Coweeta LTER 2013 Winter Meeting Agenda - February 6-7, 2013

Wednesday February 6th

8:00 – Coffee and light breakfast
8:30 – Opening remarks & introductions (Gragson/Love)
8:45 – USFS Update (Miniat)
9:00 – Renewal - Coweeta LTER VII

- Overview of the Renewal (Gragson)
- Coweeta Basin Hydroclimate Variability (Miniat)
- Watershed Ecohydrology (Band)
- Extreme Wetness and Regional Scaling (Shepherd)
- SAC White Paper (Bradford)

10:00 – Break
10:30 – Open discussion on the renewal
12:00 – Lunch
1:00 – Working Group Discussions - CWT VII Manipulation, Observation & Modeling (MOM) - *emerging suggestions*

- *Landscape Physiography and Microrefugia*
- *Ridge-to-Reach Drainage*
- *Social/Economic Regime Shift*
- *Listening & Engaging*
- *Etc.*

4:30 – MOM Group Report Out
5:00 – Meeting adjourns
6:00 – Dinner at Coweeta Residence

8:00 – Coweeta Science Advisory Meeting (closed) - Callahan Room

Thursday February 7th

8:00 – Coffee and light breakfast
8:30 – Renewal & MOM: The Morning After…
9:00 – Working Group Discussions cont.
11:00 – Report Out & Next Steps
12:00 – Lunch
1:00 – Summer 2013 Planning & Activities

- Planning Ahead for Summer (Love)
- LTLT Update: Conserve, Restore, Connect (Carlson)
- Streaming (live) Data (Chamblee)
- First Results of Macon Co Social Survey (Moore)
- LiDAR Forest Canopy Density Estimates (Bolstad)

2:15 – Open Discussion & Group Meetings as Necessary
4:00 – Meeting adjourns

Coweeta LTER 2013 Winter Meeting Notes

6 & 7 February 2013

Submitted by Jason Love with substantial contributions from Brian Burke

Day 1: Meeting started at 8:37 am

USFS Update (Miniat)

- Personnel changes: 1) new research engineer at Florida A&M as part of watershed science unit; 2) new post-doc starting in March to work on the eddy flux tower at Coweeta (Chris Oishi); 3) Coweeta is slated to hire a new hydrologist in June; 4) new research forester will start in June at Savannah River site.
- Recent events: record-breaking rainfall for January (16.79 inches compared to previous record of 14.6 in 1936). There was a little bit of flooding in the dorm and all the weirs were overtopped. Part of the road was washed out at the culvert below the WS 27 weir. Between rain events, Coweeta experienced its first wildfire in recent memory – a 100 acre blaze occurred on the hillslope across from WS 17, but it caused little to no damage and no long-term research was threatened.
- Recently completed projects: 1). National Climate Assessment: forest service led the forestry sector section; monumental project spearheaded by Jim Vose with contributions by Coweeta scientists to the fire and climate change section of the report. That report and papers related to it should be out later this year. 2). Book on climate adaptation and mitigation options coming out soon. 3). Synthesis on species composition in mesophytic coves (Elliott) is also coming out soon.
- New and ongoing projects:
    - Stephen Brantley looking at forest age and structure in eastern deciduous forests: measuring sap flow, eddy flux, and more in stands ranging from 20 – 200 years old.
    - Jennifer Knoepp is leading an effort to look at cation depletion in high-elevation watersheds and potential for these to be restored through liming.
    - Eddy covariance research continues both at Coweeta Hydro Lab and Crossett Forest in Arkansas
    - Ecosystem effects of hemlock loss & HWA treatment continues
    - Reduced precipitation project in early successional forests (throughfall displacement plots) and nutrient cycling in collaboration with Nina Wurzburger
    - Kitty Elliott is looking at a large database of tree rings of 6 species of trees in the basin and how growth patterns correlate with climate change.
    - Coweeta is working on the ecosystem service of water supply: quantifying the role of National Forests in the Southeast
    - Other projects include the functional role of herbaceous understory; and changes in sulfur deposition mediated by changes to precipitation distribution.

