Annual Report for Period: 11/2008 - 10/2009
Submitted on: 10/21/2009
Principal Investigator: Gragson, Theodore L.
Award ID: 0823293
Organization: U of Georgia Res Fdn Inc
Submitted By:
Gragson, Theodore - Principal Investigator
Title:
Southern Appalachia on the Edge - Exurbanization & Climate Interaction in the Southeast

Project Participants

Senior Personnel

Name: Gragson, Theodore
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Lead Principal Investigator for the project and administrative liaison between UGA and all subawardees. Partial support for activities from Coweeta LTER.

Name: Band, Lawrence
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Partial support for activities from Coweeta LTER.

Name: Benfield, E.
Worked for more than 160 Hours: No
Contribution to Project:
11/08-10/09: Ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Partial support for activities from Coweeta LTER.

Name: Bolstad, Paul
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Measurement and modeling of forest productivity, hydrologic cycling, and environmental and anthropgenic variables affecting them. Partial support for activities from Coweeta LTER.

Name: Bradford, Mark
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. Partial support for activities from Coweeta LTER.

Name: Clark, Jim
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Dehring, Carolyn
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Investigation of the land pricing aspects of land use regulation and open space including land conservation programs, land use regulation, and issues related to the economics of water quality and quantity. Partial support for activities from Coweeta LTER.

Name: Depken, Craig

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Investigation of the land pricing aspects of land use regulation and open space including land conservation programs, land use regulation, and issues related to the economics of water quality and quantity. Partial support for activities from Coweeta LTER.

Name: Ford, Chelcy

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Understand and quantify how natural & human-mediated disturbances affect forest water and carbon cycling, the structural & functional controls on forest water and carbon cycling, and how water use affects tree and forest carbon fluxes. No direct support from the Coweeta LTER research funds.

Name: Fraterrigo, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Performed a field experiment to test a hypothesis about a how land use affects native plants, and considered the influence of other drivers on plant population persistence. Partial support for activities from Coweeta LTER.

Name: Hepinstall-Cymerman, Jeffery

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Participated in site characterization for Phase 1 synoptic sites, developed a 2006 land cover map for the southern Appalachian study region, and documented land cover and land use change within the Little Tennessee watershed. Partial support for activities from Coweeta LTER.

Name: Heynen, Nik

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Examined the relationship between Atlanta's global city status and the exurbanization of Macon County, NC, and the connection between citizen scientific engagements related to climate change within the Southern Appalachian region. Partial support for activities from Coweeta LTER.

Name: Jackson, C.

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify channel morphology and stream temperature in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Knoepp, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify soil properties in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. No direct support from the Coweeta LTER research funds.

Name: Leigh, David

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: Maerz, John

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Examining the effects of historic and projected future land use patterns on stream morphology, hydrology, water quality and biota through characterizing the occupancy and relative abundance of salamander larvae and stream macroinvertebrates. Partial support for activities from Coweeta LTER.

Name: Mohan, Jackie

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Research on soil nutrient biogeochemistry along the elevational gradient plots linked to vegetation dynamics. Partial support for activities from Coweeta LTER.

Name: Pearson, Scott

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Studying the effects of residential development and climate on breeding bird communities and herbaceous species of Appalachian forests. Partial support for activities from Coweeta LTER.

Name: Pringle, Catherine

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Biotic synoptic sampling across the Little Tennessee Watershed in relation to geomorphology and water. Partial support for activities from Coweeta LTER.

Name: Turner, Monica

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Carried out studies focused on understanding the role of land-use history and contemporary landscape patterns affect the presence and abundance of invasive plants in the forest understory. Partial support for activities from Coweeta LTER.

Name: Valett, Maurice

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Participated in developing and executing synoptic and aquatic sampling of Little Tennessee Watershed. Partial support for activities from Coweeta LTER.

Name: Vose, Jim

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Research on linking species specific parameters of water stress with plant demography. No direct support from the Coweeta LTER research funds.

Name: Webster, Jack

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Post-doc

Name: Warren, Robert

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. No direct support from the Coweeta LTER research funds.

Name: McMahon, Sean

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Sourdril, Anne
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Investigating the consequences of exurbanization on local societies and on landscape in Buncombe County, NC. Partial support for activities from Coweeta LTER.

Graduate Student

Name: Duncan, Jon
Worked for more than 160 Hours: No
Contribution to Project:
11/08-10/09: Ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Partial support for activities from Coweeta LTER.

Name: Hwang, Tahee
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Taehee Hwang is a graduate student with Lawrence E. Band.

Name: Kove, Katherine
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Measurement and modeling of forest productivity, hydrologic cycling, and environmental and anthropgenic variables affecting them. Partial support for activities from Coweeta LTER.

Name: Keiser, Ashley
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. Partial support for activities from Coweeta LTER.

Name: Strickland, Michael
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change.. Partial support for activities from Coweeta LTER.

Name: Kramer, Timothy
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. Partial support for activities from Coweeta LTER.

Name: Tang, Zhao
Worked for more than 160 Hours: Yes
Contribution to Project:
11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. Partial support for activities from Coweeta LTER.

Name: Bell, Dave
Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Moran, Emily

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Block, Corrine

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Performed a field experiment to test a hypothesis about a how land use affects native plants, and considered the influence of other drivers on plant population persistence. Partial support for activities from Coweeta LTER.

Name: Evans, Sakura

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Investigation of land use regulation and open space including land conservation programs and land use regulation. Partial support for activities from Coweeta LTER.

Name: Gustafson, Seth

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Examined the relationship between Atlanta's global city status and the exurbanization of Macon County, NC, and the connection between citizen scientific engagements related to climate change within the Southern Appalachian region. Partial support for activities from Coweeta LTER.

Name: Price, Katie

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Working to quantify channel morphology and stream temperature in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Suther, Bradley

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: McDonald, Jake

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: Rogers, James

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: Meadows, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: Wang, Lixin

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Research into human impact on the fluvial geomorphology and stream water quality of the southern Blue Ridge Mountains region in particular sediment transport and storage in the fluvial system and relation to aquatic ecosystems. Partial support for activities from Coweeta LTER.

Name: Milanovich, Joseph

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Examining the effects of historic and projected future land use patterns on stream morphology, hydrology, water quality and biota through characterizing the occupancy and relative abundance of salamander larvae and stream macroinvertebrates. Partial support for activities from Coweeta LTER.

Name: Cecala, Kristen

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Examining the effects of historic and projected future land use patterns on stream morphology, hydrology, water quality and biota through characterizing the occupancy and relative abundance of salamander larvae and stream macroinvertebrates. Partial support for activities from Coweeta LTER.

Name: McLean, Katlin

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Research on soil nutrient biogeochemistry along the elevational gradient plots linked to vegetation dynamics. Partial support for activities from Coweeta LTER.

Name: Frisch, John

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Biotic synoptic sampling across the Little Tennessee Watershed in relation to geomorphology and water. Partial support for activities from Coweeta LTER.

Name: Lumpkin, Heather

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Carried out studies focused on understanding the role of land-use history and contemporary landscape patterns affect the presence and abundance of invasive plants in the forest understory. Partial support for activities from Coweeta LTER.

Name: Gooch, Michelle

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Carried out studies focused on understanding the role of land-use history and contemporary landscape patterns affect the presence and abundance of invasive plants in the forest understory. Partial support for activities from Coweeta LTER.

Name: Kuhman, Timothy

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Carried out studies focused on understanding the role of land-use history and contemporary landscape patterns affect

the presence and abundance of invasive plants in the forest understory. Partial support for activities from Coweeta LTER.

Name: Cheever, Beth

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Participated in developing and executing synoptic and aquatic sampling of Little Tennessee Watershed. Partial support for activities from Coweeta LTER.

Name: Kratzer, Erika

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Lin, Laurence

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Jeremiah, Nick

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Northington, Robert

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Undergraduate Student

Name: Watts, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Understanding and predicting the impacts of the tree and invasive species movement on nutrient and carbon cycling in response to climate change. Partial support for activities from Coweeta LTER.

Name: Watkins, Jessica

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Development of relational databases, GIS datasets, and socio-economic assessments pertaining to land parcel, land sale history, and environmental protection, and maintenance and updating of the Coweeta LTER Website. Partial support for activities from Coweeta LTER.

Name: Vance, Jonathan

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Development of relational databases, GIS datasets, and socio-economic assessments pertaining to land parcel, land sale history, and environmental protection, and maintenance and updating of the Coweeta LTER Website. Partial support for activities from Coweeta LTER.

Name: Love, Kenneth

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Development of relational databases, GIS datasets, and socio-economic assessments pertaining to land parcel, land sale history, and environmental protection, and maintenance and updating of the Coweeta LTER Website. Partial support for activities from Coweeta LTER.

Name: Soltof, Ben

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Davis, Joseph

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Understand and quantify how natural & human-mediated disturbances affect forest water and carbon cycling, the structural & functional controls on forest water and carbon cycling, and how water use affects tree and forest carbon fluxes. Partial support for activities from Coweeta LTER.

Name: Luttrel, Rachel

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Performed a field experiment to test a hypothesis about a how land use affects native plants, and considered the influence of other drivers on plant population persistence. Partial support for activities from Coweeta LTER.

