

# Coweeta LTER Summer Symposium and Meeting Agenda

## 10-11 June 2013

### Monday June 10

#### **8:00 Light breakfast**

- 8:30 Welcome & Introductions - Jason Love/Ted Gragson
- 8:45 Summary of Coweeta Hydrologic Laboratory research - Miniati
- 9:00 LCC Classification & Regional Processes - Jeff Hepinstall-Cymerman
- 9:20 Floodplain Geomorphic Processes - David Leigh
- 9:40 Physical & Isotope Hillslope Hydrology - Ryan Emanuel

#### **10:00 Break (30 min)**

- 10:30 Overview of SAC process - Ted Gragson
- 10:45 Summary of TDE - Chelcy Miniati
- 11:00 Summary of Riparian - Rhett Jackson
- 11:15 Summary of Biodiversity - John Maerz
- 11:30 Summary of People - Ted Gragson
- 11:45 Constraints - Ted Gragson

#### **12:00 Lunch (1 hour)**

- 1:00 Summary of Connections - Carolyn Dehring
- 1:15 Summary of Region - Paul Bolstad
- 1:30 Objectives - Ted Gragson
- 1:45 Working groups
- 4:00 Safety Meeting - Chelcy Miniati, Randy Fowler & Jason Love
- 4:45 Charge for Tuesday

#### **5:00 Social and poster session at Coweeta Dorm**

#### **6:30 Dinner at Coweeta Dorm**

### Tuesday June 11

#### **8:00 Light breakfast**

- 8:30 Annual reporting & data availability - John Chamblee
- 8:50 Monday Findings - group-by-group
- 11:30 5min updates

#### **12:00 Lunch (1 hour)**

- 1:00 Reconvene - final charge
- 3:30 Debrief & next steps

#### **4pm Adjourn**

### Wednesday June 12

- 8:00-12:00 CWT Science Advisory meeting

Coweeta LTER Summer Meeting Poster Session  
June 10, 2013

**1) Environmental factors associated with patch occupancy of stream consumers across a land use gradient in the southern Appalachians, USA**

*John R. Frisch<sup>1</sup>, James T. Peterson<sup>2</sup>, Kristen K. Cecala<sup>3</sup>, John C. Maerz<sup>4</sup>, C. Rhett Jackson<sup>4</sup>, Ted L. Gragson<sup>5</sup>, and Cathy M. Pringle<sup>1</sup>*

<sup>1</sup>Odum School of Ecology, University of Georgia <sup>2</sup>Dept. of Fisheries and Wildlife, Oregon State University; <sup>3</sup>Dept. of Biology, Davidson College <sup>4</sup>Warnell School of Forestry and Natural Resources, University of Georgia <sup>5</sup>Dept. of Anthropology, University of Georgia

**2) Scales and arrangements of large wood in streams of the Blue Ridge Mountains**

*Carrie Jensen and David Leigh*  
Dept. of Geography, University of Georgia

**3) Effects of land cover on storm and baseflow solute export from catchments in the Southern Appalachians**

*Laurence Lin, Jack R. Webster, and Rebecca M. Stewart*  
Dept. of Biological Sciences, Virginia Tech

**4) Linking terrestrial and aquatic ecosystems: a modeling approach**

*Laurence Lin and Jack R. Webster*  
Dept. of Biological Sciences, Virginia Tech

**5) Statistical classification of the intensive streams**

*Jacob M. McDonald and David S. Leigh*  
Dept. of Geography, University of Georgia

**6) Preliminary hydroclimatic analysis of southern Blue Ridge Mountain streams**

*Jacob M. McDonald and David S. Leigh*  
Dept. of Geography, University of Georgia

**7) Sediment source ascription of forest roads in the upper Little Tennessee River Valley**

*Seth Younger<sup>1</sup>, David Leigh<sup>1</sup>, and C. Rhett Jackson<sup>2</sup>*  
<sup>1</sup>Dept. of Geography, University of Georgia <sup>2</sup>Warnell School of Forestry and Natural Resources, University of Georgia

**8) Avian communities in suspended development: mechanistic effects of habitat alteration and human habitation**

*Camille Beasley, Jeff Hepinstall-Cymerman, and Clint Moore*  
Warnell School of Forestry and Natural Resources, University of Georgia