Renewal overview (Gragson)

- Coweeta is one of only two "regional LTERs", the other being Temperate Lakes LTER
- Because we are a regional LTER, we can include people in our research

- The white paper attempts to set the trajectory of the proposal; it is simply a framework to try and couch the future direction of the renewal
- Hydroclimate variability is becoming more extreme and frequent

How is local hydroclimate changing? Is it changing consistent with theoretical predictions? (Miniat)

- Precip extremes increase proportionately to the mean atmospheric water vapor content.
- Global mean water vapor content increases strongly in global warming simulations, at a rate of 7.5% per degrees K
- At Coweeta temperature has been increasing about 0.5 degrees C per decade since the 1980s
- Precip distribution is changing; the mean isn't changing, but dry years are getting drier and wet years are getting wetter
- Small storms are becoming less frequent
- Inter-storm periods are increasing over time at Coweeta
- We are getting a fewer number of storms per year
- How do forests respond to hydroclimate variability? Forests respond to the distribution of rainfall. It is important to have frequent "watering" events – frequency is more important than how much.

Ecohydrologic dynamics ~f(hydroclimate change) (Band)

- Can we detect climate effects on forest patterns and hydrologic behavior from multi-decadal and multi-scale remote sensing?
- There is increasing leaf area downslope where there are more resources available (e.g., water)
- Hydrologic vegetation gradient (HVG) - Spatial patterns of vegetation along hydrologic flowpaths. High elevation south or southeast facing forests show effect of slope, while other aspects do not.
- Horton Index (HI) represents the ratio of evapotranspiration to available soil water by excluding storm flow based on empirical hydrograph separation method.
- HI is known to better represent the status of vegetation water use by excluding precipitation variability.
- Brutsaert & Niebert (1977) proposed a well-known recession analysis by plotting a observed recession slope ($-dQ/dt$) with a given discharge (Q) as a power function. Behavioral parameter ranges for a distributed ecohydrologic model are used to identify the seasonal patterns of dominant flow regimes calculated with a GLUE (Generalized Likelihood Uncertainty Estimation) methodology. The GLUE methodology is incorporated to estimate behavioral parameter ranges in each headwater catchment rather than choosing a single optimum parameter set If Horton Index is high, more water is being used "locally" by the trees
- Growing season evapo-transpiration is increasing as temp increases
- Shortened growing season length is related to water limitation
- Emergent vegetation patterns within headwater catchments represent the level of partitioining between localized (green) water use and lateral (blue) water flow along hydrologic flowpaths

- Conclusion: changes in hydro behavior driven by climate changes are manifested in veg dynamics (and we can now see this because we have long-term records). We need to look across space/time to see gradients and transience in hydro/veg behavior.

Precipitation variability in southern Appalachia (Shepherd)

- How is precipitation varying temporally, spatially, and intensity-wise in southern Appalachia?
- What are the challenges with point source rainfall measurments for regional studies?
- Chelcy, Larry, and others did a really good job expressing trends: increased variability, more intense summer droughts, anomalous wetness; one other thing is that there are papers suggesting that some of these changes we're seeing are a result of anthropogenic climate change but also that the 10-year southern oscillation and other long-term oscillations may play a role as well. So in the white paper we have to keep in mind these teleconnections and PDO, AO, ENSO influences as well, as those also potentially affect regional climate
- Recent papers noting hyroclimate changes in SE
    - Increased variability
    - More intense summer droughts
    - Anomalous wetness
    - Wet or dry part of variability may be a function of anthropogenic climate change and phase of PDO
- Precipitation systems cover a wide range of time/space scales
- Precipitation doesn't scale the same way temperature or humidity scales
- Regionally precipitation trends are not the same, BUT evidence of increasing variability and greater extremes
- Analysis of extreme wet days using Daymet. This is a daily data set looking at percentage of days over 25 mm of rain from 1980-2011. In our paper we called it a wet-millimeter day (playing off of growing degree day) so you can see the frequency of wet-millimeter days and how they're distributed over the region. There's generally a clear relation with elevation, but there is more as well. A variety of maps show that precipitation varies with elevation and location, so it's unlikely that point-source gauges will say much. There is evidence of increased variability, and continuing development in the region raises question about vulnerabilities and the feedbacks on regional climate.

