Dear Friends and Colleagues,

From many perspectives, this past year was a very exciting and productive year for CECB. Notwithstanding, we continue to face new and continued challenges, ranging from the affects of global climate change to newly emerging diseases. We are pleased to note that Sargent Center for Outdoor Education (formerly known as Sargent Camp), located in Peterborough/Han

ock, New Hampshire, will now be managed by Nature's Classroom, an environmental educational organization based in Charlton, Massachusetts. It will continue many of the educational programs that Boston University has operated for the past 25 years. Renamed Nature's Classroom at Sargent Center, this facility will also continue to provide research opportunities for Boston University's faculty and students, many of whom are affiliated with CECB.

Boston University's Tropical Ecology Program (TEP), established in 1996, continues to provide biology and environmental science students with an unprecedented opportunity to spend a semester in Ecuador. BU's Media Group recently produced a web-based video about this program, posted on the CECB website, that includes an interview with one of our most recent participants in this program, Jackie Aliperti (see the last page of this newsletter). This interview highlights why this program has been such a magnet for students interested in ecology and conservation biology. Many of our alumni from this program have excelled in their own careers, including recent positions as technicians, acceptance into and completion of graduate degree programs, and employment with several environmental organizations. CECB, in collaboration with the International Symbiosis Society, established the Tiputini Support Group, with the goals of raising additional awareness about the conservation and research needs at the Tiputini Biodiversity Station (TBS), promoting use of alternative energy at TBS, and for raising funds to purchase new books and supplies for students and researchers to use at TBS.

Faculty associates and graduate students affiliated with CECB have had a successful year in being acknowledged for their academic achievements, including various awards and honors, and also in raising grant funds to support research on organisms in terrestrial and aquatic ecosystems, as well as those that exploit the aerosphere. In this issue of CECB Update, we highlight three projects being conducted by graduate students associated with CECB faculty associates—one focused on white-nose syndrome, an emerging disease of hibernating bats, another on the impacts of the hemlock woolly adelgid, an insect pest of hemlock trees, and the another on the role of bats in suppressing pest insects in pecan agriculture.

Lastly, we extend our congratulations to John Finnerty in being appointed the new Director of BU's Marine Program, to faculty associates who are recipients of new grants and awards, and to the newly minted Ph.D. students of our CECB faculty associates.

With best wishes for a Happy Holiday Season.

Sincerely yours,

Thomas H. Kunz, Director
Lydia Munger-Little (TEP Spring ‘99) recently moved to Honolulu, HI where she has accepted a position as a Resource Management Specialist with NOAA’s National Marine Fisheries Service - Pacific Islands Regional Office. Her position supports NOAA Fisheries co-management of the four Pacific Marine National Monuments that were created by Presidential Proclamations: the Marianas Trench Marine National Monument, the Pacific Remote Islands Marine National Monument, the Rose Atoll Marine National Monument, and the Papahanaumokuakea Marine National Monument. The current focus of the program is the implementation of the new Monuments (management scheme/plan development) and co-management/implementation of the management plan for the Papahanaumokuakea Marine National Monument.

Raymond Wright (TEP Fall ‘03) is currently the director for the National Young Scholars Program. This experiential education program introduces elementary students to the fields of medicine, forensics and architecture through exploratory-based learning. The program is held each summer in locations throughout the U.S.

Kristine Faloon (TEP Spring ‘01) recently graduated from UC Santa Barbara with a Master's in Environmental Science and Management. She has started a California Sea Grant Fellowship at the Monterey Bay National Marine Sanctuary.

Rachel Morrison (TEP Spring ‘08) graduated in May 2009, after conducting a Senior Independent Work for Distinction project relating to conservation issues for tropical reef fish. Rachel recently began working at the New England Aquarium on a project studying the biological effects of the liquid natural gas offshore ports. It is hypothesized that the exclusion zones around these underwater ports may be acting as de facto marine protected areas, or faunal refuges. Additionally, she was recently hired by CECB faculty associate Dr. Richard Primack to assist in editing his Essentials of Conservation Biology textbook in preparation for publication of the 5th edition. Rachel is also applying to PhD programs for fall 2010.

Colin Averill (TEP Fall ‘07) graduated from BU in 2008 with a degree in Biology, specialization in Ecology and Conservation. Since then he has been working at BU for CECB faculty associate Adrien Finzi as a full time research technician, continuing research he began during his senior year on soil nitrogen cycling and soil-ecosystem interactions. He is applying to graduate school programs with emphasis on soil microbial ecology, plant-soil interactions, and ecosystem function for the Fall 2010 semester.

