Annual Report for 2000
Baltimore Ecosystem Study
Urban LTER: Human Settlements as Ecosystems: Metropolitan Baltimore from 1797 - 2001

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Participant Individuals

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Dr. Kate Denniston, Towson University
Ms. Beverly Feig, Baltimore City Public Schools
Mr. Gary T. Fisher, U.S. Geological Survey
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Dr. J. Morgan Grove, USDA Forest Service
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Dr. Charles H. Nilon, University of Missouri, Columbia
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Dr. Peter Wilcock, The Johns Hopkins University
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Mr. Guy Hager, Parks and People Foundation
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Ms. Karen Hinson, Western School of Technology & Environmental Science
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Mr. William Stuck, Baltimore City Department of Public Works
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- Mr. Alexander Kalejs, Institute of Ecosystem Studies
- Ms. Alysia Koufus, Institute of Ecosystem Studies
- Mr. Alan Lorefice, Institute of Ecosystem Studies
- Mr. Thomas Maxwell, University of Maryland, Institute of Ecological Economics
- Mr. Brian Offerle, Indiana University
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- Ms. Emilie Stander, Institute of Ecosystem Studies
- Ms. Janel Vaughn, Institute of Ecosystem Studies
- Ms. Helena Voinov, University of Maryland, Institute of Ecological Economics
- Mr. Samuel P. Walker, University of Maryland, Baltimore County
- Mr. Ian Yesilonis, Institute of Ecosystem Studies, University of Maryland

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- Ms. Lataisha Cannon, Institute of Ecosystem Studies
- Ms. Danielle Christopher, Jr., Institute of Ecosystem Studies
- Mr. Elroy Christopher, Institute of Ecosystem Studies
- Mr. Kamau Crawford, Institute of Ecosystem Studies
- Ms. Jason Dawson, Institute of Ecosystem Studies
- Mr. Jonathan P. Fisher, REU, Institute of Ecosystem Studies
- Mr. Ben Hardt, REU, Institute of Ecosystem Studies
- Ms. Deidre Jordan, Institute of Ecosystem Studies
- Ms. Ko Ko Lea, Institute of Ecosystem Studies
- Ms. Antawne Martin, Institute of Ecosystem Studies
- Mr. Montez Martin, Institute of Ecosystem Studies
- Mr. Wilfred Ndifon, Morgan State University
- Mr. Chuck Okoronkwo, Towson University
- Ms. Andrea Raglin, Towson University
- Ms. Pamela Slater, Institute of Ecosystem Studies
- Ms. Amanda Thimmayya, Institute of Ecosystem Studies
- Mr. Brian Thompson, Institute of Ecosystem Studies
- Mr. Timothy Thompson, Institute of Ecosystem Studies
- Mr. Victor Ukpolo Jr., Morgan State University
- Ms. Mary Valentino, The Johns Hopkins University
- Ms. Charity Watkins, Towson University
- Ms. Candiss Williams, REU, Institute of Ecosystem Studies

Staff:

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- Ms. Brenda Lynch, BES Project Facilitator, Institute of Ecosystem Studies
- Mr. Jonathan Walsh, Webmaster/Information Manager, Institute of Ecosystem Studies
Partner Organizations:

Baltimore City Department of Public Works: Collaborative Research
Baltimore City Public Schools: Facilities; Collaborative Research; Personnel Exchanges
Bureau of the Census: Collaborative Research
Environmental Protection Agency: Financial Support, Collaborative Research
University of Toronto: Collaborative Research
University of Maryland, Baltimore County: Facilities; Collaborative Research
USDA Natural Resources Conservation Service: Financial Support; Facilities; Collaborative Research
Ohio University: Collaborative Research
Johns Hopkins University: Collaborative Research; Personnel Exchanges
Rose Street Community Center: Facilities; Collaborative Research; Personnel Exchanges
Towson University: Collaborative Research
USDA Forest Service - Northeastern Forest Experiment Station: Financial Support; In-kind Support; Facilities; Collaborative Research; Personnel Exchanges
University: Collaborative Research; Personnel Exchanges
University of Massachusetts, Amherst: Collaborative Research; Personnel Exchanges
University of North Carolina at Chapel Hill: Facilities; Collaborative Research; Personnel Exchanges
University of Maryland: Facilities; Collaborative Research; Personnel Exchanges
William and Mary College: Collaborative Research
Maryland Geological Survey: Personnel Exchanges
Purdue University: Collaborative Research; Personnel Exchanges
Indiana University: Collaborative Research; Personnel Exchanges
Western School of Environmental Science: Collaborative Research