Name: Vulova, Stenka

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Development of relational databases, GIS datasets, and socio-economic assessments pertaining to land parcel, land sale history, and environmental protection, and maintenance and updating of the Coweeta LTER Website. Partial support for activities from Coweeta LTER.

Name: Long, Lynsey

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify channel morphology and stream temperature in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Cosgrove, Julia

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Hung, David

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Examining the effects of historic and projected future land use patterns on stream morphology, hydrology, water quality and biota through characterizing the occupancy and relative abundance of salamander larvae and stream macroinvertebrates. Partial support for activities from Coweeta LTER.

Name: Masunaga, Aki

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Studying the effects of residential development and climate on breeding bird communities and herbaceous species of Appalachian forests. Partial support for activities from Coweeta LTER.

Name: Moore, Bryan

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Studying the effects of residential development and climate on breeding bird communities and herbaceous species of Appalachian forests. Partial support for activities from Coweeta LTER.

Name: Kresl, Cameron

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Biotic synoptic sampling across the Little Tennessee Watershed in relation to geomorphology and water. Partial support for activities from Coweeta LTER.

Name: Widney, Sarah

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Research on linking species specific parameters of water stress with plant demography. No direct support from the Coweeta LTER research funds.

Name: Baish, Alex

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Baker, Aurora

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: McCoy, Brandi

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Working on relation of nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Technician, Programmer

Name: Jenks, Andrew

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Partial support for activities from Coweeta LTER.

Name: Lish, Barbara

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: See, Craig

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Bergen, Elizabeth

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Berger-Jones, Kaitlin

Worked for more than 160 Hours: No

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Nichols, Lauren

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Werrell, Peter

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Collecting data from observational studies and landscape scale experiments to analyze how disturbance and climate change affect forest diversity. Partial support for activities from Coweeta LTER.

Name: Sobek, Christine

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Understand and quantify how natural & human-mediated disturbances affect forest water and carbon cycling, the structural & functional controls on forest water and carbon cycling, and how water use affects tree and forest carbon fluxes. No direct support from the Coweeta LTER research funds.

Name: McCollum, Robert

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Understand and quantify how natural & human-mediated disturbances affect forest water and carbon cycling, the structural & functional controls on forest water and carbon cycling, and how water use affects tree and forest carbon fluxes. No direct support from the Coweeta LTER research funds.

Name: Love, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Chamblee, John

Worked for more than 160 Hours: Yes

Contribution to Project:
11/08-10/09: Development of relational databases, GIS datasets, and socio-economic assessments pertaining to land parcel, land sale history, and environmental protection, and maintenance and updating of the Coweeta LTER Website. Partial support for activities from Coweeta LTER.

Name: Anderson, Zach

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Allen, Hunter

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Participated in site characterization for Phase 1 synoptic sites, developed a 2006 land cover map for the southern Appalachian study region, and documented land cover and land use change within the Little Tennessee watershed. Partial support for activities from Coweeta LTER.

Name: McMillan, Joseph

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Participated in site characterization for Phase 1 synoptic sites, developed a 2006 land cover map for the southern Appalachian study region, and documented land cover and land use change within the Little Tennessee watershed. Partial support for activities from Coweeta LTER.

Name: Nguyen, Thuy

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Participated in site characterization for Phase 1 synoptic sites, developed a 2006 land cover map for the southern Appalachian study region, and documented land cover and land use change within the Little Tennessee watershed. Partial support for activities from Coweeta LTER.

Name: Brown, Cindi

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify soil properties in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. No direct support from the Coweeta LTER research funds.

Name: Muldoon, Neal

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify soil properties in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. No direct support from the Coweeta LTER research funds.

Name: Robertson, Shelley

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Working to quantify channel morphology and stream temperature in relation to nutrient concentrations, sediment sources, and biotic assemblages along longitudinal gradients and across watersheds differing substantially in development amounts and patterns. Partial support for activities from Coweeta LTER.

Name: Harper, Carol

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Meador, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Deal, Jim

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Kitzner, Jim

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Poindexter, Mamie

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Cladis, Sheila

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Coweeta LTER site support of project activities including collecting, QC, and archiving of data, and management of vehicles and facilities. Partial support for activities from Coweeta LTER.

Name: Frankson, Paul

Worked for more than 160 Hours: No

Contribution to Project:

11/08-10/09: Research on soil nutrient biogeochemistry along the elevational gradient plots linked to vegetation dynamics. Partial support for activities from Coweeta LTER.

Name: Hutchins, Matthew

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Studying the effects of residential development and climate on breeding bird communities and herbaceous species of Appalachian forests. Partial support for activities from Coweeta LTER.

Other Participant

Research Experience for Undergraduates

Name: Zyla, Abby

Worked for more than 160 Hours: Yes

Contribution to Project:

11/08-10/09: Interviewed local residents of Appalachia for stories and songs about natural history, then retold them and illustrated to produce the manuscript of a children's book. Partial support for activities from Coweeta LTER.

Years of schooling completed: Other

Home Institution: Same as Research Site

Home Institution if Other:

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU site award

Organizational Partners

Yale University

Coweeta LTER researcher Mark Bradford is based at Yale School of Forestry & Environmental Studies. Students working with him, including B. Watts, Z. Tang, A. Keiser, and M. Strickland, received support from Yale that includes doctoral stipends, tuition and student grants.

Little Tennessee Watershed Association

Coweeta LTER researchers and staff, including P. Bolstad, J. Chamblee, T. Gragson, and J. Love, collaborate with LTWA members on a variety of outreach-related activities in the Little Tennessee Basin. These include biomonitoring and biotic inventory, water quality/quantity assessment, database development, and training.

Macon Middle School

Coweeta LTER researchers, staff and students work with members of the teaching staff at Macon Middle School (Macon County, NC) in science education. Activities include installation of meteorological equipment, co-teaching science classes, establishing citizen science projects on campus, and curriculum development.

Rabun Gap Nacoochee School

Coweeta LTER researchers, staff and students work with members of the teaching staff at Rabun Gap Nacoochee School (Rabun County, GA) in science education. Activities include installation of meteorological equipment, co-teaching science classes, establishing citizen science projects on campus, and curriculum development.

Other Collaborators or Contacts

COLLABORATORS or CONTACTS: 11/01/08 Through 10/31/09

Summary of selected collaborations:

L. Band worked with TC Hales at Cardiff University and US Forest Service researcher on a project addressing altered landslide regimes and mechanisms in Southern Appalachia.

P. Bolstad worked with Bruce Cook of NASA Goddard on waveform LiDAR data collection, Emilio Chuvieco of the University of Alcala de Henares on remote sensing of canopy architecture, and Ramesh Shrestha of NCALM on discrete-return LiDAR data collection in estimation of basin-wide leaf area.

J. Chamblee worked with William McClarney of the Little Tennessee Watershed Association to develop a relational database, GIS dataset, and prototype web application providing an access portal to 19 years of biomonitoring data across the Little Tennessee Watershed. This encompasses 7,722 individual observations on 196,238 distinct fish distributed across 80 unique species and species-hybrid classes.

C. Dehring worked with the Georgia Land Conservation Program in a project using data from the relatively new Georgia Income Tax Credit Program to examine the sensitivity of conservation activity to income.

C. Ford collaborated with Nina Wurzburger at Princeton University, Ronald Hendrick at the University of Georgia, and Brain Kloeppel at Western Carolina University on a study of forest soil CO2 efflux.

A. Soudril partnered with University of North Carolina ? Asheville and Montreat College on a PhotoVoice project that was then presented and displayed at in Black Mountain and Swannanoa (Buncombe County, NC).

M. Turner worked with US Forest Service personnel at Bent Creek Experimental Forest on a detailed study of the effects of land-use history on the presence and abundance of invasive plant species in the forest understory.

J. Hepinstall collaborated with R. Pontius at Clark University on a cross-site mapping project to standardize land cover and metrics for comparison.

Comprehensive list of institutions with which Coweeta LTER senior personnel and graduate students collaborated:

1. Bent Creek Experimental Forest
2. Black Mountain Public Library
3. Cardiff University
4. Carolina Vegetation Survey
5. City of Franklin, NC
6. Clark University
7. Coastal Carolina University
8. Columbia University
9. Friends of the Greenway
10. Georgia Land Conservation Program
11. Grandfather Mountain Golf & Country Club
12. Great Smoky Mountains National Park
13. Great Smoky Mountains Institute at Tremont
14. Highlands Biological Station
15. INRA - Toulouse
16. LandCare - New Zealand
17. Land Trust for the Littlee Tennessee
18. Macon County Folk Heritage Association
19. Macon Middle School
20. Montreat College
21. Mountain Air Property Owners Association
22. Mt Holyoak College
23. NASA Goddard Space Flight Center
24. NC Geological Survey through the same project.
25. North Carolina Department of Natural Resources
26. Northern Arizona University
27. Oak Ridge National Laboratory
28. Pisgah National Forest
29. Princeton University
30. Rabun Gap Nachoochee School
31. Swannanoa Valley Museum
32. Swannanoa Valley Public Library
33. The Little Tennessee River Watershed Association
34. The National Center for Airborne Laser Mapping
35. Town of Beech Mountain
36. University of Alabama
37. University of Alcala de Henares
38. University of Illinois
39. University of North Carolina - Asheville
40. University of Pau
41. University of Toulouse
42. University of Wisconsin
43. US Environmental Protection Agency
44. US Fish and Wildlife Service
45. US Forest Service ? Nantahala Ranger District
46. USGS Fisheries Cooperative Unit
47. Virginia Master Naturalist Program, Department of Forestry, Virginia Tech
48. Western Carolina University
49. Western North Carolina Alliance
50. Wolf Laurel Homeowners Association

Activities and Findings

Research and Education Activities:

RESEARCH ACTIVITIES: 11/01/08 to 10/31/09

Activities this year depended on funding from the Coweeta LTER award (DEB-0823293 and DEB-0218001) as well as funding from NSF (other programs), National Park Service, NASA, EPA, DOE, US Forest Service, US Fish and Wildlife Service, Andrew W. Mellon Foundation, the University of Georgia Research Foundation, the CURO ?Diversity? Apprentice Program as well as support from McIntire-Stennis formula funding to the U of Georgia Warnell School of Forest Resources. Activities this year included:

A field seeding experiment with non-native Oriental bittersweet (Celastrus orbiculatus) was implemented to elucidate the specific factors related to land-use history that might be facilitating invasion.