Emily Lindsey (TEP Fall ‘01) is a Ph.D. candidate in the Integrative Biology department at UC Berkeley, focusing on mammal paleoecology. Emily is currently back in Ecuador working on a paleontological excavation on the Santa Elena Peninsula (~2 hours west of Guayaquil).

Linsey Field (TEP Spring ‘08) is currently working for the Oregon Department of Fish and Wildlife in Maupin, Oregon along the Deschutes River as an experimental biology aide. She surveys anglers, collects data, and tags steelhead and salmon at the fish ladder at Sheer's Falls. Linsey is also applying to graduate schools.

Michelle Talmadge (TEP Spring ‘09) graduated in May ‘09 and is now working as a biological technician for the US Fish and Wildlife Service in New Jersey, where she performs vegetation surveys, endangered species monitoring, restoration management, and invasive species control.

Logan Hennessy (TEP Spring ‘95 and TF Spring ‘99) is a professor in the Liberal Studies program of San Francisco State University, and he will be attending the UN Climate Change meeting in Copenhagen this month (December 09), looking at the role of indigenous peoples in climate negotiations.

Carrie Soltanoff (TEP Spring ‘05) is currently in the second year of a Masters program in Sustainable Development and Conservation Biology at the University of Maryland, College Park. In the past year she has interned for the World Wildlife Fund and at Woods Hole Oceanographic Institution.
A $2,858,292 grant was recently awarded by the National Science Foundation to an interdisciplinary team of BU faculty members: CECB faculty associate Margrit Betke (Principal Investigator, Computer Science), CECB director Thomas Kunz (co-PI, Biology), Stan Sclaroff (co-PI, Computer Science), and Joyce Wong (co-PI, Biomedical Engineering). Betke and her co-investigators will design computer vision algorithms for intelligent tracking of large groups of living individuals in three-dimensional space. The project’s goal is to develop computational systems for tracking groups of cells, bats, birds, and humans – systems that are able to analyze the organisms’ group behavior.

The researchers will examine the conditions for formation and dispersal of groups, and the interactions of individuals within a group. Unlike previous research, this project aims to reason about the motion of large groups of living organisms observed in video data, independently of whether the organisms are humans, animals, or cells. Previous research has focused on studying the behavior of a single type of organism, and on testing theories of behavior based predominately on simulations, without the appropriate analytical tools to automatically explore and quantify the vast number of visual data sets. This project will base research findings on the analysis of thousands of trajectories of individual group members moving in 3D space.

Betke and her team will collect and use video data, generating stereoscopic reconstructions of movement trajectories based on multiple calibrated cameras, and use machine learning to model group behavior and to mine the trajectory data. They will compare their findings against current theories about the formation of groups and the interactions of individuals within a group. Understanding the processes by which groups of animals and microorganisms behave is crucial to the effective conservation of populations and ecosystems and the management of cellular environments. Ultimately, this project will advance knowledge across the fields of computer vision, artificial intelligence, behavioral ecology, and biological engineering, and will provide new tools for answering urgent economic and ethical questions - for example, about the mortality of birds and bats at wind energy facilities.
**Bat Populations Continue to Decline**

In June 2009, CECB Director Tom Kunz, other leading bat experts, and wildlife managers testified at a joint Congressional committee meeting about the continued drastic decline in bat populations throughout the Northeastern U.S. The devastating disease known as white-nose syndrome continues to spread and kill off unprecedented numbers of bats, with 90-95% bat mortality rates observed in many hibernacula throughout the Northeast. The disease is named for the white fungus that grows on affected bats’ faces and wings. To date, white-nose syndrome (WNS) has been found in nine U.S. states, and researchers fear that it may spread to the midwestern U.S., where some of the largest bat hibernacula exist.

Many questions remain about WNS. It is known that bats with WNS often starve to death and are forced to emerge from hibernation too early in the season, in fruitless attempts to find food. The Kunz lab is currently analyzing the body composition of little brown myotis (*Myotis lucifugus*, the species that has been most affected by WNS), in addition to measuring the relative immune function of affected versus unaffected bats in order to determine whether bats with WNS are experiencing immunosuppression. Along with CECB faculty associate Michael Sorenson and graduate students Marianne Moore and Jonathan Reichard, Kunz was recently awarded a U.S. Fish and Wildlife grant to continue research in this vein. However, as Kunz and other researchers testified to Congress in June, a dire need for additional funding for white-nose syndrome research remains. The panel estimated that $53 million dollars are needed over the next five years, however, to date only $2.7 million has been allocated for research on WNS. In 2009, $800,000 of U.S. Fish and Wildlife grants were awarded for WNS research, but researchers worry that this figure is a drop in the bucket. With the current rate of bat population decline, and the fact that most bats produce only one offspring per year, there may be no remaining bats to study in just a few years’ time.