Other collaborators:

Army Corps of Engineers
Baltimore Alliance for Great Urban Parks
Baltimore Area Master Gardeners
Baltimore City Department of Planning.
Baltimore City Department of Public Works.
Baltimore City Department of Recreation and Parks.
Baltimore City Development Corporation.
Baltimore City Police Department.
Baltimore City Schools.
Baltimore County Department of Environmental Protection and Resource Management.
Baltimore County Department of Recreation and Parks.
Baltimore County, Maryland Demographic Information Systems Office.
Baltimore County Schools.
Baltimore Environmentors, Baltimore City.
Baltimore Metropolitan Council of Governments.
Baltimore Neighborhood Indicators Alliance
Canton Middle School.
Center for Poverty Solutions, Baltimore, Maryland.
Central Arizona-Phoenix LTER Program.
Chesapeake Bay Program.
Center for Liveable Cities, Baltimore, Maryland.
Citizen Planning and Housing Association, Baltimore.
Coalition for Science in the Baltimore City Schools.
Community Planning and Housing Association, Baltimore City.
Cooperative Research Centre for Freshwater Ecology, Canberra, Australia (Dr. Peter Cullen, Director).
Cornell University, Environmental Project
Council for the Advancement of Science Writing.
Cowee LTER Program.
Department of Housing and Urban Development - Community Builders
Environmental Protection Agency.
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Field, Dr. Donald, University of Wisconsin, Madison.
Fortin, Dr. Marie Josee, Universite de Montreal.
Frederick Douglas High School.
Global Learning and Observations to Benefit the Environment, GLOBE Program
Glyndon Elementary School.
Gwynns Falls Watershed Association.
Herring Run Watershed Association.
Historic East Baltimore Community Action Coalition.
H. J. Andrews Forest LTER Program.
Institute for Ecological Research - Chile, Chile (Dr. Juan Armesto).
Irvine Natural Science Center.
Jones Falls Watershed Association.
Junior Tree Troops.
Kids Grow.
Landcare Research, New Zealand.
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Machlis, Dr. Gary, Department of Forest Resources, Univ. of Idaho.
Manpower Demonstration Research Corporation (Sandtown-Winchester Neighborhood).
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Maryland Institute College of Art.
Maryland Geological Survey
Maryland State Department of Education.
McDonogh School, Inc.
Merganthaler High School.
Morgan State University, Department of Landscape Architecture.
NASA Office of Earth Science.
National Aquarium in Baltimore
National Center for Ecological Analysis and Synthesis.
National Public Radio.
Natural Resource Conservation Service.
Northern High School.
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Park School.
Parks and People Foundation
Project RAISE.
Revitalizing Baltimore.
Rognel Heights Cultural Center.
Roland Park Country School.
Rose Street Community Center.
Safe and Sound.
Save Our Streams.
Seaton-Keough School.
Southeast Middle School.
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Super Kids Camp
Towson University
United States Geological Survey, National Research Program.
University of Maryland, Baltimore County - Women's Center.
Washington Council of Governments.
Western High School of Science and Technology and Environmental Science.
World Resources Institute.
Activities and findings:
Research and Education Activities:

The Baltimore Ecosystem Study LTER seeks to integrate research on ecological, physical, social, and infrastructural components to understand the metropolitan area as a comprehensive system. By examining the past states of the system, and establishing studies for the long term, we also seek to understand the temporal dynamics of the system. In addition, formal and non-formal educational activities are a key component of the BES. This report summarizes the accomplishments of the third year of the program. Abstracts of the presentations at our third annual BES meeting, as well as detailed workplans of each participant or working group, are found on our web page at http://www.ecostudies.org/bes

The program has attracted additional collaborators who have expanded the scope of research in key areas. In addition, we continue to build on the foundation of the core LTER research areas and strengthen our capacity to integrate diverse areas of research. We have put in place an new Information management system, which has established a new web page and online data management process.