A project was initiated in the French Broad on the interaction between land-use history and climate variation as it affects establishment and growth of native herbaceous species. To investigate the influence of climate and land-use history on species? current distribution, 50 random points were sampled across a climate gradient that was generated using Mahalanobis Distance models for 24 native forest herb species. These models were created using existing data from the Carolina Vegetation Survey. A 20 x 20m plot was created at each random point. Within each plot, three transects were established at 0, 10 and 20 m, and percent cover of 24 focal species was recorded in six 1- x 1-m quadrats evenly spaced along each transect. Other variables measured in each plot included percent cover for herbs and shrubs, litter depth, tree species composition, basal area, and density (using point-quarter counts), aspect, slope, and terrain shape. Additionally, five soil cores (15-dm depth) were obtained from each plot. Data will be used to model climate suitability for each species and to predict potential range shifts under climate change scenarios.

A set of studies were completed this year focused on understanding the role of land-use history and contemporary landscape patterns as they affect the presence and abundance of invasive plants in the forest understory. Tom Albright (previous PhD student affiliated with CWT) submitted a manuscript on the distribution of Celastrus orbiculatus, and that paper is now in press (Albright et al., in press). Dean Anderson (previous postdoc) submitted a manuscript on the distribution of Microstegium vimineum with a focus on relatively undisturbed forest plots.

A study was carried out on channel morphology and stream temperature across 57 locations in 12 watersheds within the Little Tennessee Basin as part of a larger effort to quantify differences in amount and pattern of development along longitudinal gradients.

A study was carried out on the consequences of exurbanization on local societies and on landscape in Buncombe County, NC. Fieldwork was carried out in four communities in Buncombe County consisting of interviews with local residents, a PhotoVoice project centered on perceptions of the land-use changes through photographs that informants were asked to take, and participatory GIS.

A study was initiated determine if the effects of exurban development on (a) bird species abundance and (b) nest predation will be exacerbated by the warmer climate projected for the Southern Appalachian region. Point counts and an artificial nest experiment were conducted during summer 2009 at locations of varying exurban development density and climate, using elevation as a surrogate for climate. Both the avian abundance and nest predation study employed a 2 x 3 experimental design in which treatments were stratified by elevation (high and low) and exurban development density (none, low, and high). Point counts for the avian abundance study were conducted in seven study sites (four high elevation and three low elevation) with 15 points at each site for a total of 105 points. Each point was visited three times during mornings in May and June for a 10-min point count. These points were revisited in July to characterize the surrounding area and forest structure. An artificial nest experiment was conducted at four (two high elevation and two low elevation) of the sites used for point counts. At each site, nine plots were established with 10 artificial nests for a total of 36 plots and 360 artificial nests. Artificial nests were checked at three-day intervals over 18 days in June to record depredation of the two Button Quail eggs placed in each artificial nest at the beginning of the experiment. Analyses of data from both of these studies are in progress.

Activies directed at linking species-specific parameters of water stress with plant demography were carried out. The goal is to improve plant demography models by linking soil moisture stress and mortality.

Built three GIS datasets in support of the development and publication of land parcel and land sale history in relation to environmental protection regulations to real estate market capitalization in Buncombe County, NC. These consisted of an annualized 8-year land owneship parcel history database, a 13-year comprehensive land sale database, and a reference environmental and socio-economic database. These were used multiple GIS sampling episodes and relational-database driven data censoring to develop datasets for input into hedonic price models.

Conducted ecohydrologic analysis and simulation of distributed carbon, water and nitrogen cycling, forest growth, spatial patterns of canopy LAI and root depth and strength. Two publications have resulted from this work: The first investigates the development of soil shear strength augmentation by root reinforcement, and variations with species and topographic positions, the second on the long term adjustment of the forest canopy spatial pattern to distributed hydrologic processes. Research in both cases included detailed field research on root distribution and properties, field and lab measurement of root properties, and spatial analysis and simulation of ecohydrological processes and patterns.

Conducted fluvial geomorphology and stream water quality analysis in the Little Tennessee Basin to determine relative human impact. Focus is on both long-term and short-term timescales that encompass prehistoric to modern changes as well as recent changes within the last several decades related to housing growth and development in the region. The research is concerned with sediment transport and storage in the fluvial system and how it relates to aquatic ecosystems.

Conducting a large, observational study across a pronounced climate gradient, with 12 paired invasion sites at each of three locations (in around the basin, the Chatahoochee, the Georgia Piedmont; giving 72 experimental plots) and measured ecosystem and community consequences of the grasses presence in addition to metrics that will help us delineate the species? niche. Survey approaches were used to investigate the species presence or absence based on proximate variables (e.g. soil moisture and light) and proxy variables (e.g. distance to waterway or slope). The survey work sets the stage for further investigation of the species fitness (e.g. seed abundance and quality) as a function of habitat and to inform experimental hypotheses relating to its likely spread and impact per climate change and exurbanization.

Constructed and deployed systems that captured whole-tree water transport based on sap flux methodology in two common riparian species in the Coweeta Basin. The data will be synthesized this winter along with past data on other species throughout the southeast into a meta-analysis that will provide general scaling relationships based on xylem anatomy.

Data collected from observational studies and landscape scale experiments was analyzed to discern how disturbance and climate change affect forest diversity. Results are being assimilated using models to understand how forests will respond to future climate change. The goals include predictions of species at risk of extinction, those likely to increase in dominance, and others likely to immigrate with climate change.

Developed relational database in support of thematic analysis of 442 spatially-contextualized ethnographic interviews concerning land use and land use change among short-term and long-term residents in the Swannanoa Valley, Buncombe County, NC. Including generating maps for follow-up interviews concerning photograph locations.

Development 2006 land cover map for the regional study area that supports different projects and CWT participants. The map is based on satellite data compiled and pre-processed, ancillary geospatial data layers (e.g., elevation and derived layers), training and testing sites classified from digital aerial imagery (DOQQs), and preliminary classifications completed. Final products should be available for use fall 2009.

Development relational database with linked GIS dataset along with a prototype web application for display and download of retrospective fish-species diversity data across the Little Tennessee Watershed.

Document the avian communities surrounding synoptic study sites in the Littlee Tennessee Basin. Each of 38 sites were sampled 2 or 3 times during the 2009 breeding season (May 15th ? July 5th). All birds seen or heard were recorded.

Initial stages of a project were completed that builds on historic research at Coweeta demonstrating the effects nutrient enrichment on nutrient dynamics and heterotroph communities in streams. This research, drawing on funding from other sources as well, will be a multi-year study of stream responses to different ratios of nitrogen and phosphorus enrichment.

Investigated the impact of conservation easements on immediately proximate and distant properties in the Asheville, NC area. Those properties that are immediately adjacent to a conservation easement likely receive some benefits as development is limited whereas those properties that are in the so-called ?viewshed? or which have visual access to the easement, even if they are miles away, may also receive an amenity effect of a conservation easement, something that has heretofore not been investigated. First part of the empirical work focused on proximate properties is finished, the second part, focusing on the viewshed, is ongoing.

Investigated the impact of land-use restrictions in watersheds on property values of the encumbered properties and those properties that are impacted (generally in a positive manner) from the land-use restrictions. Paper was published in Regional Science and Urban Economics, which is a high-quality peer-reviewed journal.

Lead editors of Coweeta WS7 synthesis volume completed manuscript for submission to Oxford Press.

Patterns of salamander species loss under projected climate change scenarios was modeled using current and future climatic ranges for all species currently located within the southern Appalachian mountains. To address the potential consequences of species losses, current abundance and nutrient stocks retained within salamander communities within the Coweeta basin were measured. In situ communities were also constructed to representing current and future projected assemblages of salamanders to determine whether their will be a net change in larval salamander biomass and associated nutrient retention within headwater ecosystems.

Preliminary steps were taken on investigating the relation between Atlanta as a global city and the exurbanization of Macon County, NC. This includes establishing connection between citizen scientific engagements to climate change within the Southern Appalachian region.

Project documented recent land use and land cover change within the Little Tennessee watershed in collaboration with G. Pontius from Clark University. The work involved compiling land cover, land use, and ancillary geospatial data for the watershed, documented changes, and developing a model to explain the observed changes.