**Bat carcasses and skeletons in Aeolus Cave in Vermont, September, 2009. Photo by Marianne Moore.**

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**TIPUTINI SUPPORT GROUP**

- Raising awareness about conservation and research at the Tiputini Biodiversity Station (TBS)
- Raising funds to support alternative energy at TBS - including stationary energy-generating bicycles and solar panels - lessening the station’s dependence on the encroaching oil industry
- Raising funds for new books for the station’s library, and other supplies and materials for use at the station

Contributors of $100 or more may elect to receive a 2010 calendar featuring photos from Tiputini. Payment can be made via check to “Boston University - Tiputini Support Group” and sent to CECB, 5 Cummington St., Boston University, Boston, MA 02215. For more information, see: [www.bu.edu/cecb/tiputini/tsg](http://www.bu.edu/cecb/tiputini/tsg)

Questions? Please contact cecb@bu.edu. We hope to hear from you soon!

Tropical rainforests not only are havens for the great diversity of life, but they are also crucial to the current and future health of humans and other life forms around the planet. Rainforests influence regional and global weather systems, carbon dioxide sequestration, albedo effects, and harbor potential medicinal benefits. The Tiputini station – adjacent to the Yasuní National Park – plays a key role in northwest Amazonian conservation efforts.

With this in mind, we ask you to join the Tiputini Support Group (TSG). Affiliated with CECB and the International Symbiosis Society, the Group’s main focus is to create a source of targeted funding support for necessary conservation research and education assistance at Tiputini.
North American temperate forests are recognized as vital terrestrial sinks for atmospheric carbon dioxide; they exchange and store vast quantities of carbon. In recent years, carbon sequestration has become a focus in politics as well as science. Carbon sinks are taken into account when developing policies that govern the reduction of greenhouse gases - one of many reasons why it is important to accurately measure and predict levels of carbon storage and uptake. Although much research has been conducted to this end, one important parameter has been largely ignored; that is, how does forest species transition (whether due to climate change, anthropogenic disturbance, or pests) affect carbon storage? Changes in species composition can greatly alter the carbon balance, due to transitions in wood density, litter quality, and the decomposition of soil organic matter, among several other factors. By neglecting to take species composition into account, predicted levels of forest carbon storage may be inaccurate.

The hemlock woolly adelgid (Adelgis tsugae) is an introduced pest that has been transforming the Southern New England forest landscape in recent years, by killing off late-successional hemlock trees and giving way to early successional black birch trees. Poliana Lemos, a graduate student of CECB faculty associate Adrien Finzi, hypothesizes that less carbon is (or will be) stored as a result of the transition from hemlock forest to black birch. Lemos is using a chronosequence approach to document the change in carbon storage: she is comparing sites in Massachusetts and Connecticut that are dominated by a) old-growth hemlock trees; b) second-growth hemlock; c) 5-year-old transition; d) 15-year-old transition; and e) second-growth black birch. By examining changes in belowground biomass, net primary productivity, woody debris, and rate of decomposition, she hopes to demonstrate the carbon budget behavior throughout the species transition process, and whether there may be an over- or under-estimation in carbon mitigation levels if species are not taken into account. Lemos will also collaborate with CECB faculty associate Curtis Woodcock and two of his graduate students, who use GIS and remote sensing data to better understand the spatial distribution and speed of the species transition.

Thus far, Lemos has found that coarse woody debris, which contributes to the nutrient cycling and respiration of the forest, tends to decrease eight-fold along the chronosequence, but is interrupted by a peak production of almost three times the volume of what is found in old-growth hemlock forests during the 5-15 year post-infestation period. She has also found that litterfall (which is directly related to the input of nutrients in the soil) produced at the endpoint of the chronosequence (second-growth black birch) is more than double that produced in the old-growth hemlock forests.

In addition to offering insight into the effects of the invasive hemlock woolly adelgid on New England forests, Lemos’s work may have the larger impact of demonstrating the need to consider species when predicting carbon sequestration levels.
CECB Director TOM KUNZ is one of only 29 animal ecologists and conservationists worldwide to be nominated for the prestigious 2010 Indianapolis Prize. The biennial prize represents the largest individual monetary award for animal conservation in the world, and has been awarded only twice (in 2006 and 2008).