White Paper: "Drivers and Consequences of Increasing Hydroclimate Variation and Changing Ecosystem Connectivity in Southern Appalachia" (Bradford)

- The purpose of the white paper is to guide development of the Coweeta LTER VII renewal and to define the "problem" (but not address how we solve it)
- NSF criteria for an LTER renewal:
    1) Integrate site and region scale research
    2) Combine manipulative, observational and modeling approaches to scale between local and regional dynamics
    3) Build on Coweeta's historical data and strengths (e.g. disturbance, watershed dynamics, land use patterns)

4) Capitalize on multi-institution and multi-disciplinary expertise; build connections with local stakeholders
5) Emphasize place-based research: stress uniqueness of SA
6) Test and develop major ecological and/or ecosystem theories

- Problem: *Increasing hydroclimate variation* – a widening of the probability density function of any hydroclimate variable in terrestrial, aquatic and/or built environments. This means the frequency and magnitude of wet and dry extremes are increasing.
- Problem: *Changing ecosystem connectivity* - an increase or decrease in the potential rate of movement of materials (e.g. water, species) and energy within and between ecosystems. An example would be the shift to a service and commercial economic base drives change in land use patterns, such as mountainside road development.
- Conceptual Framework: A changing economic base and hydroclimae – caused by natural and social factors both within and outside the region – collide in southern Appalachia. Our overarching conceptual framework is built around the arising, key drivers of increasing hydroclimate variability and changing ecosystem connectivity, that interact with both biophysical (e.g. ecological) and social response variables.

Discussion about White Paper

- Connectivity and hydroclimate is also being looked at by Luquillo, GCE, and McMurdo too
- Should climate go beyond just temp and precip, but also include things like solar radiation and wind
- "Climate Drivers" model is from GCE; we can use this as a starting point
- Are we exploring local climatic variability to understand hydroclimate variability? Both exploiting and understanding impacts of temporal variability? For instance, we expect mammals to be very sensitive to climate variability, but likely not salamanders
- Our region encompasses mostly mountains, but some Piedmont too
- Global Climate Models all agree on temp but not precipitation in our study area
- Hallmark of Coweeta is watershed – watershed is integrating unit or term; don't need to lose sight of that
- Scalar analysis needs to be included
- Last proposal focused on headwater catchments, downslope to large watersheds; length scale – correlation length; a length scale is the smallest scale that captures variability
- Is endemism being reduced because of suburbanization
- How much should focus on scale? NSF might grab on to that as a central theme and may expect to see that.
- Do we have data that shows the region heading towards homogeneity?
- Dow we have biodiversity models that can be tested? Are there length scales that fall out of those models?
- Hydroclimatic variability could be a hypotheses – need to strengthen the statistics
- How do we mitigate and adapt to extreme events?
- Natural forests are subsumed inside human environments – need to make connections between hydroclimate and land use change.
- What is hydroclimate? It is a bridge between climate and land surface interactions, including streamflow.

- N deposition is expected to increase too – need to make sure that is included in "climate"
- Streamflow (e.g. baseflow) directly impacts water supply – how is this impacted by hydroclimatic variability and land use (e.g. roads, etc.); this is important to society
- Are we interested in hydroclimatic variability across space and time? Yes – both are important
- Three things keeping popping up: watershed, scale, homogenization
- Maybe we need some strong theoretical, systematic way to determine what we invest our time in
- Hydroclimate variation is happening gradually, though land use change is more acute (e.g. building a road has immediate local impact)
- Should revisit ISEE document – presses vs. pulses
- Resiliency should be part of this discussion – are watersheds resilient?

Breakout Session (Gragson)

- By noon tomorrow should have:1) identified direction of research; 2) conceptual diagram; 3) 3-4 overarching questions
- We are about a year out before the renewal is due
- Practically we will have only 1 more big meeting (summer) and possibly 2 gatherings
- LTER actually issued an RFP for the first time in 2012 and articulated some of the things that they wanted to be addressed (these are in the bullets of the white paper)
- Seems to be a certain appeal to hydroclimate variability among the group
- If hydroclimate variability and connectivity are what captures everyone's attention, then how to we go about doing that – need to get in smaller groups
    - Landscape Physiography and Microrefugia
    - Ridge-to-Reach Drainage
    - Social/Economic Regime Shift
    - Listening and Engaging
- The whole issue of scale needs to be resolved; watersheds change scale based on the research
- No conceptual model will be pleasing to everyone, but NSF expects it to be in the proposal

Break-out Session Reports

Broke into 4 groups to discuss and define variability, scale, connectivity

Group 1

- Variability – Hydrological and terrestrial variability in land uses; it was discussed broadly in climate and biodiversity as a function of the mountains. David Leigh brought up the range of natural variability versus variations based on human actions. Examples of variability include flow, precipitation, hydro and terrestrial land use.
- Scale – used different terminology discussing terrestrial/social (micro, parcel, community, landscapes) versus aquatic (headwater to large streams, variable source area). Temporal: annual, decades, thousands of years.
- Connectivity – hydrologic flowpaths with respect to organisms, populations and metapopulation dynamics: habitats and changes in community composition. Also relevant is disturbances (floods and fires) and both natural and human variation. With respect to

social systems, connectivity re: similarity of people in terms of values/preferences, connectivity in patterns of governance.

