratories and universities, led by Oak Ridge National Laboratory.

- **Recent Progress:**
  - Continuing collaborations with NASA ABoVE
  - All hands meeting in Dec
  - # of pubs!
  - Preparing for Phase III proposal

NGEE – Tropics

Goal: Improve our understanding of ecosystem-climate feedbacks due to changes in precipitation, temperature, nutrient cycling and disturbance in tropical forests.

Objectives:

- Development of a representative, process-rich ecosystem model, extending from bedrock to the top of the vegetative canopy-atmospheric interface, in which the evolution and feedbacks of tropical ecosystems in a changing climate can be modeled at the scale/resolution of a high resolution next generation Earth system model (ESM) grid cell.

Approach:

- Collaborative effort among DOE National Laboratories and universities, led by Lawrence Berkeley National Laboratory.

Update:

- G-LiHT imaging of Puerto Rico, pre hurricanes
- Virtual All Hands Meeting held in Feb
- FATES model v1 release
- Preparing for Phase II proposal

Preparing for 3rd year of full treatments

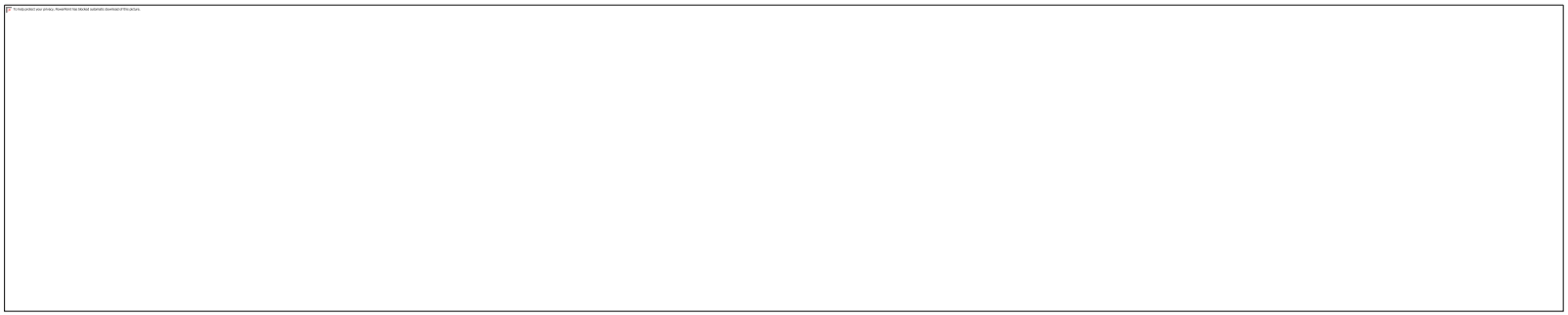
- Deep soil heating and air warming started in 2015 followed by CO_2 enrichment
- All Hands Meeting next week in MN

Looking Ahead and Strategic Plans

- CESD Strategic Plan to be released last week (https://science.energy.gov/~/media/ber/pdf/workshop%20reports/2018_CESD_Strategic_Plan.pdf)
- Anticipating FOA release in Fall 2018 (pending outcome of FY-19 budget) – Topics TBD
- Connect projects closely to other research activities within CESD, within BER, and among the other Federal agencies.
  - E.g., ILAMB, ACME, Genomic Sciences Program
- Forge strong programmatic coordination with the BER Scientific User Facilities (ARM, EMSL, JGI and Synchrotrons) Wed Lunch session;
- ESS-DIVE launch (April 1) – No Joke!