2013 Coweeta LTER Summer Meeting Notes  
June 10-11, 2013

Submitted by Jason Love  
Coweeta LTER Site Manager

Summary of Coweeta Hydrologic Laboratory research (Miniat)

- Organizational structure: Coweeta one of five locations in the work unit
- New personnel: Post-doc working on eddy flux tower (Chris Oishi); new hydrologist position is on hold because of budget cuts
- Forest Service Research Priorities (Chief Tidwell): 1) Restoration, 2) Climate Change, 3) Fire
- Sequestration will result in 6.5% cut this fiscal year
- Nantahala and Pisgah NF undergoing a Forest Plan Revision; currently we are in the assessment phase
- USFS land managers need science on how to restore riparian areas impacted by hemlock wooly adelgid
- Completed and Ongoing Projects:
  - 1) National Climate Assessment
  - 2) Climate Change Adaptation and Mitigation Management Options
  - 3) Species & Composition of Mesophytic Cove Forests: Synthesis & Knowledge Gaps
  - 4) Consequences of Stand Age and Structure on Forest Water Yield
  - 5) Restoration of Base Cation Depleted High-elevation Watersheds
  - 6) NEE Flux Towers: Eddy Covariance
  - 7) Effects of reduced precipitation on C, H<sub>2</sub>O, and N cycling in early successional forests
  - 8) Ecosystem effects of hemlock loss and HWA treatment
  - 9) Growth-climate relationships of southern Appalachian trees: dendroclimatology of 6 species spanning 85+ years
  - 10) The ecosystem service of water supply: quantifying the role of National Forests in the SE
  - 11) Functional role of the herbaceous understory
  - 12) Changes in sulfur deposition mediated by changes in precipitation distribution concentrations
- Upcoming projects:
  - 13) Restoring riparian forests in the wake of hemlock mortality – this study will involve following treatments: a) removing rhododendron (herbicide stumps), b) removing litter, c) remove rhodo and litter, d) control. Plot treatments at Coweeta, reach treatments in Nantahala NF

LCC Classification and Regional Processes (Hepinstall-Cymerman)

- Land cover specifics – have data from 1986, 1991, 1996, 2001, 2006, and 2011 (expected August 2013) – all were classified using the same methodology
- Classification system matches National Land Cover Dataset
- About the 0.8 ha scale
- Jeff showed several maps showing urban and population change in our study area

- It is possible to look at the amount of urban land cover versus population
- Suspended developments – land cleared and basic infrastructure installed; these sites were abandoned when housing market crashed; as a result, there is little or no subsequent influence
- MS student Camille looked at bird communities in these developments – is it the structural changes or people that influence bird communities
- Suspended development is an effective experimental landscape – allows quasi-experimental approach
- Can look at other biodiversity in these developments and may also be used in in Larry Band’s road-interception ideas
- Jeff looked and MODIS Normalized Difference Vegetation Index (NDVI) in suspended developments; can see a signature in roads going in at this scale; we might be able to regionalize this work
- Tom Prebyl developed a model for spring green-up at Coweeta
- Marshall Shepherd developed rain/drought models and Jeff and John have a student looking at avian and salamander relative abundance in these areas

#### Floodplain Geomorphic Processes (Leigh)

- Floods and floodplains directly tie in to humans (loss of property, loss of life, etc.)
- Human and climatic drivers are primary shapers in Blue Ridge Province
- Paleoflood analysis: used sedimentology to look at occurrence of flood events going back to 1945
- Near middle of Medieval Warm Period was more dry –fewer floods; periods identified as flood prone also correspond with wetness in dendrochronology records
- Vegetation was changing through time – more warm season grasses with Native Americans occupying the landscape, caused by land clearing by Native Americans and corn agriculture. Agricultural areas were likely restricted to bottomlands, not hillslopes where erosion occurs.
- Native Americans practiced no-till agriculture, so likely very little sediment reaching streams from agriculture
- Leigh’s lab is also looking at charcoal record
- In bedrock gorges (Nantahala Gorge) backwater tributaries accumulate flood sediments so the magnitude of previous floods can be estimated
- Extreme floods clustered in late 1800s to early 1900s possibly because of timber harvest
- Huge gap in tropical storms between 1940 and 1970
- There is an order of magnitude difference in sedimentation rate following settlement of Europeans
- In Little T, no clear evidence that sedimentation rates were accelerated by Native Americans, as claimed by Stinchcombe et al. (2011)
- Some claim that anastomosing (braided channels caused by beavers, etc.) was pre-settlement norm for eastern US streams
- Stratigraphic survey of paleomeanders is underway – effort led by Jake McDonald
- Also looking at lateral erosion rates in channels; we manage streams to prevent bank erosion –need to look at what “natural” rates or erosion might be