Group 2

- What are the scales that we have been using: plot to hillslope to Little T to southern App to SE
- Scale - Started talking about the scales we've been using: typically measuring plot scale, hillslope, watershed, Little T, southern App, and southeast. Typically measuring at plot scale with interest in what happens at higher scales. Southeast is our contextual scale (can we take what we've learned locally and apply broadly). Then scales of social science: household, parcel, county, state, national. Same sort of hierarchy, and these levels don't exactly map onto the others, which is one of our difficulties, but we're learning to deal with that sort of mapping. Similar process: measure at lower level to describe local region and extrapolate more broadly. Can we take plot, hillslope, and Little T and scale up to regional scale?
- Variability - social variables include (population increase, increase social heterogeneity, increasing age diversification, decrease household size, change farming to services, ownership turnover in older neighborhoods). Response variables in ecosystems: should focus on what we have the expertise to measure (salamanders, birds, nutrients, water, vegetation). And what do we have long-term records on (hydrology, nutrients)—these are exceptionally valuable and we should make use of them.
- Connectivity: does stronger connectivity lead to stronger feedback in systems, and can we have systems that become over-connected and therefore brittle?
- Social – can we take households, parcels, neighborhood, county, state, and national and plug them into the ecological scales that we have been using
- Social variability and trends – populations increasing, increasing age diversication, decrease in avg household size; what are response variables and drivers? And what do we have the expertise to measure? And what do we have long-term records on – climate and stream discharge
- Drivers - Level that we look at for drivers is different than the level we look at for responses. What are the drivers that will be important 20-30-50 years from now – should we start to identify and collect data on those drivers?

Group 3

- Contrast hydrologic, ecologic, and social systems – are there common paradigms in terms of connectivity, scale, and flow
- Connectivity - There is a definite connective structure between plots, hillslopes, and large regions. We'd insert on the social side neighborhoods (regions of relative homogeneity) or landscales (similar demographics and types of building). So the types of connectivity: water is key, migration corridors for terrestrial systems. It is tougher to think through connectivity for social systems (what's actually flowing, how do you define the network, what's actually moving (people, capital, innovations, behavior), are they well-formed networks or do they form and reform).
- Capital should be conserved, but not necessarily true; is behavior or trust something that flows?
- How much flow is taking place versus the storage and heterogeneity of that flow; floods tend to homogenize; low flows have more local variability

- Can use land use as a boundary object
- Legacy of past land use needs to be considered

Group 4

- Rhett gave example of wealthy couple moving from Atlanta to the mountains: they chose their house site based on aesthetics, chose type of house based on value of capital, building changed flow paths, nitrogen fertilizer changed nutrients, presence of house on hillslope changed value of neighbor's house, cat they brought in killed a bunch of birds. Every single thing they did was related to the biophysical place and their neighbors. That's why it's so hard to draw these arrows: you just have to get the zen concept that everything is connected.
- Connectivity – organizations
- Information connectivity – landslide hazards map. For instance, the landslides on Wayah Bald, lined up perfectly with landslide hazards map which nobody knew about, then landowner talked with neighbors and they all asked for more info on that.
- Variability – As others mentioned this morning, we have to think carefully about our definition of variability: across what types of boundaries or gradients? How do we account for other measures like skewness? And have to be able to account for thresholds (how much change matters... does it change enough to matter). E.g. stream flow, 20-25% change in peak flows doesn't make much difference (we talk of doubling and tripling) but with soil moisture that makes a big difference. So the question is, if your stream flow goes up/down 25%, how does that relate to soil moisture? Model needs more emphasis on spatial variability (not just temporal).
- Scales – everyone will figure out appropriate scale for what they are doing

Meeting ended ~5pm.