Project was initiated with Gaby Katul (Duke University) and John Walker (US-EPA) to establish an eddy flux tower at Coweeta using a combination of funds from the USFS, the US-EPA, with support from Coweeta LTER.

Relational database in support of the Synoptic Sampling Program in Macon County, NC, was built. This consisted of developing a relational database framework for geomorphological and photographic data, and delineating watersheds based on synoptic sampling and GIS-based resampling of regional datasets to the spatial extent of derived watersheds. Also compilation of data documentation and metadata as well as developing occupancy index to establish a gradient of human activity among watersheds that are all heavily forested, and in semi-rural areas located far from the nearest town settlement.

Research was initiated to discern the relationship between forest soil CO2 efflux and transpiration is in preliminary stages. By combining the ongoing measurements of forest transpiration in a species-rich system (described above), with measurements of soil CO2 efflux and modeling techniques, we will be able to elucidate patterns of soil autotrophic respiration.

Roadside surveys were conducted throughout a four-county region to determine the distribution of a suite of non-native forest invaders, and the factors explaining their distributions were examined at local and regional scales using linear and generalized linear models.

Sap flux methodology and scaling techniques were used to quantify the transpirational flux of eastern hemlock and co-occurring deciduous species to assess the probable effect of replacing hemlock by co-occurring deciduous species. Eastern hemlock is at risk of potential extirpation throughout its range due to attack by the invasive, exotic insect hemlock woolly adelgid (HWA).

Several manuscripts were prepared for an edited book on comparing land use change between Southern Appalachia and the North-facing Pyr?n?es (France) mountains.

Synoptic Stream Sampling project was initiated this year to examine the effects of historic and projected future land use patterns on stream morphology, hydrology, water quality and biota. Fifty seven streams across 12 watersheds representing different land use categories were selected. Stream morphology was measured along with water chemistry during two sampling periods. In addition, occupancy and relative abundance of salamander larvas, stream macroinvertebrates and fish species were characterized in relation to land use metrics and stream character.

Tim Kuhman completed his dissertation (Kuhman 2009), which focused on non-native invasive plants that are well adapted for spread in forested landscapes and pose a threat to forest communities in the southern Appalachians.

To assess the influence of climate and land-use history on establishment of forest herbs experimentally, an additional 20 x 20 m germination plot was established adjacent to or in close proximity to each of the performance plots. An additional two data-loggers were placed in each of the germination plots. Seeds were collected from wild plants of six species (Disporum lanuginosum, Maianthemum racemosa, Melampyrum lineareae, Trillium erectum, Trillium grandiflorum, and Streptopus amplexifolius) and planted along three transects in each plot. Species were randomly ordered within three 2 x 2 m subplots along each transect, for a total of nine subplots per plot. Seed densities varied from 10 to 20 seeds per 0.5 m2. Data on percent germination and performance of seedlings will be collected during summer 2010.

To assess the influence of climate and land-use history on performance and population dynamics of forest herbs, 20 sites were selected using a 2 x 2 design reflecting climate suitability (suitable or not) and stand age (old or young). Climate suitability was determined using data described above for five species (Arisaema triphyllum, Caulophyllum thalictroides, Disporum lanuginosum, Sanguinaria canadensis, and Trillium grandiflorum). At each site, 20 x 20 m performance plots were established that contained populations of at least three of these species. Premanent quadrats (1 x 2 m) were established around populations of these species, and individual plants were mapped to the nearest centimeter. Measurements related to biomass and life-history stage (i.e., stem height, leaf area, number of flowers and/or fruits) were taken for each individual until a sample size of at least 20 individuals per species was reached in every plot. The same environmental covariates described above for the distribution modeling were also recorded for each of these plots. Additionally, a Thermocron iButton data-logger was placed in the air and in the soil (buried to a depth of 10 cm) in each performance plot to record air/soil temperature at 4-hour intervals throughout the year. The same plants will be re-measured during summer 2010 to monitor individual plant performance (indicated by change in biomass) and population dynamics (indicated by death and establishment rates).

We collected and organized climatic data records, including soil and air temperature, soil moisture, precipitation, solar insolation, and river flow, both from the Coweeta network (4 to 12 stations, depending on variables), and regional networks (11 to 62 stations, depending on variables), over a 30-year record. Then developed models to estimate spatial fields of important environmental driving variables, including air temperature, precipitation, insolation, vapor pressure deficit, soil depth, moisture, and temperature, overstory leaf area, and species composition. Finally optimized spatial field models, and estimated plant watershed in hierarchical models, testing sensitivity to parameter variation using Monte-Carlo/Markov Chain simulations. The objective is to determine how does forest structure, particularly leaf area, species composition, and canopy display of leaves, affect aggreagate plant water use and carbon cycling across space and time, and second, how does human disturbance history and current disturbance regimes alter these cycles.

We developed a spatially explicit simulation model to investigate how stochasticity in survival and reproduction influence population dynamics on landscapes that differ in habitat configuration. Results indicated that habitat configuration has a dominant effect on population size, accounting for up to 80% of the variation in population size. Stochasticity in survival and reproduction were much less influential, but tended to exacerbate the negative effects of habitat configuration by increasing the number of local extinctions in isolated habitat patches. In a separate study.

We examined the response of six forest herb taxa to N fertilization in forests with and without an agricultural history to examine the hypothesis that plants in post-agricultural stands are N limited.

We have a combined, experimental field and laboratory experiment established using sites, soils and litters within the Coweeta basin and extending outside of the basin to higher elevation (Blue Ridge Parkway) in a study to predict the influence of tree species movement, in response to climate change, on nutrient and carbon cycling.

We initiated an investigation of the effects of hemlock loss, due to infestation by the hemlock woolly adelgid, on nutrient dynamics along an N deposition gradient in the Coweeta basin. Our primary objective is to understand how the spread of exotics (plant or insect) will alter the availability and cycling of nutrients in Southern Appalachian forests.

PUBLICATIONS NOT REPORTED ELSEWHERE (in press, in revision & in review): 11/1/08 to 10/31/09

Albright, T., D. Anderson, N. Keuler, S. Pearson, and M.G. Turner. The spatial legacy of introduction: Celastrus orbiculatus in the southern Appalachians, USA. Journal of Applied Ecology.

Anderson, D.P., M.G. Turner, S.M. Pearson, T.P. Albright, R.K. Peet and A. Wieben. Spatial attributes of the Microstegium vimineum invasion in forests of the southern Blue Ridge Mountains, U.S.A. Landscape Ecology.

Ball, B.A., Hunter, M.D., Kominoski, J.S., Pringle, C.M., Bradford, M.A. Responses of litter and microbial C dynamics to litter mixing in a coupled terrestrial and aquatic system. Ecology.

Ball, B.A., M.D. Hunter, J.S. Kominoski, C.M. Pringle and M.A. Bradford. Responses of litter and microbial C dynamics to litter mixing in A coupled terrestrial and aquatic system. Functional Ecology.

Chamblee, J.F., P.F. Colwell, C.A. Dehring, and C.A. Depken. The value of land conservation.

Clark, J.S., D. Bell, M. Dietze, M. Hersh, I. Ibanez, S. LaDeau, S. McMahon, J. Metcalf, E. Moran, L. Pangle, and M. Wolosin. 2009. Models for demography of plant populations. in T. O'Hagan and M. West (eds) Handbook of Bayesian Analysis, Oxford University Press.

Davies, C.A., Fierer, N., Maddox, T.R., Bradford, M.A. The anammox process in a forest soil. Soil Biology & Biochemistry.

Dye, S.E., C.M. Pringle and J.L. Meyer. Weak trophic cascades In a complex foodweb with omnivory. Freshwater Biology.

Ford C.R., Reynolds B.C., Vose J.M. Xylem transport models optimize effectiveness of systemic insecticide applications for controlling hemlock woolly adelgid. Forest Science.

Fraterrigo, J.M., S.M. Pearson, and M. G.Turner. Joint effects of habitat configuration and temporal stochasticity on population dynamics. Landscape Ecology.

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Lalibert?, E., J. Wells, F. DeClerck, D. Metcalfe, C. Catterall, C. Queiroz, I. Aubin, S. Bonser, Y. Ding, J. M. Fraterrigo, J. Morgan, P. Vesk, and M. Mayfield. Land use intensification reduces response diversity in plant communities.

Leigh, D.S. Morphology and channel evolution of small streams in the southern Blue Ridge Mountains of western North Carolina. Southeastern Geographer.

McMahon, S. M., M. C. Dietze, M. H. Hersh, E. V. Moran, and J. S. Clark. 2009. A Predictive Framework to Understand Forest Responses to Global Change. Pages 221-236 in R. Ostfeld and W.H. Schlesinger (eds). Year in Ecology and Conservation Biology 2009.

Metcalf, C.J.E., J. S. Clark, and D. A. Clark. 2009. Tree growth inference and prediction when the point of measurement changes: modelling around buttresses in tropical forests. Journal of Tropical Ecology.

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Price, K., C.R. Jackson, and A.J. Parker. Variation of surficial soil hydraulic properties across land uses in the southern Blue Ridge Mountains. Journal of Hydrology.