- Future research: continue paleoflood analysis; decipher human-induced vs. climatic causes of extreme floods; establish natural background; how this work could inform stream restoration

#### Physical & Isotope Hillslope Hydrology (Emanuel)

- Emanuel lab has 4 PhD students and several MS students
- Emanuel lab working in eddy flux towers in lodgepole pole stands in MT, in Christmas tree farms in NC, in natural conifer forests in Roan Mtn., and in old field going through succession
- Worked in forested catchments in lodgepole forests in MT – hydrology simple (one event per year from snow melt and vegetation simple (all pine); much different than hydrology at Coweeta
- If you peel back vegetation at Coweeta, you have biophysical interactions between terrain and vegetation
- As drainage area accumulates at hillslope scale, topography dominates shallow – more vegetation leads to areas drier than expected and but wet areas also have more trees because of presence of groundwater penetration
- At Coweeta, short-term dynamics are primary drivers for hydrology
- Looked at hillslope plots (forested and agriculture) – soil moisture much more variable on forested sites; shallow water table at ag sites much more variable than forested sites; interaction between land use and terrain (ag sites less steep)
- How does water table affect temporal dynamics of soil moisture at each of the sites?
- Isotopes – can use precipitation signal to trace water through the system; groundwater systematically lighter than precipitation
- Can assign soil water to “groundwater-like” or “precipitation-like”
- Water stress is dynamic through time – function of soil, function of atmosphere, etc. – can couple soil water availability, atmosphere, and vegetation

#### Overview of SAC process (Gragson)

- Renewal chronology: SAC has met either face-to-face or virtually about 12 times since September 6, 2012 to discuss renewal
- Part of objective is to share with group the renewal process and what progress has been taken thus far in terms of the renewal
- This renewal will be much different than previous renewals; it will be much more competitive and with more scrutiny; last RFP from Goltz was 5 lines long in an email
- Since Henry Goltz’s removal, we’ve gone through 2 temporary and 2 “permanent” NSF LTER Program Officers
- Budgets have been cut for NSF – we are flat-funded; same budget for next 6 years as it was for previous 6 years
- Now there is an official NSF style RFP in alignment with federal guidelines – it is viewed as a contract between funder and fundee
- There are no second chances on these RFPs
- All proposals go through technical review. Proposals might be rejected because of technicalities (e.g., are margins correct, is page length correct, etc.)
- Scientific review process will be more rigorous

- Because of these changes, SAC decided to spend much more time addressing technical and bureaucratic issues
- SAC was increased in size to help with proposal; last proposal a relatively small number of SAC members took about 35 proposals to shape them into one proposal; budget did not get done until the week before proposal was due – do not want to re-create this scenario
- We started this process as a group in Feb. 2012 to describe the problem – hydroclimatic extremes
- There are 6 white papers to study hydroclimatic extremes, but they are not integrated yet
- Synopsis of LTER research: proposals must address ecological questions that cannot be resolved with short term observations or experiments
- Unique components of LTER research: 1) located at sites representative of major ecosystems or natural biomes; 2) study phenomena over long periods of time based on data collection in 5 core areas; 3) include significant integrative, cross-site, network-wide research
- Must address 5 core areas: Primary production, population studies, movement of organic matter, movement of inorganic matter, disturbance patterns
- Coweeta should still have supplemental funding because it is regional site (the other is Northern Temperate Lakes LTER)