Although our research is ultimately aimed at an integrated understanding of the metropolitan ecosystem, for simplicity we present the research activities and results in the following categories: 1) Social processes and environmental hazards, 2) Stream and riparian processes, 3) Micrometeorology and climate, 4) Soil structure, function and organisms, 4) Vegetation dynamics and structure, and 5) Integrated watershed modeling. Educational and outreach activities are crucial to the success of BES, and we detail these activities below as well. We conduct quarterly science meetings to strengthen specific research areas, develop new research initiatives, and to link research efforts and results from throughout the BES.

The project continues to focus on sites concentrated along the Gwynns Falls watershed, which encompasses land now undergoing the transition from agriculture to suburban development, through old suburbs and urban residential areas, to dense, old residential and industrial areas. A reference forested watershed is located at Oregon Ridge County Park and permanent point samples have been established throughout Baltimore City. The research is integrated by the patch dynamic approach, the human ecosystem model, and the small watershed approach, all applied in a spatially explicit manner in the 17,000 ha Gwynns Falls watershed.

We are conducting research to discover the social processes that drive and are affected by biogeoophysical processes in the urban ecosystem. Research has focused on the development of a framework for the analysis of land use models, and development of field data collection methods that can be linked to market and US Census surveys, to administrative records, and to remotely-sensed data. Social capital has been assessed through organizational analysis and assessment of regulations and programs that affect environmental management regimes and water quality. Measurements of boundaries, pattern and process in social patches have been compared with biophysical approaches. Patterns and processes of environmental equity are being addressed through Census data and EPA Toxics Release Inventory data, and various local historical records. Various data sources are being evaluated for their utility in explaining demographic and land use dynamics over time.

Our research on stream processes is based on USGS guaging stations in the Gwynns Falls watershed and elsewhere in the Baltimore region. These stations provide a continuous data record. USGS is investigating new approaches for high-flow storm sewer outfalls, as well as ground water hydrology. Geologic remapping is being conducted to improve hydrological data. Flow and stream chemistry are being measured at the guaging stations. Water samples are archived.

Riparian areas are key locations in which to assess the function of urban ecosystems and to link human history with ecological processes. Integrated studies of soils, vegetation, and biogeochemical processes are being conducted in riparian zones along the Gwynns Falls watershed. These studies also include paleoecological core sampling resolved into 1 cm depth increments. Cores also are collected from the Inner Harbor.
Meteorology links important processes in the ecosystem. The BES now has an LTER Network class 4 meterological station installed at the McDonogh School. Additional stations are being planned and intensification of the type of data collected at existing stations is being evaluated. Data from the Global Historical Climate Network have been used to assess the status and change of Baltimore heat island, and to compare this with Phoenix. Existing meterological stations were examined for usefulness in climate change study. A flux tower installation is being scoped.

Soils and ecosystem processes are a core part of our LTER effort. Long term biogeochemical monitoring encompasses 2 yr of monthly data on soil nitrogen cycling (mineralization, nitrification, denitrification, nitrate leaching and N$_2$O flux in eight forested permanent plots. One year of data exists on two permanent grass plots. Extensive surveys for biogeochemical processes include 12 forest, 12 grass, and 12 cropland plots where soil N and microbial processes were measured. The role of exotic species on nutrient dynamics continues to be investigated.

Ecosystem process studies described above require detailed knowledge of the urban soils. Soil survey at a fine scale has been conducted on 130 plots throughout Baltimore City. Riparian soils have been examined in 70 undisturbed cores. Heavy metals content has been assessed in soils.

Soil organisms are being investigated using two approaches. Monthly pitfall sampling and has been conducted in forested plots in Oregon Ridge, Hillsdale Park, and Leakin Park. These plots have also been sampled for earthworms. Qualitative sampling of Isopoda and Diplopoa is conducted in unmanaged grassy plots, managed lawns, city parks, roadsides and abandoned fields. Arthropod sampling is conducted at sites with data on soils, biogeochemical processes, and vegetation. Soil organism data are being compared with climatic models.

Interaction of exotic arthropods and vegetation can have major impacts on urban vegetation. Data from permanent point-based plots throughout Baltimore City was analyzed and integrated with data from other metropolitan areas to assess 1) the potential impact of Asian longhorned beetle on US urban forests, 2) the total compensatory value of carbon in US urban forests, and 3) national carbon storage and sequestration rates by US forests.