Strickland, M.S., Callaham, M.A. Jr., Davies, C.A., Lauber, C.L., Ramirez, K., Richter, D.D., Fierer, N., Bradford, M.A. Rates of in situ carbon mineralization in relation to land-use, microbial community and edaphic characteristics. Soil Biology & Biochemistry.

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Warren, R.J, Bradford, M.A. Testing niche theory: observation and experimentation with two understorey herbs.

Findings:

FINDINGS: 11/01/08 to10/31/09

Ecohydrological equilibrium, or optimality, has been posed as an adjustment of ?canopy density? to local soil and climate conditions at the patch level, which maximizes productivity. We have demonstrated that this equilibrium concept operates at the level of hydrologic flowpaths where ecosystem patches are connected by the downslope transport of water and nutrients, and by extension to the catchment. This suggests that entire patterns of forest canopy ?density? (quantified here as leaf area index), are adjusted to maximize ecosystem productivity at the landscape level, and is not limited to individual patches (Hwang et al. in press).

Research was completed on the adaptive capacity of non-native invasive plants to spread in forested landscapes and pose a threat to forest communities in the southern Appalachians (Kuhman 2009). Both contemporary and historic land use can affect invasion by non-native plants.

Factors related to land use, the biotic community and the abiotic template were investigated at local to regional scales in western North Carolina to determine their roles in shaping the distributions of forest invaders. The influence of agricultural land-use history and roads was evaluated in a forested watershed where cultivated areas had been abandoned a century earlier. A field seeding experiment with non-native Oriental bittersweet (Celastrus orbiculatus) was implemented to elucidate the specific factors related to land-use history that might be facilitating invasion. Finally, roadside surveys were conducted throughout a four-county region to determine the distribution of a suite of non-native forest invaders, and the factors explaining their distributions were examined at local and regional scales using linear and generalized linear models. Land-use history was an important determinant of invasion, particular at local scales. Areas with agricultural land-use histories often had overstory communities with high tulip poplar (Liriodendron tulipifera) dominance. Such areas had more invasive plants than comparable sites that were never cultivated and typically dominated by oaks (Quercus spp). Field experiment results indicated that higher invasibility in tulip poplar stands could be attributed to thinner leaf litter layers and moister soil conditions. Results from the broader-scale survey showed that the factors explaining distributions of forest invaders throughout the region varied among species and between scales of analysis. At the regional scale, many species were more common closer to the city center (Asheville, NC), at lower elevations, and in watersheds with less forest cover. At the local scale, species responded more strongly to land use and land cover; many were more common in areas with greater forest regrowth and less total forest cover. Overall, results emphasize the important role of land-use history and provide insights regarding the interactions between historic land use and the contemporary landscape that influence non-native plant invasion in the forest-dominated southern Appalachians. Three manuscripts are forthcoming from this work.

Forests with a history of agriculture can have reduced nitrogen (N) availability. Response of six forest herb taxa to N fertilization was examined in forests with and without an agricultural history to assess the hypothesis that plants in post-agricultural stands are N limited (Fraterrigo et al. 2009). Significant interaction was found between land-use history and N treatment for several species, such that N fertilization increased aboveground biomass or leaf area more in the post-agriculture site than in the reference site. Surprisingly, N fertilization depressed aboveground biomass or leaf area for several species in the reference site. These results suggest that some plants growing in post-agricultural stands may be N limited, whereas undisturbed stands in this region appear to be approaching N saturation. Thus, environmental conditions, and particularly N availability, may be an obstacle to the restoration of forest herb communities. We also considered the joint effects of contemporary land use and climate variation on plant persistence.

A spatially explicit simulation model was developed to investigate how stochasticity in survival and reproduction influence population dynamics on landscapes that differ in habitat configuration (Fraterrigo et al. 2009). Results indicated that habitat configuration has a dominant effect on population size, accounting for up to 80% of the variation in population size. Stochasticity in survival and reproduction were much less influential, but tended to exacerbate the negative effects of habitat configuration by increasing the number of local extinctions in isolated habitat patches. In a related study currently in press (Pearson and Fraterrigo, in press), the influence of spatial variation in habitat quality on plant populations was considered, finding a dominant effect of habitat configuration. Together, these studies suggest that greater environmental variability, as might arise due to climate change, is likely to compound population losses due to habitat fragmentation and variation in habitat quality. Additional results are included in a review article on disturbance-driven changes in ecological variability (Fraterrigo and Rusak 2008).

Work recently published (Hales et al. 2009) provides the results of an investigation into the relationship between species composition, topographic and soil characteristics, and landslide potential. This work showed that species and topographic position affect root tensile strength and thus landslide potential. Furthermore, data showed that across all species, root tensile strength was positively correlated with root cellulose content, and that within a species, root cellulose content per unit root diameter was greater in species occupying more convex topographic positions compared to more concave ones.

A study was published (Nuckolls et al. 2009) on hemlock decline induced by either girdling or HWA infestation and quantified the concurrent changes to the carbon cycle in a mixed stand of hemlock and hardwoods. The results of this research suggest that hemlock is declining more rapidly from HWA infestation in the southeast than in the northeast, and that hemlock decline from HWA has a rapid effect on the carbon cycle.

Among several recent published results are the findings that species show large differences in terms of their sensitivities to mean climate differences (i.e., spatial variation), which are typically used to model biodiversity response to climate change, and variation within a location, over time. The latter is what species will actually experience and may explain the results of invasion studies that the successful species were not necessarily those most likely to invade with future climate change (Ib??ez et al. 2008, 2009).

A Coweeta LTER project investigated the impact of land-use restrictions in watersheds influences property values of the encumbered properties and those properties that are impacted (generally in a positive manner) from the land-use restrictions. Results indicated that encumbered properties were reduced in value, as reflected in market transactions, whereas those properties that enjoyed ecosystem benefits from the watershed protection policy increased in value. These findings were the basis for suggestions that policy makers might consider compensatory measures in future watershed policies (Chamblee et al. 2009).

A study by Ardon et al. (2009) used standardized analytical techniques to measure chemistry and breakdown rate of leaves from common riparian tree species. Comparisons of the effects of leaf litter chemistry on leaf breakdown rates in tropical versus temperate streams are hindered by the lack of comparability of analytical methods used to measure leaf chemistry between studies and across sites. We conducted this study at two sites where there is a relatively large amount of information on litter chemistry and breakdown rates in streams: a tropical site (La Selva Biological Station, Costa Rica) and a temperate site (Coweeta Hydrologic Laboratory, N.C., USA). We selected eight common riparian tree species from La Selva and seven common riparian species from Coweeta that spanned the range of leaf litter chemistry naturally entering streams at each site. We predicted that concentrations of secondary compounds would be higher in the tropical species than in the temperate species and that concentrations of condensed tannins would decrease breakdown rates in both sites. Contrary to our predictions, mean concentration of condensed tannins was significantly greater (2.6 fold, $p < 0.001$) for Coweeta than for La Selva species. Concentrations of condensed tannins were negatively correlated with breakdown rate among Coweeta species ($r = -0.77$), but not among La Selva species. Concentrations of structural compounds were strongly correlated with breakdown rate at both sites (Coweeta species: lignin $r = -0.94$, cellulose $r = -0.76$; La Selva species: cellulose $r = -0.78$, carbon $r = -0.76$). Findings challenge previous generalizations regarding tropical-temperate differences in how leaf litter secondary compounds determine breakdown in streams, by suggesting that the initial chemistry among these eight riparian species from La Selva and seven riparian species from Coweeta is not as different as previously thought. The results underline the importance of using standardized analytical techniques to measure leaf chemistry when making cross-site comparisons.

The publication by Gardiner et al. (2009) describes a proactive sampling strategy designed and implemented in 2000 by the Coweeta LTER Program to document changes in streams in which catchment land uses were predicted to change over the next two decades due to increased building density. Diatoms, macroinvertebrates, fishes, suspended solids, dissolved solids, and bed composition were measured at two reference sites and six ?hazard sites,? where a socioeconomic model suggested new building construction would influence stream ecosystems in the future. The six hazard sites were located in catchments with forested and agricultural land use histories. Diatoms were species-poor at reference sites but did not show clear patterns among the hazard sites. Cluster analysis, Wishart?s distance function, non-metric multidimensional scaling, indicator species analysis, and t-tests show that macroinvertebrate assemblages, fish assemblages, in situ physical measures, and catchment land use and land cover were different between streams whose catchments were mostly forested, relative to those with agricultural land use histories. Based on previous sampling and similar statistical analyses, we predict more rapidly deteriorating biotic integrity at the agricultural sites where more intense building activities occur. Comparing current fish collections with a previously collected data set, catchment classes were identified and mapped (k-means clustering) throughout an 8600 km2 region in western North Carolina?s Blue Ridge physiographic province. Combining field sampling, ordination, and simple statistical procedures, we identify catchments that were likely to be similar to the hazard sites at the inception of the study. A major contribution of this manuscript is that it predicts how two different trajectories of land use change will support streams with diverging biota and physical conditions over the next two decades and it provides a foundation for further hazard site monitoring by the Coweeta LTER Project.