#### Summary of Throughfall Displacement Experiment (TDE) (Miniat)

- Throughfall is the fraction of rainfall that hits the forest floor
- We are fairly certain that extreme precipitation events will increase due to climate change
- Long-term record: max, min, and mean air temps have been increasing
- Wettest July's are getting wetter and driest July's are getting drier
- Small storms becoming less frequent, fewer number of total storms per year, and time between storms is increasing
- Proposed TDE would be in Coweeta, probably in WS 7 – clear-cut in 1977
- WS7 would have three landscape positions (ridge, mid-slope, cove)
- Two replicate plots
- South facing forest will not have energy limitation
- Younger forest may have shallower, smaller rooting zones than 85 year old forest
- WS7 was first Coweeta LTER-funded experiment and has extensive, well-maintained roads
- Existing AFRI water balance site could be leveraged from WS7
- Most famous TDE is Walker Branch site at Oak Ridge, but only one landscape position (1993-2000)
- This study removed 33% and added 33% of throughfall
- Most of their results were non-significant (except a few species of saplings) and their study was an unreplicated study (n=1)
- What about subsurface flow? Perhaps we could use road-cuts to cut off subsurface flow
- We could also have cross-site collaborative efforts
- Turner – Could herbaceous species be used as response variables?

#### Summary of Riparian (Jackson)

- In terms of stream hydrology, precipitation is only one of the drivers – also vegetation, land use, geology, etc.
- For stream temperature, riparian condition is more important than a 2 degrees increase in temperature from climate change
- Rhododendron became more extensive when American chestnut died; same thing is occurring with loss of eastern hemlock
- Effects of rhododendron removal would likely last a long time
- Connections – no good connections to social science in rhododendron study
- Stream dewatering experiment – Northington and Webster; we could expand on this and make it 100 m of dewatering instead of 30 m; do 2 year study
- Would want sites big enough for brook trout, but small enough for salamanders
- Possibly looking at restoration on Lakey Creek – follow stream through time and develop repeatable surveys through time
- Stream temperature in riparian gaps – only see a big difference in summer
- Landowners like to have unforested stream sections for recreational purposes; good social science connections

#### Summary of Biodiversity (Maerz)

- Biodiversity group needs to come together and develop some ideas on how to integrate their ideas in some of the projects
- RFP says LTER needs to represent a natural system or biome (montane forest with streams)
- Need to develop the same level of research that Clark's work has provide us for forests (i.e. following individuals through time) to other taxa
- Some of the challenges to biodiversity group: challenges of scale – using fine-scale mechanistic studies to scale up to the landscape level
- Can also look at connectivity and fragmentation in the landscape and how these react with hydroclimatic variability
- RFP says project should be based on data that is in hand; we don't necessarily have that in some of the work coming forward – need to do a better job showing how projects are based on previous data

#### Summary of People (Gragson)

- Three processes stand out as critical in southern Appalachia: globalization, urbanization, and hydro-climate change. Their influence on local sites is mediated by: a) exurbanization and movement; b) governance; c) vulnerability.

##### *Exurbanization and movement*

- Large movement component – second home-owners are from somewhere and going somewhere
- Exurbanization in Front Range of Colorado looks differently and is composed of different areas of people compared to exurbanization in southern Appalachians

##### *Governance*

- Governance and community – how global economic system (banking structure) might create distinct lending environments that impacts on how exurbanization plays out

##### *Vulnerability*

- Climate Change Vulnerability Index – vulnerability to exposure and sensitivities to event, as well as adaptive capacity to event; creeping change in climate over decades coupled with hydroclimatic variability; in GA have identified counties most vulnerable to the changes

How might social sciences engage with other projects?

- ***Regional Foundations of Exurbanization***: processes of human mobility and social connections affecting land use decisions and practices.
- ***Mapping the Landscape of Governance***: institutional arrangements of environmental governance, overlapping jurisdictions, funding, and missions.
- ***Public Understandings of Science, the Environment, and Governance***: public engagement in SW NC with science and environmental topics.
- ***Community Responses to Climate Change***: collaboration with groups/organizations strategizing their efforts to mitigate and adapt to climate change.
- ***Riparian GAP/Restoration***: social dynamics of riparian restoration.
- ***Quantifying Hydroclimate Variability: Past, Present and Future***: county-level social vulnerability (SOVI), anomalies and responses.
- ***Vulnerability Trajectories***: pathways through time and inflection points for change.
- CLP – public engagement in SW NC with science and environmental topics

Summary of Connections (Dehring)