JUSTIN TOUCHON, a recent graduate of CECB faculty associate KAREN WARKENTIN’s lab, was awarded the 2009 Belamarich Award for Outstanding Work at the Doctoral Level for his dissertation, “Developmental Ecology and Reproductive Mode Plasticity of a Neotropical Treefrog: Interacting Abiotic and Biotic Environmental Effects over Three Life Stages.” Justin was also awarded the Stoye Award for the Best Student Paper in Ecology and Ethology at the American Society of Ichthyologists and Herpetologists meeting.

CECB faculty associate RICHARD PRIMACK was awarded $340,000 of a collaborative National Science Foundation award to study: “Spatio-temporal models of phenology: Integrating the effects of climate change on plants and animals.”

KATIE STRYJEWSKI, a graduate student of CECB faculty associate MIKE SORENSON, won the 2009 Graduate School of Arts and Sciences Dean’s Award at BU’s Science and Engineering Day for her work on “Divergent, Host-Specific Female Lineages in the Brood Parasitic Greater Honeyguide.”

CECB faculty associate MIKE SORENSON was recently elected a Fellow of the American Ornithologists’ Union. Fellows are chosen for exceptional and sustained contributions to ornithology and/or union service.

CECB faculty associate LES KAUFMAN received a Partners in Conservation Award from the Department of the Interior for his long-term collaborative research monitoring coral reef health in the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico.

CECB faculty associate STEVE GOLUBIC received a Lifetime Achievement Award from the Croatian Society of Natural Sciences. The honor is awarded to a distinguished researcher from abroad who has contributed to the promotion of Croatian science; it recognizes Golubic’s career-long contributions to understanding the microbial role in the formation of carbonate depositing systems of lakes and waterfalls.

A $2.8 million grant from the National Science Foundation was recently awarded to a research team that includes CECB faculty associate MARGRIT BETKE and CECB director TOM KUNZ. Researchers involved with the project, titled “Intelligent Tracking Systems that Reason about Group Behavior,” will examine the movements of bats, cells and humans to build computational systems that have the ability to comprehend and judge the behavior of organisms in a group (also see page 3).

CECB faculty associate JOHN FINNERTY was recently appointed director of BUMP (BU Marine Program).

DR. KUNZ, co-PI MIKE SORENSON and graduate students MARIANNE MOORE and JON REICHARD, were awarded a $105,000 grant from U.S. Fish and Wildlife to continue their research on white-nose syndrome: “Immune Function, Body Composition and Genetic Correlates of Bat ‘White-nose Syndrome’.”

CECB faculty associate FAROUK EL-BAZ was appointed to the board of directors of the U.S. Civilian Research & Development Foundation (CRDF), a nonprofit organization that promotes international scientific and technical collaboration through grants, technical resources, and training.

CECB faculty associate CUTLER CLEVELAND and co-PI Adil Najam were awarded a $150,000 grant to lead an interdisciplinary seminar on energy transitions—shifts in the types of energy (e.g., coal, nuclear, wind) used by societies.
Notes from the field:

Bats in a Pecan Agroecosystem

During the summer of 2009, Kunz lab graduate student Elizabeth Braun de Torrez, assisted by undergraduate Lauren Snyder, continued her study on the ecosystem services of insectivorous bat populations in Texas pecan orchards. Braun de Torrez’s project compares bat activity in organic orchards, conventional (commercial) orchards, and natural sites consisting of juniper/mesquite shrub land. Study sites are in San Saba, Texas, hailed as the “Pecan Capital of the World” and home to hundreds of native and commercial pecan orchards. Braun de Torrez and Snyder spent the summer examining the foraging behaviors of bats in pecan orchards and assessing the potential pest control services of bats in the orchards. Snyder also completed an independent project that examined the social behaviors of bats roosting in a bat house on an organic pecan orchard in San Saba.

Bats play a vital role in ecosystem health and function: they pollinate plants, disperse seeds, and suppress insect populations. Insectivorous bats’ roles in keeping populations of crop pests in check serve as a focal point for this study. The two pests of particular interest in this project are the pecan nut casebearer moth and the hickory shuckworm moth: both species are thought to be preyed upon by bats, and both pests feed on nuts, causing considerable damage in pecan orchards. As a result, orchard owners often spray chemical pesticides throughout the summer to prevent excessive crop damage. Previous studies have shown that millions of Tadarida brasiliensis consume vast quantities of agricultural pests in Texas every summer. Braun de Torrez’s project aims to determine whether bats can provide sufficient pest control services in agroecosystems (and in particular, pecan orchards) that they can be utilized as a safer, less toxic, and less expensive alternative to the chemical pesticides currently in use by many landowners.