Findings described in Kominoski et al. (2009) address the relationship between species diversity and leaf litter breakdown based on examining effects of leaf litter quality and species mixing on microbial community diversity and litter processing in a forested headwater stream. Single- and mixed-species litter from dominant tree species (Liriodendron tulipifera, Acer rubrum, Quercus prinus, Rhododendron maximum) were incubated in a southern Appalachian headwater stream at Coweeta . Litter carbon-to-nitrogen ratios (C:N), mass loss, microbial respiration, and microbial community diversity were analyzed on individual litter species after incubation. Initial C:N varied widely among individual litter species, and these differences persisted throughout the 50-day incubation period. Litter C:N of the recalcitrant species R. maximum remained higher than that of all other litter species, and C:N of R. maximum and L. tulipifera increased when both species were present together in a mixture. Although mass loss of individual species was generally unaffected by mixing, microbial respiration was greater on A. rubrum and Q. prinus litter incubated with R. maximum compared to either species alone. Enhanced resource heterogeneity, which was experimentally achieved by litter mixing low- and higher-quality litter species, resulted in apparent shifts in microbial community diversity on individual litter species. Responses of bacterial and fungal community diversity to litter mixing varied among individual litter species. Findings suggest that changes in tree species composition in riparian forests and subsequent changes in litter resource heterogeneity could alter stream microbial community diversity and function. As bacteria and fungi are important decomposers of plant litter in aquatic ecosystems, resource-dependent changes in microbial communities could alter detrital processing dynamics in streams.

In a paper ?in press? by Kominoski and Pringle, results are presented from testing the effects of leaf litter species diversity (i.e. litter mixing) on litter mass remaining and macroinvertebrate communities (taxon diversity, abundance and biomass) during breakdown in a detritus-based headwater stream at Coweeta. A full-factorial analyses was used of single- and mixed-species litter from dominant riparian tree species with distinct leaf chemistries [red maple (Acer rubrum), tulip poplar (Liriodendron tulipifera), chestnut oak (Quercus prinus) and rhododendron (Rhododendron maximum)] to test for additivity (single-species litter presence / absence effects) and non-additivity (emergent effects of litter species interactions). Findings were significant for non-additive effects of litter mixing on litter mass remaining that was explained by species composition, but not richness, and litter-mixing effects were variable throughout breakdown. Litter mixing had non-additive effects on macroinvertebrate community structure. The number of species in litter mixtures (two to four), but not litter species composition, was a significant predictor of the dominance of particular macroinvertebrates (i.e. indicator taxa) within mixed-species packs. In addition, the presence / absence of high- (L. tulipifera) and low-quality (R. maximum) litter had additive effects on macroinvertebrate taxon richness,

abundance and biomass. The presence of L. tulipifera litter had both positive (synergistic) and negative (antagonistic) effects on invertebrate taxon richness, that varied during breakdown but were not related to litter chemistry. In contrast, the presence / absence of L. tulipifera had a negative relationship with total macroinvertebrate biomass (due to low leaf mass remaining when L. tulipifera was present and higher condensed and hydrolysable tannins associated with leaf packs lacking L. tulipifera). Macroinvertebrate abundance was consistently lower when R. maximum was present, which was partially explained by litter chemistry [e.g. high concentrations of lignin, condensed tannins, hydrolysable tannins and total phenolics and high carbon to nutrient (N and P) ratios].

In a synthesis paper now in press (Kominoski et al. in press) examine effects of resource and consumer diversity on stream organic matter processing to identify general patterns and potential mechanisms of non-additivity across spatial and temporal heterogeneity. They also review multi-trophic consumer response patterns to resource diversity to assess how consumer diversity responses compare to independent resource and consumer effects on organic matter processing in streams. Consistent emergent patterns include: (1) Top-down (i.e. consumer) diversity effects are common among vertebrate, invertebrate and microbial trophic levels and are generally explained by species evenness; (2) bottom-up (i.e. resource) diversity effects are mediated by species evenness and vary both spatially and temporally and (3) consumer responses to resource diversity that best explain resource diversity effects are predominantly seen at thet microbial level. Resource and consumer diversity effects are driven by dominance of functionally distinct taxa. However, response of consumers to resource diversity only partially explain resource diversity effects, suggesting functional differences between how naturally colonizing and manipulated consumer assemblages use organic matter resources. The challenges facing general ecology and the advancement of Biodiversity-Ecosystem Function (BEF) Theory include an improved understanding of how environmental heterogeneity and temporal and spatial variation influence BEF patterns.

An article published in Ecological Indicators (Walters et al. 2009) reiterates that fine sediment is detrimental to aquatic biota. This and other information derived from the 2009 Synoptic Sampling in the Little Tennessee Basin clearly show that human impact has caused more than 50 percent narrowing of small stream channels in the upper Little Tennessee River basin. Narrowing of small stream channels equates to loss of aquatic habitat, so it has great ecological significance.

Presentations
Coweeta LTER senior personnel and their students delivered oral presentations of their research at the following venues:

2009 Southeastern Ecology and Evolution Annual Meeting in Gainesville, FL
The University of Alcala de Henares, Spain
Complutense University, Madrid, Spain
The University of Zaragoza, Spain
2009 Ecological Society of America Annual Meeting, Albuquerque, NM
2009 North American Bethological Society Annual Meeting, Grand Rapids, MI
Georgia Water Resources Conference, April 27-29, University of Georgia
American Geophysical Union Conference, San Francisco, CA
2009 All Scientists LTER Meeting, Estes Park

Media Coverage
Two recently published articles by Coweeta LTER researchers generated significant media coverage:

1. Nuckolls A, Wurzburger N, Ford CR, Hendrick RL, Vose JM, Kloeppel BD. 2009. Hemlock declines rapidly with hemlock woolly adelgid infestation: impacts on the carbon cycle of southern Appalachian forests. Ecosystems 12: 179?190. DOI:10.1007/s10021-008-9215-3

Story published 3/11/09: ClimateWire (online news source with subscription), Washington, DC: ?Changing the carbon cycle of eastern U.S. forests, one hemlock at a time?

Story published 3/7/09: Knoxville News Sentinel newspaper, Knoxville, TN: ?Trees dying faster than expected, carbon cycle altered: Adelgid damage more severe? http://www.knoxnews.com/news/2009/mar/07/adelgid-damage-more-severe/

Story aired 3/4/09: WJCW-AM, Johnson City, TN: Chelcy Ford appeared on live morning show 'Thinking Out Loud' at 7:45 am. This is a commercial radio station.

Story aired 3/3/09: WUOT Public Radio, Knoxville, TN ? Story covered in afternoon news reports.

Story published on 2/27/09: Charlotte Observer newspaper, Charlotte, NC: ?Study: Trees dying quickly: Insect may kill off most Eastern hemlocks within a decade, Forest Service researchers find? http://www.charlotteobserver.com/breaking/story/564181.html\

Story published on 2/27/09: News & Observer newspaper, Raleigh, NC: ?Study: Hemlocks dying quickly? http://www.newsobserver.com/news/health_science/story/1421520.html

Story published on 2/27/09: Asheville Citizen-Times newspaper, Asheville, NC: ?Study: Hemlocks dying faster than expected? http://www.citizen-times.com/apps/pbcs.dll/article?AID=2009902270353

Story published on 2/27/09: Hickory Daily Record newspaper, NC, (By Bruce Henderson, McClatchy Tribune Wire Service): ?Insect may kill off most Eastern hemlocks? http://www2.hickoryrecord.com/content/2009/feb/27/insect-may-kill-most-eastern-hemlocks/lifestyles/

Story published on 2/27/09: Statesville Record & Landmark newspaper, NC, (By Bruce Henderson, McClatchy Tribune Wire Service): ?Insect may kill off most Eastern hemlocks? http://www2.statesville.com/content/2009/feb/27/insect-may-kill-most-eastern-hemlocks/lifestyles/

Story published on 2/27/09: The McDowell News newspaper, NC, (By Bruce Henderson, McClatchy Tribune Wire Service): ?Insect may kill off most Eastern hemlocks? http://www2.mcdowellnews.com/content/2009/feb/27/insect-may-kill-most-eastern-hemlocks/lifestyles/

Story published on 2/27/09: Greenwire (online news source with subscription), Washington, DC: ?Eastern insect killing trees at high rate ? study? (Story available with subscription)

Story published on 2/27/09: RedOrbit.com (online news source): ?Hemlock Trees Dying Rapidly? http://www.redorbit.com/news/science/1646300/hemlock_trees_dying_rapidly/

Story on 2/26/09: Asheville Citizen-Times newspaper, Asheville, NC: ?Study: hemlocks dying fast, affecting carbon cycle? http://www.citizen-times.com/apps/pbcs.dll/article?AID=200990226023

Story on 2/26/09: WATE-TV, ABC affiliate, Knoxville, TN ?Study: most Hemlock trees in S. Appalachia could die within decade? http://www.wate.com/global/story.asp?s=9910692

Story on 2/26/09: WUNC Public Radio in Raleigh, NC carried the story in afternoon newscasts

Story on 2/26/09: WLRH Public Radio in Huntsville, AL carried the story in newscasts

Science Daily (online news source) ?Hemlock Trees Dying Rapidly, Affecting Forest Carbon Cycle? http://www.sciencedaily.com/releases/2009/02/090226122730.htm

ScienceMode (online news source) ?Study finds hemlock trees dying rapidly, affecting forest carbon cycle? http://sciencemode.com/2009/02/26/study-finds-hemlock-trees-dying-rapidly-affecting-forest-carbon-cycle/

