A Cross-Site Synthesis of the Long-Term Effects of Land Use History on Carbon and Water Balance
Ted L. Gragson et al.

Presenters in an All Scientist Meeting workshop organized by Olga Krankina addressed the long-term effects of land use on carbon and water balance in landscapes and ecosystems. Presentations from Russia, Puerto Rico, UK and Southern Appalachia demonstrated how land use and land-use change are among the major factors shaping carbon and water balance in landscapes and ecosystems. Carbon and water are of great consequence as synthesis topics because they are quantifiable, important at all sites, and represent globally significant ecosystem functions that are relevant to national and international policy. We propose over the next 12 months to carry out a rigorous cross-site comparison and synthesis of the knowledge of and methodology for linking land use to carbon and water balance (see list of participants below).

Participant	Affiliation
Jess Zimmerman	Institute for Tropical Ecosystem Studies & Luquillo LTER
Jorge Ortiz	Institute for Tropical Ecosystem Studies & Luquillo LTER
Mark Harmon	Oregon State University & H.J. Andrews Forest LTER
Olga Krankina	Oregon State University & H.J. Andrews Forest LTER
Barbara Bond	Oregon State University & H.J. Andrews Forest LTER
Terry Parr	UK Environmental Change Network, Centre for Ecology and Hydrology – Merlewood
Ted Gragson	University of Georgia & Coweeta LTER
Paul Bolstad	University of Minnesota & Coweeta LTER
Lawrence Band	University of North Carolina – Chapel Hill & Baltimore Ecosystem LTER
Jim Vose	US Forest Service & Coweeta LTER

Many LTER sites and research projects outside the LTER Network are demonstrating there are common in patterns to land use history. However, there is major uncertainty in our understanding of the effects of land use on the global patterns of carbon and water exchange. Reducing this uncertainty is one of the Grand Challenges in Ecology. The unique role that the LTER Network can play in addressing this topic is defined by the availability of long-term ecological and socio-economic data sets, and inter-disciplinary research teams. These are not often found outside the LTER Network, a primary reason our proposed effort can yield novel results. Furthermore, the topic lends itself to rigorous cross-site comparison with the potential for globally significant results central to current LTER synthesis efforts. Following are three issues that direct us to propose this cross-site collaboration and synthesis effort.

- In different locations around the world and for various reasons, land once dedicated to agriculture has been abandoned and forest and woody vegetation cover has expanded. Our understanding of the long-term ecological consequences of this change as well as the mechanisms linking the underlying causes to their various outcomes remains limited. Little is known about how much additional carbon storage is represented by reforesting lands, how long this carbon store will last, or, how much longer forests will continue to expand and accumulate carbon. These are crucial issues for both ecology as well as initiatives directed to the international trade in carbon.

- Water quantity and quality are important issues in many parts of the world. However, we know very little about how different land uses and changes in land use cumulatively affect water quality, quantity, or aquatic biota. There have been only limited attempts to derive process-based predictions of the cumulative temporal and spatial effects of multiple land uses and land-use change on water quantity, quality and biota. This seriously constrains efforts to forecast future ecosystem responses or to execute management strategies that anticipate the most likely outcomes of change trajectories.
- The large investment to date in research has led to the development of methods for assessing the effects of land use on carbon and water balance at the site level. However, moving from site to region or from region to continent has yet to be realized. This is unfortunate, because the full implications of mechanism and process transcend the particularities of local settings to influence conditions, knowledge and policy at regional to global scales. Currently missing are the scaling methods for moving from the site to the landscape and the region, and the standardization of methods that would allow for cross-site synthesis.

Over the course of the next 12 months we propose development of two review articles for publication. The first will synthesize knowledge about the consequences of land use/land use change for carbon and water balance based on evidence derived from sites with long term ecological and socioeconomic data records. This review will address the “what” and “why” of carbon and water balance, and include a summary discussion of the global consequences and policy implications of this knowledge. The second review would be a "how to" for linking land use to carbon/water balance as it pertains to bridging site-level studies to cross-site comparison and synthesis. The two proposed review articles will build from the wealth of idiosyncratic knowledge gained to date at individual LTER and other sites to knowledge that is generalizable and applicable at larger scales.

The outline and section drafts of both review articles will be developed via email and conference call between the participants between January-May, 2004. We will convene as a group for a 2½-day workshop in approximately mid-May, 2004, to pool our collective knowledge and finalize a unified draft of both reviews. Final revisions of the reviews will be completed over the summer and early fall via email and conference call, with the expectation of submitting them for publication by the end of 2004. The natural outgrowth of this effort could easily be a cross-site proposal, but the final decision on whether to develop such a proposal will be made by the participants at the conclusion of the proposed activity.

The diversity of expertise represented by the participants in the proposed activity are critical to its success, but their number and geographic distribution also means that organizing or financing more than one face-to-face workshop is not possible. The workshop will be held at the Coweeta Hydrological Laboratory, NC. The geographical centrality of Coweeta to the participants as a group and its proximity to the Atlanta International Airport both facilitates the arrival/departure of participants and minimizes the overall cost of transportation. In holding the workshop at Coweeta we can also significantly reduce the overall expense of the workshop through cost-sharing. The Coweeta LTER project would provide local transportation to/from the airport by using project vans; staff and students on the project would provide administrative and research assistance; and, most importantly, participants would be able to work in the new on-site Conference Center and lodge at the renovated Residence. The attached sheet details the budget and justification.

Travel	
Durham, NC-Atlanta, round trip x 1	$200
London, UK-Atlanta, round trip x 1	$600
Minneapolis, MN-Atlanta, round trip x 1	$300
Portland, OR-Atlanta, round-trip x 3	$1,200
San Juan, PR-Atlanta, round trip x 2	$1,200
Other fees & expenses	$1,500
Subtotal	$5,000
Subsistence	
10 people @ $28/day for 4 days	$1,120
Supplies & Expenses	
Communication & publication costs	$1,750
Lodging	
7 people @ $15/day for 4 days	$420
TOTAL	$8,290

Cost Share Equivalent	
Local transportation	$250
Administrative Assistance	$600
Conference Center use	$500
Research Assistance	$2,000
TOTAL	$3,350

Justification

The total request for the proposed activity is $8,290; the cost-share equivalent by the Coweeta LTER is $3,350. As an LTER Network-supported effort, no overhead will be charged. Following are details on the budget and cost share.

Travel: Transportation expenses are based on the lowest commercial roundtrip airfares from the major airport nearest each participant's home base to Atlanta. The category "Other fees and expenses" will cover additional charges incurred by participants to reach and/or depart the airport closest to them (e.g., airport transportation, parking, exit fees).

Subsistence: This cost is based on the official University of Georgia per diem rate of $28/day. The full kitchen facilities in the Coweeta Residence ensure this rate is adequate. Four days per person, rather than simply the duration of the workshop, were used to calculate the total in order to cover expenses incurred by participants during their travel to Coweeta.

Supplies & Expenses: Covers communication expenses (e.g., conference telephone charges, copying, mailings), as well as final publication costs (e.g., page charges).

Lodging: Participants will be housed at the Coweeta Residence, a fully furnished facility with kitchen, laundry, and T-1 access in every room. The $15/day fee per participant is the regular charge to users, which covers cleaning and maintenance of the facility. There is no fee for the three Coweeta investigators

Cost Share Equivalent: These are the dollar-equivalent amounts for the various services to be provided by the Coweeta LTER in hosting this workshop.