Knowledge of bat activity and diversity in human-altered landscapes (such as orchards) is crucial for understanding the role of bats in providing this ecosystem service. To this end, mist netting and radio tracking provided data on bat activity, and thermal cameras allowed the researchers to census roosting bat populations. Additionally, acoustic detectors and insect traps with pheromone lures provided data that allowed Braun de Torrez to examine the relationship between insect abundance and bat foraging behavior. By documenting habitat use by bats within the pecan agroecosystem, Braun de Torrez aimed to evaluate: 1) the role of pecan orchards as a source of riparian woodland habitat for bats, 2) the influence of management intensity on bat activity and diversity, and 3) temporal and spatial interactions of bats and pests within these orchards.

Throughout the summer, five bat species were found in the pecan orchards: Tadarida brasiliensis, Myotis velifer, Nycticeius humeralis, Lasiurus borealis, and Perimyotis subflavus. Mist netting results revealed that the abundance of adult bats was significantly higher in pecan orchards than in commercial plantations and natural woodlands, suggesting that the orchards provide important bat habitat. Braun de Torrez also found that bat diversity was higher in organic orchards than in either commercial orchards or woodlands, suggesting that these sites could play a vital role in bat conservation. The Brazilian free-tailed bat (T. brasiliensis), whose ecosystem services have been previously demonstrated in Texas cotton production, was found predominately in organic orchards and natural woodlands, and only rarely in commercial orchards.

Field work for Braun de Torrez’s project will continue over the next two summers. Ultimately, Braun de Torrez aims to develop a predictive model that can be used to quantify the economic benefit of bats within pecan woodlands based on bat activity, species composition, pest emergence patterns and other factors measured in her study.
Exploring Biodiversity:
from the Mountains to the Coast and the Ecuadorian Amazon
by Jackie Aliperti, BU Tropical Ecology Program (BU-TEP) student, Spring 2009

Despite its extremely small size, Ecuador is perhaps the most biologically diverse country in the world. From the ice caps of the Andes to the depths of the rain forest, a wide range of tropical plant and animal species thrive. Taking part in the BU-TEP program opened my eyes to the importance and the beauty of such diverse ecosystems.

During the montane ecology section of the program, we spent twelve hours at Cotopaxi, the world’s largest active volcano, and took extensive measurements of plant dispersal in the Paramo (Andean permafrost-like substrate found at high elevations). I couldn’t believe how much the vegetation changed with increases in elevation of only 100 m at a time. It is one thing to learn about changes in plant trends in class or out of a book, but it’s completely different to be able to feel the plants, walk through the terrain, and to make conclusions based on your own observations. Our final stop had an elevation of about 4,600 m (15,000 ft), where we approached snowline and there was hardly any life. It looked like we were on Mars; it’s strange how something so barren could be so beautiful.

Our next stop was the coast, where a change in biological diversity is reflected by a change in Ecuadorian culture. Coastal life revolves around the fish market, where men line up dozens of trucks along the beach in preparation of transporting and selling the daily catch. I conducted a project on the abundance and distribution of sharks at the Puerto Lopez fish market, taking into account both raw data of marketed fish as well as ethical issues regarding bycatch. I also collected data for projects on pelicans, barnacles, sea stars, and ghost crabs. Each and every day was full and beautiful. I spent most nights searching for critters on the rocks by the tide pools – when we weren’t processing bats, that is. I fell in love with studying bats from the first week of the program. We were lucky enough to catch a vampire bat at the coast. The only bat capable of saltatory movement - the vampire bat - ran straight into our net! Talk about good luck.

While visiting and learning about the endemic species of the Galapagos Islands was absolutely amazing, I would have to say that living and studying at Tiputini in the Ecuadorian Amazon was by far the highlight of my BU-TEP semester. The Station is home to over 560 species of birds, 12 species of primates, and over 230 species of mammals. I spent most days walking through trails collecting data and most nights setting nets to catch and process bat species richness. I also took part in a side project in which I directly observed frugivorous bats in a flight cage and studied their foraging behavior. Diversity among bats alone has opened my eyes to the intricacies of tropical biology. My favorite daytime activity, however, was searching for monkeys in the canopy. I shadowed two primate field assistants and recorded the behavior of habituated spider monkeys. The days were long and physically strenuous; with twelve hours of running through off-trail rain forest came cuts, bruises, and the frequent frustration of being lost. Nonetheless, the adventure was exhilarating and only reassured my newfound love for the tropics and its associated biological diversity.

Support CECB!

Your donations help CECB continue the training of undergraduate and graduate students in the fields of ecology and conservation biology, and fund critical environmental and biological research.

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Center for Ecology and Conservation Biology
5 Cummington St., Room 431
Boston University
Boston, MA 02215

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Web site: www.bu.edu/cecb