Vegetation processes in and around the urban center are a fundamental structural and dynamic component of the metropolitan ecosystem. Maryland forest history is being analyzed using historical maps, State Forestry Board archives, and other archival data. The status of Maryland forest and parkland conservation and management is being compared with other states. High resolution, digital imagery was obtained for the Gwynns Falls watershed and Oregon Ridge in October 1999, extending our long-term record of growing season coverages. Forest patches are being quantified, and the vegetation structure and composition of forested permanent plots, extensive permanent point samples, forest gaps, and riparian zones assessed. Ecological delimitation of patches types in and around the small gauged catchments along Gwynns Falls is being conducted, and the patterns of heterogeneity in those areas assessed via transects.

Integrated watershed modeling has focused on construction, linking, and accessing data to support the models. Acquisition of new data bases for modeling has been accomplished. Spatial data frameworks and simulation models are being developed for water, energy, carbon, and nutrient balance in catchments of the Baltimore region. The BASINS simulator is being employed over the period 1973-1990 for land use change. The models include social survey data on managment decisions at the household level. Large scale unit models of landscape processes have been modularized for Gwynns Falls. The General Human Ecosystem model is being run using demographics from Baltimore. Social capital is being translated into a simulation module. The carbon dynamics of built capital is being incorporated. The Human Ecosystem Model is being linked to the Global Unified Metamodel of the Biosphere in order to integrate social and natural processes. Valuation will be possible using this model.

Findings:

The report of findings is organized around the five major categories used to outline research activities: 1) Social processes and environmental hazards, 2) Stream and riparian processes, 3) Micrometeorology and climate, 4) Soil structure, function and organisms, 4) Vegetation dynamics and structure, and 5) Integrated watershed modeling. The outcomes of education and outreach activities are described later.
Our survey of land use change models has demonstrated that they rarely include human decision making. A modular approach to land use change models is advanced, which exploits the comparability of social, ecological, and physical assessments of patch types we have documented. Social patches have a high degree of local scale homogeneity and contribute to high diversity at larger landscape scales. Comparison of social process models focusing on Baltimore with those used in the international development arena confirms that accounting for property institutions is a key process in the role of humans as ecological agents.

The kind and location of environmental hazards is a key component of urban structure and linked social-ecological dynamics. Distribution of toxic releases in Baltimore is uneven and concentrated primarily in working class, white neighborhoods. A history of residential segregation and varying perceptions emerge as potential explanations for this pattern.

The stream flow record is published annually with some data available in near real time (http://md.water.usgs.gov/BES/). The stream data represent the four subwatersheds, and four additional sites along the Gwynns Falls that represent different degrees of urban land use and demographic characteristics. Variation in stream chemistry shows improvements downstream. Initial analysis of trends reflects road density and housing age, among other features. Questions of the role of agricultural legacies in upstream and rural stations have emerged.

Urban riparian zones tend to be relics that are now separated from stream influence by stream downcutting. Many riparian soils have buried surface or organic horizons and lowered water tables. Species distributions differ along the length of the watershed, with an increase in some fast growing exotic riparian species in lower reaches. Exotics are more prevalent among the herbaceous than the arboreal flora. Distributions of groups of plants correspond to rural, urban residential and dense urban residential-industrial zones, and relate to history of disturbance, mode of invasion and life cycles of individual species.

The heat island is better developed in Baltimore compared to Phoenix due to the cooling effect of watering of urban plantings in the arid Southwest. Urban maximum is cooler than rural sites in Phoenix, but higher in Baltimore, as expected for urban heat islands. Urban heat island development has followed expected patterns with population change. Movement of meteorological stations has compromised their utility for climate change studies. Poor local location of rain gauges is a limit to their utility.

Soils with recognizable profiles behave differently in urban sites than rural sites. Most urban soils in Baltimore have high base saturation, often approaching 100%. Nitrogen transformation processes are highest in agricultural plots, followed in order by lawns and forest soils. Lawn areas near roads have the highest heavy metal contents.