- Band and Dehring pulled information from a document given to them by Bolstad
- How is region becoming more connected through roads, etc.?
- Hydroclimate change – how is development altering hydroclimate regimes; how is development changing (more demand for housing on mountain slopes); steep slope ordinance in Buncombe County, but not in Macon County – development playing out in different regulatory backdrops. Is regulation affecting development patterns and is risk lowered in counties with more strict regulations?
- Can we document more flooding as a result of development (as well as landslides)
- Hypothesize that we have larger, more concentrated development than in past

Objectives (Gragson)

- Creating value requires cooperative behaviors; claiming value revolves around competition
- Because of scope of project, nothing is in stone yet – still time to give input and create value in process
- Renewal process must: (copy Ted's slide)
- Our goal is to run a coherent, integrated research program that gets people involved
- We cannot afford to do everything we propose – based on a coarse budget, we already 4x over the proposed funding
- Need to anticipate a 10% reduction
- UGA will likely give an off-campus rate (26%)
- UGA may waive overhead charges on subs
- If there are subs, you will be strongly encouraged to negotiate support comparable to that provided by UGA
- Must be single lead institution (UGA)

- Budget capped at \$1.28 million/yr or \$7.68 million/6 years; ~ 65% supports salaries, infrastructure, outreach, travel, and “contingencies” – show table of expenses; research budget ends up at \$468,000/yr
- PI salary – little will be allocated to PI salary; lead PI will likely receive 1 mo/yr. SAC may receive 0.5 mo/yr; PI may receive 0.25-0.5 mo/yr for 3 or 6 years depending on responsibilities
- Working guidelines – junior before senior PI; students before PIs; project before anyone. There will likely be funding for summer (student technicians), but not for permanent technicians associated with a lab. An unknown element at present is ongoing/continuing data collection activities
- Ancillary benefits: 1) LTER sites only flourish when individual PIs leverage core funding; 2) Supplements – there is never a guarantee can provide additional funding to support REU students, international travel, ROAs, equipment, etc.; 3) LTER network – All Scientist Meeting every 3 years, cross-site proposals, working groups, etc.
- **March 14, 2014** is when final proposal is due; really March 1 deadline
- Need a **full first draft** on **October 1**
- Proposal is 25 pages of text, with 5 pages summarizing accomplishments; the other 20 pages is the actual proposal – some of those pages might be towards schoolyard program; includes biosketch, conflict of interest table, table that includes all datasets that are publicly available; site management plan; information management plan; post-doc management plan; graduate student management plan might be required too – whole proposal is 120-150 pages long
- By end of tomorrow, need a single document describing conceptual framework and ecosystem theory that we’ve agreed on, and candidate list of projects
- Need discrete awareness of group membership; need to start deciding whether you are in or out
- When we get into groups to discuss documents, need to discover opportunities, be upfront in interests and limitations – right now is when everything is negotiable
- Each group needs to keep scale in mind – need to have some sort of synthesis

#### Information Management (Chamblee)

- John gave an overview of data management at Coweeta
- Data availability is becoming a big deal, memo from White House addressing data availability
- Coweeta LTER has adopted a lot of tools from GCE LTER
- We now have a data submission form that researchers can download, fill out, and submit to John
- There is a new form for submitting annual reports
- PIs can also log-in to a new private site on the Coweeta LTER webpage and update their bibliography; John is notified of these changes so he can make sure the changes are enacted
- Annual reporting: 1) fill out new spreadsheet form, 2) log-in to private site and fill-out bibliographic form online, 3) fill-out word document on accomplishments
- **Upcoming: (copy slide)**

- Clark mentioned that it would be useful to develop daily and monthly summaries of the streaming environmental data; this is possible, but needs to be a group effort in terms of deciding how to fill data gaps, etc.
- Gragson mentioned that the RFP specifically says to focus on making more data available over making data products (e.g. monthly summaries)