Energy Exascale Earth System Model (E3SM)

- Version 1 Released April 23rd
- Land Model (ELM) meeting yesterday
  - Updates on interactions between NGEE's and E3SM
  - Roadmap discussions on V2 and beyond
- Numerous TES investments collaborate and support the current and future development and use of E3SM



Major Developments In TES

- **Next ESS PI Meeting**
  - Joint with SBR; May 1-2, 2018 in Potomac, MD
  - Data working group meeting April 30, 2018
  - Co-organizing joint E3SM Land model session on April 30, 2018
- **ESS FOA**
  - Released Nov 16; Pre-apps due Dec 20; Full apps received March 1 (~$5M)
  - Panels will be held in early May
  - Three science areas: 1) Interactions between above and belowground processes and traits; 2) Terrestrial-aquatic interfaces; and 3) Disturbance
- **NGEE-Arctic All Hands Meeting (New Orleans, LA)**
  - Held Dec 9-10 (before AGU) with participants from NASA ABoVE
- **NGEE-Tropics Virtual All Hands Meeting**
  - Held Feb 13-14th online (given budget uncertainty)
- **Dynamic Vegetation and Disturbance in Earth System Models Workshop (Gaithersburg, MD)**
  - Held March 15-16th
  - Report Due in Late May

Science Highlights

An important way to communicate scientific accomplishments to program managers, BER, the Office of Science and the public.

- BER has a new publication highlight policy and procedure
  - Will greatly streamline the process of posting highlights online
- A template that the author fills out when the publication has a DOI number
  - Should clearly articulate and distill the major points of the publication for a several audiences (scientists to the **general public**)
- Requested for all BER-funded projects
  - National Labs & University
- A one-slide PowerPoint slide

[Day] [Month] [Year]

[Title in Capitalized Format]

[Subtitle not capitalized, ending with a period.]

The Science

[A sentence or two, accessible to the non-specialist.]

The Impact

[A sentence or two, accessible to the non-specialist. The "impact" of a use-inspired science highlight is typically a potential technological advance while the "impact" of a discovery science highlight might be to open up new frontiers of science or resolve a longstanding question.]

Summary

[A paragraph, hopefully still accessible to the non-specialist, but may be more technical if necessary.]

Contacts (BER PM)

[Name]
[Institution with optional title, optional address]
[Email and/or telephone]

(PI Contact)

[Name]
[Institution with optional title, optional address]
[Email and/or telephone]

Funding

[Explanation of funding ***including citation of all significant sources, including non-DOE sources if applicable***; formatting is flexible: can be a bulleted list, a sentence, or a short paragraph.]

Publications

[List publications one per line in the format used by Nature:
M. Butterworth, "Optimal sugar content of artificial maple syrup." *Science* **35**, 221 (2012). [DOI].]

Related Links

[include optional related links, one per line]

So Easy….

Terrestrial Ecosystem Science Program

About the Program | Research | Highlights | PI Meeting | Site Map | Contact Us

U.S. Department of Energy Office of Biological and Environmental Research

PI-Submitted Research Highlights for Terrestrial Ecosystem Science Program

DOE TES Researchers: Submit Your Research Highlight!

Tell us about your research! This system is designed to collect brief science highlights describing published research supported by the Terrestrial Ecosystem Science (TI program within DOE's Office of Biological and Environmental Research (BER). For each highlight, you will be asked to submit a research summary, a PDF of the publica a PDF of the BER highlight slide (*slide examples*).

Once submitted, these science highlights are (1) used by the TES program management team as part of regular efforts to inform senior BER and DOE Office of Science management of the importance and impact of TES-supported research; (2) posted on the TES website to inform other TES-supported researchers of important recently p work; (3) submitted to BER's science highlights archive; (4) considered for use in TES, Climate and Environmental Sciences Division, and BER outreach and communic materials; and (5) used for other scientific outreach and communication purposes [e.g., posted on the Office of Science highlights website].

Edits

To edit or delete a previous submission, please contact the administrators.