All 10 species of isopods found are exotic. One is new to the fauna of North America. The highest numbers of individuals are found in the urban forest sites, and decrease in the rural reference forest stand. Eight species of earthworms include 2 natives, and 6 exotics. The rural reference forest contains all 8 species, but natives are rare. The two remaining urban sites have only exotics, with biomass declining from urban to rural forest soils.

The Asian longhorned beetle, recently found in New York and Chicago has prompted removal of trees in an attempt to control the invader. Data from nine cities including Baltimore, based on tree species preference by the beetle, show from 12-61 % of trees to be at risk, with potential damage ranging from $72 million to $2.3 billion per city. The maximum potential national urban impact of the beetle is associated with a value loss of $669 billion.

Data on forest vegetation exposes important features of the urban ecosystem and its dynamics. Maryland forests were in relatively poor condition for the 1906-1916 survey, and the state established the 3rd state forester position in the nation. Multiple forest uses were promoted. Urban forested plots are more structurally and compositionally heterogeneous than rural reference stands, and urban and suburban forest gaps support more exotic vines than rural.

Integrated watershed models have yielded promising results. The BASINS software adequately simulates land use change and runoff production. This model uses the lumped hydrological approach to watershed covers. This approach is not as useful for changing nutrient regimes, since integration of distributed hydrological modeling regime with a plot based ecosystem modeling approach improves the simulation of terrestrial delivery of nitrate to stream channels in the BES forest reference watershed. Growing season nitrate export in the reference watershed does not
indicate nitrogen saturation, but results from seasonal dynamics of the distribution of nitrate sinks and sources along the hydrological flowpaths.

**Training and Development:**

The BES education program is organized around two activities: School/Community Partnership Program, and the Neighborhood Science Program. The program builds partnerships between BES scientists, teachers, students and community groups to engage students in on-going studies of the local environment. Teachers who participated in a two week, Urban Ecosystem Education Summer Institute developed action plans for the 2000 school year. Teachers at six partnership schools received financial assistance for equipment, materials and supplies, and software to support student researcher in their schoolyards. During 2000, we offered three professional development workshops for current and new partnership schools: 1) Investigating Earthworms, 2) Modeling the local ecosystem, and 3) Animal life in urban ecosystems. As a complement to the partnership program, we offered a High School Internship Program for 5 students from the Western High School of Technology and Environmental Science.

The Neighborhood Science Program worked with two community centers. At the Rose Street Community Center, BES educators, staff and scientists expanded an existing tutoring program, and brought ecological expertise to field and local activities at the center. Through the Rognel Heights Cultural Center, BES members helped students understand sustainable agriculture in an urban setting. Field activities, cross-generational exchanges, and writing are a part of that program.

College and university based education involved two Research Experiences for Undergraduates students, and six students who were part of the Baltimore Collaborative for Environmental Biology, a UMEB program based at Towson University. Student interns with the Revitalizing Baltimore program worked on technology transfer projects, and therefore developed both science and policy experience.

Training and information exchange were important activities. Two sessions were offered for educators and volunteers from the Baltimore City Department of Recreation and Parks, and from the Irvine Science Center was conducted on the topic of urban soils and earthworms. BES has been integrated into the Revitalizing Baltimore Steering Committee, and Technical Advisory Committee. The Parks and People Foundation has played a crucial role in the development of PARKSTAT: Baltimore City Department of Recreation and Parks' geographical information system inventory, as well as a supervisory role in the assessment of Baltimore's 'Friends of the Park' groups.

Education of BES staff and scientists about the nature of the complex and diverse communities they work in, is also necessary for success of the project. In addition to educating participants in safety procedures, the training was designed to enhance the interaction of BES members with the public and organizations in the various neighborhoods where they work. This Staff Safety and Community Awareness training occurs annually near the beginning of the field season, and is required of all BES participants.

Results of educational and outreach activities are diverse. Advanced placement students in American History who participated in the social ecology (Human Ecosystem Model) based activities had higher scores on the advanced placement test than other students. The AP students produced a book on the environmental history of Baltimore. Students at other schools participated in wetland planning; conducted research on streams, woods, soils and earthworms; or designed, installed and tested a stream gauge. In other schools students researched water quality in Herring Run and collected data on stream invertebrates. Northern High School students conducted a symposium and field trips for students throughout the city.