#### Summaries of break-out groups

- Regional (Bolstad) – don't know which subtopics are likely to expand; would like to have a meeting of group representatives to help break the silos up
- Biodiversity (Maerz) – group came up with a laundry list of different topics; came up a list of questions to vet the topics in terms of 1) is existing data available, 2) can it be scaled up, 3) can topic be linked to other projects (e.g. TDE, rhodo removal), 4) what topics work on taxa that are influential in ecosystem processes, are regionally important, and have a life span and life history that works with the plan
- TDE (Mohan) – Discussed issues of spatial scale – have replication or not; talked about vertical scale (herbaceous, shrub layer, overstory); talked about time scale; what's missing: there are some possible associations with social scientists (water availability to landowners), need to sharpen focus on linkages to other groups, develop a common conceptual model with stream diversion; one of challenges is the herbaceous layer may not be intact in a young forest – hard to link that on site; might have control sites in older forests; focus has been on drying, but we could also look at wetting
- People (Burke) – talked about criteria for the project; socioecological changes over time; links to riparian restoration and biodiversity about landscape and governmental ideas; governance to community – knowledge does not lead directly to action; look at history of how public understands science; alteration of flow paths; hydroclimate extremes and social vulnerability – look at occurrences (flooding)

#### Groups reconvened and final charge (Gragson)

- 1) Finish up discussion and wrap up
- 2) Identify a) key decision points, b) key theory, c) criteria for inclusion/exclusion
- 3) Identify 2-3 representatives for cross-pollination group

At 10:30-12:00 – 2 groups form:

- 1) Cross-pollination Group – 2-3 reps from each group to discuss findings and work on integration, regionalization, and scaling components;
- 2) Resource-Needs Group – balance of group participants to discuss needs, opportunities, etc.

At 1:00-3:00 – Group of the Whole – open discussion on findings from Cross-pollination/Resource-Needs Discussion

Resource Needs group:

- 1) How to share common sites and instrumentation on those common sites that everyone would use.
- 2) Connecting proposal to “past” a) conceptually and b) data in hand
- 3) Trend analysis of existing stream temp data

- 4) Assessment of existing climate GIS layers and have a concerted strategy for downscaling that information (PRISM, DAYMET, etc.) to look at finer scale variability
- 5) Whether or not we continue collection of long-term data (gradient plots)

#### Debriefing and Discussion

*Regionalization* – Challenge coupling TDE study to other projects; there are pluses and minuses about having TDE in WS7; doesn't represent older forests; WS7 isn't as diverse in terms of trees and likely would not have a diverse/abundant array of salamanders/herbs; TDE are 30x30 m; Elliott brought up that WS10, which is adjacent to WS7, might be a good watershed as it was selectively cut in the 1950s and is fairly diverse

*Riparian* – If we look at state changes, resilience, tipping points, etc., look at how ecosystems and human systems relate to hydroclimate vulnerability; rhodo removal and riparian gap are the same thing; got rid of Lakey Creek; still interested in doing streamflow reduction project

*People* – working on scaling of vulnerability question – this is the best way to frame the research concerning people; looking at suspended developments – why were roads put in this way; which ecosystems services are salient to the public

Gragsen – Reflecting on Coweeta LTER, a lot of work has been intensively site-based with the hope that it speaks to regional-level processes, but the connection is weak. Around 1996, the argument was to decide how these site-based studies relate to the broader region. During the last renewal, we learned that we got caught saying the site based work really relates to the regional scale. Reading into the RFP, it is essential to integrate the study and make sure that the site-based research can be used to inform regional processes.

We need to make sure this is regional in nature, we need to make sure we have mechanistic ways to study this, and need to reach a consensus about where to place TDE study.

Turner – need to think about study as a portfolio; need both space and time, need big scale, need mechanistic studies at the plot scale and good models and good synthesis; need range of these things

Jackson – 5 things to justify research: 1) is it big science (tipping point, etc.); 2) is it affordable; 3) are people interested/invested in the project; 4) can we leverage long-term data and does it relate to past LTER research; 5) does it relate to regional issues

Maerz – None of the research addressed networking with other LTER sites or other partners; part of what makes us a regional LTER is that we are leading on these collaborations Ted – I see three components: 1) riparian component; 2) biodiversity component; 3) human component that is largely regional but also site-based. In terms of networking, we need to get our research proposal first and then develop relationships and reach out to other organizations.

Turner – To avoid working in silos, we need to have a set of questions (What are consequences of hydroclimatic vulnerability) that relate to all components of the research.

Discussion Session Round-up Summary (Gragson)

Deadline is in 2 weeks to come up with a plan:

Jackson - Riparian

Holloway - Human

Maerz - Biodiversity

These folks are tasked to reaching out and getting feed-back from the group. Vulnerability, connectivity, and hydroclimate vulnerability. Do these arguments connect to activities that we are proposing?