<u>Day 2: Meeting started at 8:30 am</u>

The group divided into 4 self-selected groups to answer the big question:
How does hydroclimate variability affect your response variables, what is the nature and strength of the feedback, and how can this knowledge inform social strategies of risk mitigation and/or adaptation.

a) what are the relevant theoretical constructs
b) what are the response variables
c) what is the experimental design
d) what are the necessary data

4 self-selected groups:
1. Ecological population & community
2. Riparian stream interaction
3. Ridge-to-river
4. People

Report on ecophysiological/demography group (Clark)

- Hypothesis: Responses to the hydroclimate will be controlled by interactions

- Biogeochemistry is the lynchpin – opportunity to look at how moisture pulses affect N cycling and in turn have impacts of biodiversity
- Rainfall diversion and trenching with N addition, for a factorial experimental design
- On bio side, will work on digital veg maps to predict where changes will take place
- 3 subgroups: biogeochemistry, biotic, and hydrology; by end of Feb. will have some text to sharpen the discussion that can be shared with others
- Rhododendron removal not brought up yet – could be part of the discussion
- What is the relationship between this group and community and population group? If population & community group can put some text together, we might be able to find some commonalities and synergy between the two groups.
- Is all the work in the basin? Work would be done at the plot level at Coweeta and then modeled at a larger scale. But there is a current study with Nina Wurzburger in an early successional forest outside the basin that might be included in the study.
- Use observational studies outside the basin, but controlled experiment inside the basin.
- One of the challenges is how to do exciting stuff regionally
- What is the relationship of this research to mitigation? Talked about alternative states (e.g., savannahfication of SE); is this something social scientists might find interesting? Carbon sequestration might be a social question too.
- Do we do trenching first? Not a given that there is lateral flow worth worrying about. Can possibly use road cuts to regionalize the question of whether or not lateral flow occurs and if it does, where.

People (Social scientists)

- The social scientists feel agile enough to dovetail into some of these other groups/questions
- Two parts: 1) How to deal with regional change and changes to communities, questions around civil society and NGOs (LTLT), questions around political organization & market failures, slowdown in building and exurbanization, 2) science allows us to collect social data (e.g., using salamanders as a gateway (translational dialogues))
- It is important to remember that people don't care about climate change, they care about drought, hillslope failure, etc.
- Push in LTER to create scenarios that
- Risks and mitigation – notion of increased flood risk linked to hydrologic variability, as well as land use patterns
- Housing market is starting to pick up slowly; is there specific information that can be pulled out from number of building permits issued per year, etc.?
- Census bureau is starting to take annual "census" at some sites

Riparian stream interaction (Jackson)

- What is scrub/shrub habitat – sparsely developed areas along streams.
- Drought manipulation – add demographics of stream critters would be interesting; process rates are delayed, which might impact life history of macroinvertebrates
- Riparian gaps – temperature, fish movement, primary productivity, bugs; An interesting question to pursue is what is the critical canopy gap size along streams before we start to see impacts.

- We would like to investigate long-term riparian restoration corridor on the whole stream network; 20 year project; every few years have a MS student collect data for their thesis; look at rhizosphere – when does it come to play
- Possibility of collaborating with Land Trust for the Little Tennessee
- Riparian corridor restoration can be used to mitigate changes in the hydroclimate
- Why would landowners do this? Which landowners would agree to this? These are household decisions that would need to be made.
- Riparian zone is a feedback to hydroclimate variability; putting shade back on can possibly mitigate this variability

Community and population (Bradford)

- Distribution of organisms
    - Topographic processes (dispersal)
    - Tolerance of abiotic conditions
    - Biotic interactions
- Relative importance of these influenced by 1) connectivity and 2) hydroclimate variability in space and time
- Idea is to take this framework and use patterns in the landscape for precip and climate, as well as land use, and try and predict where shifts in communities and populations might occur
- There might be influence of those species on other ecosystem processes – opportunity to use long-term data to link these processes
- This has ties to Whitaker's work on influence of climate on plant communities
- Salamanders, herbs, ants, and birds all came up as organisms to study
- Obstracles: Some of the manipulative mechanistic things need to be done at the plot scale and it can be hard to scale up