Physorg.com (online news source) ?Study finds hemlock trees dying rapidly, affecting forest carbon cycle? http://www.physorg.com/news154872476.html

ScienceBlog.com (online news source) ?Study finds hemlock trees dying rapidly, affecting forest carbon cycle? http://www.scienceblog.com/cms/study-finds-hemlock-trees-dying-rapidly-affecting-forest-carbon-cycle-18964.html

Genetic Engineering News, (online and print publication) ?Study finds hemlock trees dying rapidly, affecting forest carbon cycle? http://www.genengnews.com/news/bnitem.aspx?name=50245196#

2. Hales TC, Ford CR, Hwang T, Vose JM, Band LE. 2009. Topographic and ecologic controls on root reinforcement. Journal of Geophysical Research 114: F03013. doi:10.1029/2008JF001168

Story on 8/31/09: WHSV - an ABC-TV affiliate in Shenandoah, Virginia - Aug. 31, 2009 'Certain Plant May Make Landslides in the Appalachians More Likely' http://www.whsv.com/news/headlines/56360427.html

Georgia Forestry Commission - Aug. 31, 2009 (has a link to the article on their website under 'Forestry News' http://www.gfc.state.ga.us/

EurekAlert - Aug. 31, 2009 'Rhododendron expansion may increase the chance of landslides on Southern Appalachian slopes'

http://www.eurekalert.org/pub_releases/2009-08/srs--rem083109.php

PhysOrg Mobile - Aug. 31, 2009 'Rhododendron expansion may increase the chance of landslides on Southern Appalachian slopes'
http://pda.physorg.com/rhododendron-species-southern_news170946074.html

Bright Surf - Aug. 31, 2009 'Rhododendron expansion may increase the chance of landslides on Southern Appalachian slopes'
http://www.brightsurf.com/news/headlines/48206/Rhododendron_expansion_may_increase_the_chance_of_landslides_on_Southern_Appalachian_s

RedOrbit - Aug. 31, 2009 'Rhododendron expansion could increase the chance of landslides on Southern Appalachian slopes'
http://www.redorbit.com/news/science/1745269/rhododendron_expansion_could_increase_the_chance_of_landslides_on_southern/index.html?sourc

First Science - Aug. 31, 2009 'Rhododendron expansion may increase the chance of landslides on Southern Appalachian slopes'
http://www.firstscience.com/home/news/breaking-news-all-topics/rhododendron-expansion-may-increase-the-chance-of-landslides-on-southern-app

Asheville Citizen Times - Sept. 1, 2009 'Study: More Rhododendrons may increase chances of landslides in Appalachians'
http://www.citizen-times.com/apps/pbcs.dll/article?AID=/20090901/LOCAL/90901036

Training and Development:

TRAINING & DEVELOPMENT: 11/01/08 to 10/31/09

Graduate students involved with Coweeta LTER research worked both as Research Assistants as well as Teaching Assistants in classes in hydrology, GIS, modeling, geography, and ecology often using material from the Coweeta project.

A distributed graduate seminar titled ?From Yardstick to Gyroscope? centering on socioecological methods for long-term research was co-taught January-May, 2009, by Ted Gragson (CWT), Laura Ogden (FCE), Morgan Grove (BES), and Chris Boone (CAP). Guest presentations explicitly identified the social and behavioral science theory behind focal questions driving site-level research along with how data are collected and analyzed. During this class, 25 graduate students distributed across the LTER Network worked with four site LPIs (FCE, BNZ, BES and CWT) and nine additional site researchers.

Undergraduate students in the UNC Institute for the Environment program based at the Highlands Biological Station collaborated with Coweeta personnel and local watershed NGOs on aquatic ecology of the Little Tennessee River.

Coweeta LTER researchers served as advisors to Post-doctoral investigators, as well as PhD and MS students at Yale University, University of Minnesota, University of Wisconsin, University of Illinois, University of North Carolina, Duke University, and University of Georgia. Five students graduated with a PhD and four with an MS.

A Coweeta LTER researcher (M. Bradford) is lead author for an ecology textbook chapter based on interactive learning using computer software. This is part of a larger effort by joint private industry and NSF funding to develop undergraduate, educational materials. The chapter utilizes the location and research conducted at the Coweeta LTER to illustrate concepts and present data and real world examples of decomposition in terrestrial and freshwater ecosystems.

Career development training and instruction in basic research were provided for three highschool students through the University of Georgia?s Young Dawgs career development program.

Between August 1, 2008 and June 25, 2009, the Coweeta LTER web site served 68,000 unique hosts and trasnfered 395 GB of data. Downloads of publications and data directories alone account for 72% of all bandwidth. An additional 10% of all traffic was accounted for by access of files and directories that provide key Information Management services including metadata provision, regional GIS data support, interpretation for the public of our research proposals and products, Schoolyard support, and collaborative research products.

Students enrolled in courses taught by Coweeta LTER researchers at Yale University, University of Minnesota, University of Wisconsin, University of Illinois, University of North Carolina, Duke University, and University of Georgia read papers written by Coweeta LTER researchers. These courses included graduate and undergraduate students in real estate, econometrics, and allied social sciences as well as geography, hydrology, biology, and ecology.

Graduate and undergraduate students were included in the execution of winter and summer synoptic sampling of 57 locations across the Little Tennessee Basin, as well as the conceptual basis for the assessment. The students participating in this research are being trained in climate

change influences on streams, computational approaches to N uptake in streams, ?pulse? and ?steady-state? assessment of nutrient uptake in streams, determining N and P availability in streams and the role that conusmers (i.e., aquatic macroinvertebrates) may play in nutrient cycling, and application of the Redfield Ratio to microbial assemblages in streams and stoichiometric control of N and P uptake.

Summer student interns working at the Coweeta Hydrologic Laboratory with the Coweeta LTER Site Manager and USFS researchers have been provided authenitic research experiences and the opportunity to co-author a long-term stream salamander paper; assist with the collection, QC, and archiving of a number of different data sets; work with the Schoolyard coordinator to train middle school students at Rabun Gap-Nacoochee School (RGNS) in field methods and establishment of citizen science projects at both RGNS and Macon Middle School; worked with graduate students and researchers in locating field sites and coordinating research activities; and participated in the Summer Coweeta LTER meeting.

Outreach Activities:

OUTREACH ACTIVITIES: 11/01/08 to 10/31/09

Established a stream salamander monitoring program at Rabun Gap Nacoochee School (Middle and Highschool). Leaf litter bags are used to survey stream salamanders, with information collected at regular intervals and recorded in a database for long-term analysis of trends. The program is modeled on the long-term ?Stream Salamander Monitoring in Great Smoky Mountains National Park?. This citizen science stream salamander monitoring program was initiated in 1999 at Great Smoky Mountains Institute at Tremont, TN.

Installed manual weather station at Macon Middle School in Franklin, NC, where students will check the weather every morning (temperature, max/min temp, barometer, wind direction, wind speed, rainfall). Based on their data, they can use ?The Wheel of Weather? to predict the forecast, which will then be included in morning announcements.

Published ?Upper Little Tennessee Watershed Water and Habitat Quality Educational Curriculum? by Adrian Holt in cooperation with Coweeta LTER and the Little Tennessee Watershed Association for distribution with Coweeta Stream Study Box and use by local science teachers and organizations.

Finalized Coweeta Stream Study Box ? this includes equipment for measuring flow, temperature, dissolved oxigen, pH, turbidity, etc. with an associated curriculum and cards to help teachers tie the activities to the NC-mandated science curriculum. The box includes a series of digital and hard-copy maps produced by Coweeta LTER Information management for use in the ?How Healthy is Your Stream? activity. The maps consist of 6, 42 in x 42 in maps of different subsections of the Upper Little Tennessee Watershed, laminated for re-use.

Coweeta Stream Study Box used by: Macon Middle School (300 students), the Macon County 4-H (25 students), the Macon County Gear Up Program (24 students), Macon County Homeschool Group (15 students), and Little Tennessee Watershed Association ? Cherokee Reservation Stream Program (25 students).

Organized and led three-day Citizen Science training trip at Great Smoky Mountains Institute at Tremont (46 students and 8 teachers). Courses centered on ?Salamander Monitoring and the Scientific Method?, ?Stream Ecology? and ?Stream Physics?. Students were exposed/introduced to national projects called Firefly Watch, Frog Watch, The Community collaborative Rain, Hail and Snow Network (CoCORaHS), and the USGS Phenology Project.

Coordinator co-taught stream ecology at Macon Middle School to approximately 300 students. One class used Stream Assessment Protocol included in the Coweeta Stream Study Box along with the Curriculum to assess the stream health through observation. Another group looked at dissolved oxygen and pH and a third group looked at turbidity and temperature.

Coordinator co-taught 300 students at Macon Middle School to use seine nets, buckets, waders, bug boxes, macro-invertebrate keys and hand nets to conduct a macroinvertebrate inventory of stream on school property to determine stream health.

Science Club established at Macon Middle School - 20 students participate every Thursday from 3:00 ? 4:30 for one semester. A new group of 20 students then participate for the second semester.