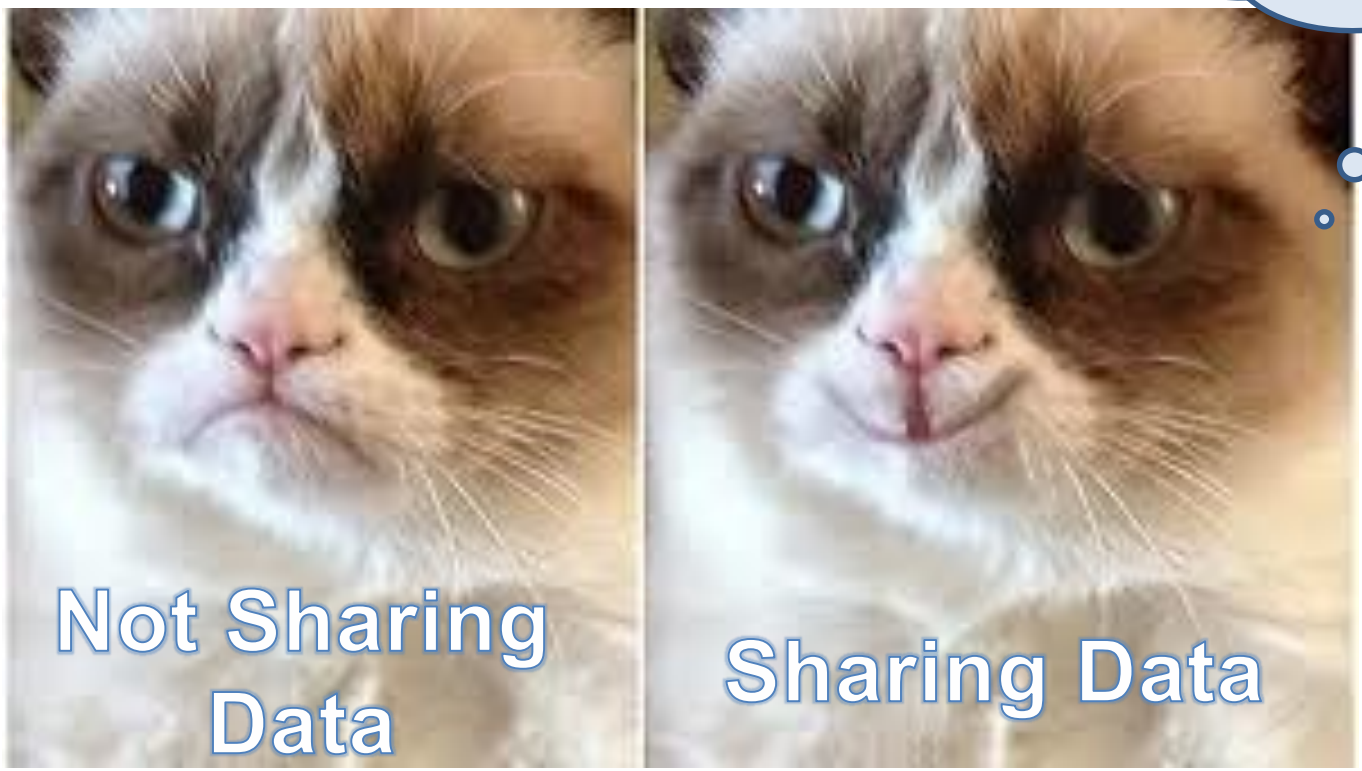
Checklist and Instructions

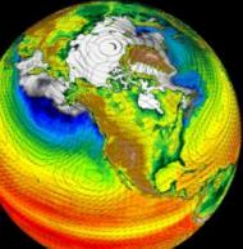
Please have the following information ready.

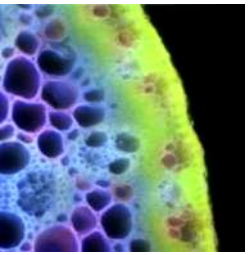
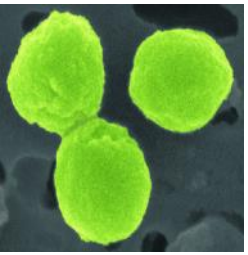
1. Highlight as a Word document. *(required)* Create highlight using **this new template** before beginning form.

And Don’t Forget Data!!!

- Data management plans are required
- Research data obtained through public funding are a public trust and must be publicly accessible.
- ESS-Dive is now online!!
  - Check out the posters and tutorial sessons!





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Questions?

Backup slides