Follow-up Discussion

- We need to define the region that we are working in and need to show a lot of group cohesion for this proposal
- We have number of storms and storm damage for this region
- Studies should have regional relevance, but need plot based studies that are very detailed and processed-based
- The only way to answer the charge of ecological theory is at the plot scale
- LTER RFP defines regional LTER as a biome or ecosystem that will incorporate social science
- LCC – Landscape Conservation Cooperatives; are sort of like regional LTER
- At Andrews LTER – had central question that was retained through several renewals; The central theme at CWT have remained the same (disturbance and stress).
- LTER program has changed in that there is less emphasis on process-based work and more emphasis on regional
- Gradient plots are still being used, but not as important (though there are still long-term studies being carried out in these plots)
- Coweeta basin could be argued as a model system that we can carry away certain insights

- Scenarios and future visioning have played very important roles at Williamette Valley (AND), Hubbard Brook, and Temperate Lake
- What kinds of things could or should be done prior to the renewal? 1) Write the best proposal and go with it or 2) Do a pilot study?, etc.
- Do we have the capacity and interest to see if high and low flows are occurring at a larger scale and how are humans adapting? We should really start to think about synthetic activities. Can we pilot some sort of synthetic microproject? Need to put up more collaborative software (Band)
- Under current landcover conditions, can look at hydroclimate variability on flow, soil moisture regimes, etc.
- How hydroclimate variability will affect biodiversity, muddiness, water quality, etc.? Can we do this preliminary? Do we need pilot study? Chelcy mentioned landslides and rhodo cover. There are counties with landslide risk maps that we could use.
- Why don't we just develop and hydroclimatic variability scenario (e.g. risk analaysis) like Wear and Bolstad development scenario? Band and Shepherd might be able to pull something together to show range of potential conditions (e.g. what if you increase flashiness in a landscape in 20-30 years where there is more development)
- NASA looks at projects within its larger project area; CWT LTER hasn't done much in the decision support; working towards common set of tools to get data online
- Primary user groups of scientific information at CWT are USFS, watershed orgs, and USDA-Aphis
- Ted will ask for brief write-ups from yesterday and today; need at least outlines and ideas; make sure theory, research design, etc. are explicit; **this is needed by end of next week.** This information will go into a re-drafting of the white paper (ver. 2.0).
- Survey will be sent for individual work; questions come right out of the RFP and will be things like define the region we work in, etc.
- There will be a SAC meeting soon to debrief on meeting; several issues will need to be addressed – what is spatial boundary of our research, how to we insure cohesion, what do we need to do before we go into the renewal?
- There may be a need for individuals to meet again to re-draft or clarify their research
- Summer meeting might be dedicated towards resolving some of these issues (e.g. Are scenarios an effective way to go to help frame the research?)
- Important to show proof of concept to show why it is important to work across disciplines and that we can accomplish what we propose.
- Still don't know when renewal is due. Probably due April 2014, but might be December 2013. PIs will be called upon to write sections, edit, etc. and sometimes the timeline to work on these edits, etc. will be short

From Data Sets to Data Products: The GCE Toolbox for MATLAB and Near-Real-Time Data Streams (Chamblee)

- Data sets vs. data products
- Data set – text delimited file without metadata
- Data products includes metadata, attribute metadata, data and flagged arrays; all the information is in one place

- CWT LTER has been using the GCE Toolbox, which was built by Wade Sheldon, the IM for GCE
- CWT has been working with Wade to develop teaching models to use this Toolbox
- CWT received a Field Station and Marine Lab (FSML) grant to set up 30 microclimate stations in our study region to have data stream in real time
- Matlab be used as the data repository
- Training – there is a manual and funds left for another 50-60 hours of work to put Matlab manual online and produce short videos; should be wrapped up by May 4th
- Repository – you can hook your data back into CWT LTER repository
- We will build in QA/QC flags that tell us if data stops being harvested

Land Trust for the Little Tennessee (LTLT) overview (Carlson)