ORGANIZED EVENTS:

1. Macon County Beekeeper?s Association ? (5 March 2009, Franklin, NC) ? presentation on bear biology, black bear conservation and management, and preventing bear-human conflicts; 40 people attended.
2. Franklin Trail Days Event (4 April 2009, Franklin, NC) ? booth at event at which about 25 citizens stopped by to pick up literature or talk

about the Schoolyard program.
3. Macon County Folk Heritage Festival (18 July 2009, Franklin, NC) ? set up booth at festival; approximately 200 participants stopped by the booth to talk and/or pick up literature.
4. Presented curriculum and stream study box at Great Smoky Mountains Institute at Tremont for the Smoky Mountain Science Teacher Institute; 26 teachers attended.
5. Coweeta Open House (25 July 2009, Coweeta Hydrologic Lab, NC) ? Approximately 300 citizens toured Coweeta, including learning about the LTER program at Coweeta.
6. Rabun Gap-Nacoochee School (2 June 2009, Coweeta Hydrologic Lab) ? gave field and lab tour of Coweeta to 10 RGNS teachers/administrators (2 hour tour).
7. Coweeta Hydrologic Laboratory (18 March 2009) ? 2 hr presentation and field tour to 6 student from Iowa State University.
8. Presented ?Learning to Appreciate, Identify and Understand Lichens? program for the brown bag lunch program at Coweeta Hydrologic Lab; 25 adults attended.

MEDIA COVERAGE:

April 1 ? Franklin Press article ?Help with Stream Studies?
May 13th - Franklin Press article ?Middle School Kids Go Outdoors, Learn Science the Hands-on Way?
May 13th - Macon County News article ?Education Program Grooms Budding Scientists?

Journal Publications

Gardiner, N., Sutherland, A. B., Bixby, R. J., Scott, M. C., Meyer, J. L, Helfman, G. S., Benfield, E. F., Pringle, C. M., Bolstad, C. M., and D. N. Wear, "Linking stream and landscape trajectories in the southern Appalachians", Appalachians. Environmental Management, p. 17, vol. , (2008). Published, 10.1007/s10661-008-0460-x

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Web/Internet Site

URL(s):

http://coweeta.uga.edu/ecology/research.html
http://coweeta.uga.edu/ecology/chem_lab.html
http://coweeta.uga.edu/ecology/web_learning/intro2009.html

Description:

URL 1: represents a reorganization of the research section of the Coweeta LTER website - includes documentation for the 2008-2014 "Southern Appalachia on the Edge" project, an links to projects from previous funding cycles.

URL 2: an overview of the Coweeta Analytical Lab with links to procedures for processing samples

URL 3: website for the distributed graduate seminar "From Yardstick to Gyroscope"

Other Specific Products

Contributions

Contributions within Discipline:

We have developed methods within geography and hydrology to characterize the joint distributions of canopy LAI, root depth from a combination of high resolution remote sensing, field sampling and spatial statistical analysis as conditioned by topographic position. The methods may be extended to significantly improve the parameterization of landslide hazard models commonly used in geomorphic and engineering analysis of slope stability.

Results were published that address the dynamics of N cycling in streams, which help understand streams as ecosystems along with their response to increased availability of reactive N.

Dialogue was increased between French and American social scientists as to the interactions between society and environment. While this is a subject well-advanced in North America, it is largely unexamined by French social scientists.

Advanced the methodology for occupancy sampling of invertebrate taxa at landscape scales in aquatic ecology.

Recent publications address the ecologically fundamental issues of metabolic theory and spatial subsidies as controls over ecosystem metabolism. In addition, we have addressed the fundamental issue of steady-state dynamics in headwater stream and its implications for using streams as signatures for ?terrestrial? processes. This issue is generic to many of the claims being made both by aquatic and terrestrial ecologists in regards to the locations and character of N retention on the landscape.

Published research findings have contributed to the scientific understanding of the importance of terrestrial resource diversity to stream consumer structure and ecosystem functioning.

Cross-site comparisons between Coweeta and La Selva made important scientific contributions of our understanding of tropical-temperate differences in how leaf litter secondary compounds determine breakdown in streams.

Published results contributed to a better general understanding of the base of knowledge, theory, research and pedagogical methods in the field of fluvial geomorphology.

Our research has contributed methodological techniques and new empirical findings in the area of land economics.

Our research contributes to the economics and real estate fields in illustrating the effects of environmental protection on land prices. In particular, the private vs. social cost argument of these types of protective measures. This contributes evidence in the debate regarding the effects of building codes on safety and property risk.

We have contributed to improved understanding of the controls of plant water use on a watershed to regional scale (relying on heat pulse and dissipation probe measurements). This is a missing piece in hydrology, as much effort has been dedicated by plant physiologists to understanding water relations and use at the cellular through leaf to branch and lately, plant scales, while hydrologic science has focused on physical aspects of spatial hydrology.

Our research addresses the need identified by various bodies including the NRC, to provide a framework for species invasion that relies on fundamental ecological understanding.

We have contributed results furthering the basic understanding of forest and biodiversity response to climate change.

Contributions to Other Disciplines:

Research has documented the importance of soil management to the hydrology of rural and urban stream systems by demonstrating1) that soils underlying lawns and pastures frequently produce Hortonian overland flow and contribute significantly to peak flow increases when forest lands are converted, and 2) that the loss of soil storage and infiltration in converted forest soils exceeds the effect of reduced transpiration from such conversion with the net result of reduced baseflows.

We are advancing the use of climate envelop modeling to predict future climatic distributions of species to overcome the current criticism that these approaches fail to account for other processes such as biological interactions, and over weight the role of climate in organismal distributions. We have examined both distributions that assume strict and relaxed climatic control on species ranges. And, bracket the predictions around a suite of climate change models and expected CO2 levels. This allows collectively examining a range of pessimistic and optimistic scenarios for changes in species distributions within a region.

We have extended patch level optimality theory to full, three dimensional landscapes which represents a significant advance in the study of coupled geomorphic / climate / ecosystem processes as well as tight coupling of water, carbon and nutrient cycling. By working in a data-rich environment (Coweeta LTER), we are able to develop complex, linked models of long term canopy development within catchments, and test the models with detailed spatial and temporal data. The use of ecosystem information in addition to more standard hydrology information in the development of ecohydrologic models provides much better constraints and identifiability of complex model structure.

Our research activities have contributed to some improved understanding of aquatic ecosystems in terms of interactions between the geomorphic and biotic systems.

Contributions to Human Resource Development:

Material from the Coweeta LTER research rapidly finds its ways into undergraduate and graduate courses taught by project researchers at University of Minnesota, University of North Carolina, University of Wisconsin, University of Illinois, University of Georgia, Duke University, and Mars Hill College. Students coming through these classes are trained in new developments in digital spatial analysis, numerical models, watershed theory, ecosystem theory, occupancy modeling, use of GIS approaches in econometrics, etc. A number of students have

successfully moved into graduate programs or professional careers making significant use of these skills.

Coweeta LTER research and outreach has served as a springboard to additional research in ecology, biology, social science as well as greater exposure among local residents in western North Carolina increasing their familiarity with the research program.

Coweeta LTER investigators worked with, supported, and involved in project research activities a total of 30 graduate students, 34 undergraduate students and 2 highschool students this year. They participated in many aspects including sampling in the field, data compilation and analysis, and presentation in professional meetings. These activities contributed materially to their professional development.

Full-time research technicians in addition to providing investigator support, were provided with opportunities to help analyze long-term salamander data and to be co-author of manuscript; and, teach ecology/science to middle school students involved with the Coweeta Schoolyard Program.

Contributions to Resources for Research and Education:

Our work in LTER network is providing useful examples and demonstrations of the necessity of working in interdisciplinary, place-based projects to facilitate interdisciplinary science. A Coweeta researcher (L. Band) is incoming Board Chair for the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), and he is drawing on Coweeta projects and experience to help plan the consortium?s activities promoting interdisciplinary hydrologic science.

Coweeta LTER has put significant effort into providing greater access to CyberInfrastructure, relational database design principles and tools, and GIS analytical frameworks to partner organizations, including the Rabun Gap Nacoochee School, the Highlands Biological Station, and the Little Tennessee Watershed Association.

Development of a 2006 land cover and land use map for the Southern Appalachians along with the compilation of satellite imagery, digital orthophotographs, and ancillary geospatial data will be available through the CWT digital archive. This represents the most current classification publically available for the region. (NLCD is dated 2001.)

Contributions Beyond Science and Engineering:

The Coweeta Site Manager (J. Love) is a member of the steering committee to educate the public about invasive species and in managing and restoring native plant communities along the Little Tennessee River Greenway. In addition, he was recently appointed to the NC Parks, Parkway, and Forests Development Council to advise the governor?s office on matters pertaining to sustainable development and conservation of western North Carolina?s natural resources.

The public?s understanding of science and technology has been enhanced by Coweeta LTER research results being conveyed to nonprofit watershed conservation organizations, such as the Little Tennessee Watershed organization.

Key project results help inform the public of the costs of land use restrictions designed to protect water supplies and guides policy on protection of these water sources. In addition, they reveal the policy consequences related to the untended consequences of regulations designed to protect buildings in high hazard areas. These raise important questions about the best scale of governance with regard to mitigation.

Conference Proceedings

Special Requirements

Special reporting requirements: None
Change in Objectives or Scope: None
Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Product
Any Conference