**Outreach Activities:**

Education and outreach are fundamental to the mission and success of the Baltimore Ecosystem Study. As a research question, we are concerned to know how people develop and use knowledge of the metropolitan area as an ecological system. In addition, we have learned from the literature and from a 10 yr social science and community restoration research program in Baltimore predating the LTER effort, that informing and working with communities and constituencies is required to site ecological research in the city and suburbs. Hence we conduct a wide variety of community and educational activities.
Public outreach was accomplished through the BES Annual Meeting, attended by scientists, educators, community members, and decision leaders from the Baltimore region as well as by BES researchers and educators. A quarterly newsletter, entitled Baltimore Ecosystem News, and written in plain language, was initiated and widely distributed to the public. The distribution of the Gwynns Falls Ecological Resource Atlas to public libraries was accompanied by an educational seminar series at each library.

Following is a list of presentations and meetings to be considered outreach activities:


Boone, C. 'Census Data as a Core Demographic, Social, and Economic Dataset for Long Term Ecological and Social and M. Ratcliffe]. All Scientists Meeting of the Long Term Ecological Research Network, Snowbird, Utah (August 2000).


Buckley, G. L., April 5, 2000, 'Historical Analysis of Forest Cover in the Baltimore Ecosystem Study Area, 1906-1916.' Annual Meeting of the Association of American Geographers, Pittsburgh, Pennsylvania. (An abstract was published on CD and distributed to meeting attendees)

Burch, Jr. W. and Clark, T. Developing the means for integrating social and biophysical ecological approaches. 'Society and Natural Resources. 746a. 23 students.

Burch, Jr., W. Seminar in Ecosystem Management. 15 students at 6 credits or 30 FTE's. The students did a follow up on use of web sites for data collection and developed a critical analysis of these sites for reproduction on the BES web site. Field trip to Baltimore Ecosystem Study.

Burch, Jr., W. 18-22 January...meeting organized by NSF-CAP/BES LTERs on integrating the social and biophysical sciences. Presentation on The unifying influence of social ecology in ecosystem studies'

Burch, Jr., W. The Restoration Agenda: Blueprint 2,000, Yale University. 29 March--'Vine of life, Ax of Hope--Lessons of Restoration from Country and City.'

Burch, Jr., W. 1-2 February...Fairmont Park Commission/William Penn Foundation, Philadelphia. 'The importance of trails and volunteer coordinator systems in ensuring sustainable ecosystem restoration'

Burch, Jr., W. 14-15 April–Cuyahoga Valley National Recreation Area, Ecosystem Research Consortium. 'People as an ecosystem component--lessons from Baltimore, New Haven and Philadelphia.'

Burch, Jr., W. 17 Earthday Keynote sponsored by Environmental Science program, Cleveland State University

Burch, Jr., W. 18 May–Glasgow, Scotland: Central Scotland Conservation Trust–'Putting the social into ecosystem restoration--an agenda for community and conservation.'

Burch, Jr., W. 19-22 June–Society and Natural Resources meetings, Bellingham, Washington, present paper on 'Travelers in the forest--the co-evolution of social ecology and silviculture'; panelist on two discussion sessions revolving around ecosystem management research.

Burch, Jr., W. 1-10 August–NSF-LTER All scientists meeting participation. Snowbird, Utah. Ecological Society of America, paper, 'Perspectives on the methods and applications of biosocial patch analysis in three different anthropogenic ecosystems--Gansu Province, PRC, Western Nepal, and Baltimore, MD.'


11
Costanza, R. First Lancaster Environmental Symposium: 'Human Impact on Natural Resources: a Regional Perspective'. Invited keynote speaker: 'Dynamics and Economic Value of Ecosystem Services.'


Fabiyi, V. and Staff from McDonogh School. BES Education Programs. Maryland Association of Biology Teachers (MABT), [location]. April 8, 2000.


Groffman, P. M. Presentation to Chesapeake Bay Program Scientific and Technical Advisory Committee on Baltimore Ecosystem Study. March 2000.


Grove, J.M. 1999. I have Stood on the Shoulders of Giants (or the feet of dwarfs) so that I Might See so Far: some thoughts on the lessons learned from Dr. William R. Burch, Jr. Festschrift for William R. Burch, Jr.