- The goal of LTLT is to conserve waters, forests, farms, and heritage of the upper Little T and Hiwassee River basins
- LTLT merged with the Little Tennessee Watershed Association at the beginning of 2012, so the new LTLT now works more with water
- There are 3 primary programs that LTLT focuses on: Conserve-Restore_Connect
- Conserve: Traditional land trust mission; protect land through easements or acquisition; in 1999 LTLT helped add the Needmore Tract, which helped protect the lower 12 miles of the Little Tennessee before it reaches Lake Fontana. Also focusing on the Cowee – Nantahala corridor near Lost Bridge
- Restore: Began much restoration starting in the late 1990s. Much of this was funded by the NC Clean Water Trust Fund. LTLT is starting to look at biotic interchange between the mainstem and tributaries, including the movements of the Spotfin Chub, a federally threatened species. LTLT has been involved in the removal of barriers, such as poorly placed culverts. LTLT also engages of restoration of river cane, which are then used by Cherokee artisans for baskets and blow guns. LTLT also is involved in burning to try and restore degraded pine-oak communities.
- Connect – brings up the social and people side of conservation; biggest piece is Bill McLarney's fish monitoring that started 24 years ago. Also SVAP is emerging as a technique for citizen science
- Little T is anomaly – water quality improves as you move downstream
- USFWS is #1 public sector funder; losing cool water is starting to become a big deal
- Shade Your Stream could be elevated as LTLT's over-arching theme for work in the water quality arena
- Little TN at heart of a climate change adaptation laboratory
- Is there an opportunity for LTLT and LTER to collaborate on projects such as stream restoration?

Quantifying riparian vegetation using LiDAR canopy (Bolstad)

- Recent meeting with federal, state, and NGOs to address water quality; 3 species petitioned to be listed recently: sicklefin redhorse, hellbender, and Little T crayfish
- At the meeting is was noted that there was a need to identify areas to target restoration efforts. Can we quantify riparian condition without walking the stream?
- LiDAR uses laser scanning to "paint" the landscape; 10 returns per square meter

- We can use ground hits versus tree hits
- Pulse lasts some duration; most LiDAR flown to get better DEMS and floodplain maps
- In Macon Co., 0.5 returns per m^2
- We can identify canopy % cover to create an index
- It is leaf-off data because they want to get to the ground
- These data need to be calibrated with field measurements using hemispherical photos or spherical densitometers that are GPS'd
- NCALM – high resolution LiDAR; NSF funded group to push the technology – 8 returns per m^2
- Using LiDAR, we can also get information on tree height and biomass

Meeting ended at 3:45 pm.

List of attendees:

Name	**Affiliation**
Jennifer Knoepp	CWT PI - USFS
Jim Clark	CWT PI - Duke University
Nik Heynen	CWT PI - UGA
Kitty Elliott	CWT PI -USFS
Paul Bolstad	CWT PI - University of Minnesota
Marshall Shepherd	CWT PI - UGA
John Chamblee	CWT IM - UGA
Mark Bradford	CWT PI - Yale University
Rebecca Moore	CWT PI - UGA
Rhett Jackson	CWT PI - UGA
Carolyn Dehring	CWT PI - UGA
Chelcy Miniat	CWT PI - USFS
Ted Gragson	Lead PI - UGA
David Leigh	CWT PI - UGA
Fred Benfield	CWT PI - Virginia Tech
Jen Fraterrigo	CWT PI - University of Illinois
Scott Pearson	CWT PI - Mars Hill College
Jack Webster	CWT PI - Virginia Tech
John Maerz	CWT PI - UGA
Jackie Mohan	CWT PI - UGA
Don Nelson	CWT PI - UGA
Jeb Barrett	CWT PI - Virginia Tech
Cathy Pringle	CWT PI - UGA
Jeff Hepinstall-Cymerman	CWT PI - UGA
Jason Love	CWT SM - UGA
Larry Band	CWT PI - UNC at Chapel Hill
Ryan Emmanuel	CWT PI - NCSU

Steven Brantley	Post-doc - University of Minnesota
Stephanie Laseter	Staff - USFS
Dan Markowitz	Invited researcher - UGA
Nina Wurzburger	Invited researcher - UGA
Kevin McGuire	Invited researcher - Virginia Tech
Brian Stram	Invited researcher - Virginia Tech
Kim Novick	Invited researcher - Indiana University
Chris Ohishi	USFS Post-doc - Duke University
Ben Laseter	Staff - Land Trust for the Little Tennessee
Meredith Welch Devine	Invited researcher - UGA
Paul Carlson	Executive Director - Land Trust for the Little Tennessee
Jeff McDonnell	Guest scientist - Oregon State University
Tim Burt	Guest scientist - Durham University
Brian McGlynn	Guest scientist - Duke University
Bill McLarney	Biologist - Land Trust for the Little Tennessee

CWT PIs unable to attend: Monica Turner, Craig Depken