Parks and People Foundation. Hosted Yale University's School of Forestry and Environmental Studies, Ecosystem Management class (March 2000). This field exercise examined the fluxes and flows of information through the metropolitan area, and considered the consequences for natural resource management at various scales.


Ratcliffe, M., Boone, C., Grove, J.M. 2000. Census Data As A Core Demographic, Social, And Economic Dataset For Long Term Ecological and Social Research. All Scientists' Meeting of the Long Term Ecological (LTER) Network, Snowbird, Utah, August 2-5.


Schweik, C.M. 2000. 'Global Monitoring and the Human Dimensions of Global Change (HDGC),' Invited presentation at the Workshop on human dimensions of global change, Castle Wendgräben, Germany, July 13-15. Workshop to advise the German national committee for Global Change research on HDGC research directions.


Szlavecz, K. and Nilon, C. - 2000: Workshop host and leader 'Animal Life in Urban Landscapes'.

Szlavecz, K. - 2000: Visited to Roland Park Country School, for student presentation of results of earthworm sampling.


**Journal Publications:**


**Book(s) of other one-time publications:**


Boumans Roelof, Robert Costanza and Josh Farley, "A model on the Human System, calibrated and tested for the Baltimore MD urban area for urban ecology." , bibl.. paper Published


Other Specific Products:

Software (or netware)
Arcview and GRASS software for processing terrain, land cover, soils information for use in catchment modeling, hydroecological modeling tools. All are available for use within the scientific community. Information will be shared through the internet

Teaching aids
Baltimore Urban Ecosystem Teaching Modules for we-based support of BES Educators, via Internet
Data or databases
Inventory of 121 ground-water wells within the Gwynns Falls watershed and a search or current literature in urban groundwater hydrology, via Microsoft Access database

Working Paper Series


Internet Dissemination:
www.unc.edu/dept/geog/them
www.ecostudies.org/bes
http://md.water.usgs.gov/BES/
http://md.water/usgs.gov/BES/architecture/
www.parksandpeople.org/gfatlas
www.parksandpeople.org
http://128.119.99.210/

Contributions:
Contributions within Discipline:

This third year of the Baltimore Ecosystem Study has continued to extend the scope of ecology to the ecologically neglected urban realm. The world-wide increase in urbanization makes ecological attention to urban systems both practically and intellectually appropriate. The testing of patch theory in a novel ecosystem type is one example of an intellectual benefit to ecology. An additional benefit is the comparison spatially explicit watershed models with spatially lumped models. We have obtained initial results that confirm the applicability of patch theory to integrated social and ecological systems, and the improved capacity of spatially explicit watershed models in urban systems. We continue to explore research and modeling approaches in disciplines outside ecology as potential tools for integration with ecology and within ecology per se. We, in association with colleagues from the CAP LTER and other scientists in the LTER Network, have furthered the articulation of socioeconomic principles for research in LTER programs.

Contributions to Other Disciplines:
The main contribution to different disciplines continues to be the exploration of variables and approaches that are useful for integration. Patch dynamics, spatially explicit catchment models, social capital models, and now different
scales of environmental valuation are issues that we have begun to investigate. We continue to be a source for importing spatially explicit simulations to additional natural and social science specialties. Our work also continues to illustrate the utility of metadata in physical sciences.

**Contributions to Education and Human Resources:**

BES continues its manifest commitment to involve students from K-12, through postdoctoral levels. Teacher training and curriculum development reaches urban and suburban, and public and private schools. We work substantially with underrepresented populations in all our educational and outreach activities.

**Contributions to Resources for Science and Technology:**

BES continues to develop digital data bases, and integration of multiscale remote sensing imagery for urban analysis. We are integrating the diverse elements of landscapes into unified models that can support decision making. We are exploring the strategies for urban field stations, and web based linkage of communities and environmental organizations with scientists and decision makers.

**Contributions Beyond Science and Engineering:**

Both the general public and governmental agencies desire the integrated, spatial models we are developing. The public is concerned with processes of non-point sources of pollution, community and neighborhood restoration, and watershed protection our models are designed to evaluate. We are exploring new ways to link with stakeholders in our region and neighborhoods. The public concern with smart growth, the new urbanism, and with metropolitanism as policy alternatives all intersect tightly with our scientific and educational mandate.