

CCSD: 10 years of achievement, 2002-2012



**CC
SD** CENTER FOR
CONSERVATION
AND
SUSTAINABLE
DEVELOPMENT
 MISSOURI BOTANICAL GARDEN

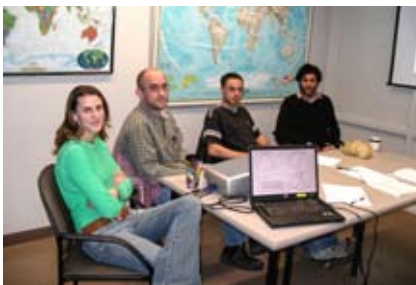
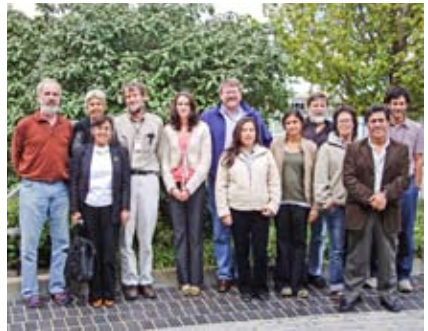


The Center for Conservation and Sustainable Development (CCSD), created in 2001 with generous support from the Bellwether Foundation, is today a leader in national and international efforts to conserve and promote biodiversity worldwide. Through its important role in conserving the most imperiled plants of the United States and in delivering the Global Strategy for Plant Conservation, to cite just two examples, CCSD has emerged as a major force in biodiversity conservation and is now widely recognized as an important plant conservation center of growing international significance. With its vibrant programs, CCSD has brought a new dimension to the work of the Missouri Botanical Garden (MBG) in plant sciences, complementing MBG's many years of successful plant research and exploration and enabling MBG to engage in and contribute to plant conservation more effectively.

In the last ten years, CCSD has developed and has continued to advance the following programs:

- Biodiversity and Conservation Research and Conservation Action
- Community-based Conservation
- Capacity Building for Conservation

In the relatively brief period since its establishment, CCSD has experienced remarkable growth. The progressive expansion of CCSD's staff, including the hiring of several scientists with expertise in conservation, has made this growth possible and is reflected on the facing page. In addition, as indicated on the last page of this brochure, building collaborations has always been one of CCSD's priorities and has enabled CCSD to amplify the work accomplished.



Biodiversity and Conservation Research and Conservation Action

To achieve long-lasting conservation, CCSD scientists focus their work in two areas:

- Examining and testing fundamental ideas about biodiversity and conservation that shape conservation practice and applying the results to devise effective solutions to particular conservation problems, and
- Undertaking tangible conservation actions that halt the loss of biodiversity and the extinction of those species at immediate risk.

In addressing these themes, CCSD has conducted both large-scale and small-scale analyses and projects and has concentrated its work in the Americas, Indochina, Africa, and the Caucasus.

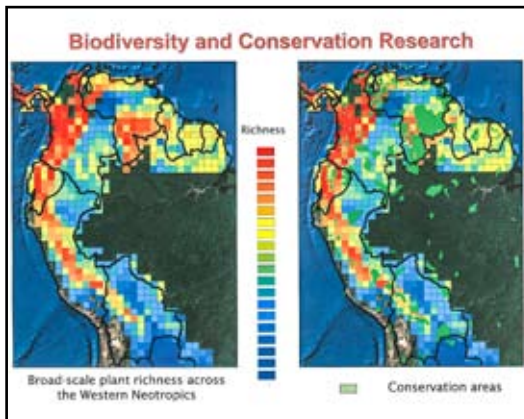
Studies of plant distributions and diversity patterns

This program has advanced understanding of a critical element in conservation decision-making: where the most important concentrations of plant diversity occur in a given area. CCSD's work on this topic, which centers on western tropical America—a region known to hold an exceptionally large biota—has made seminal contributions to conservation through production of detailed studies of the distribution of plant diversity across the region. The resulting information is essential to evaluate current threats to biodiversity and to design best practices for conservation.

CCSD scientists also study extinction risk in relation to the size of a species' geographic range, an important factor affecting its potential extinction and a topic poorly understood. This research focuses on plant species with small distributions, which are known to suffer from higher extinction risks. Findings to date show that in all probability many such species have never been found and that, consequently, much plant diversity is as yet unknown and is potentially threatened.

Equally significant in their impact are CCSD's studies of habitat fragmentation, one of the most serious threats to biodiversity worldwide. These studies show that, in some regions, at least some species may be resilient to fragmentation, permitting forest patches and populations to remain connected and thus allowing time for conservation practices to be applied in the region before many plant and animal species are irreversibly affected by fragmentation.





Selected achievements

- Publications in peer-reviewed journals: 13
- Reports and other publications: 2
- Students
 - Long-term mentoring or collaboration, in particular with graduate students (including service on graduate committees): 15
 - Middle-term mentoring of interns or fellows (one to three months): 11
 - Advice to graduate students on specific issues on which CCSD staff have expertise that is unique in the St. Louis region: 4
- Workshops: three workshops conducted, two in Bolivia and one in St. Louis. The topic was an introduction to R, a tool for data manipulation and analysis. In total, 64 graduate and undergraduate students, faculty, and fellows attended the workshops.
- Biodiversity Journal Club: a discussion group addressing current topics in ecology, evolution, and conservation that is held weekly during the academic year. The group has an average of 15 participants, including graduate students, faculty, and fellows at MBG.
- Lectures and conference presentations: 17
- Public talks and posters: 2
- Scientific collaborators: 18



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SAVING PLANTS IN A CHANGING CLIMATE

DR. MATTHEW ALBRECHT
Assistant Curator of Conservation Biology at The Missouri Botanical Garden

Climate change, pests, weeds and man's impact on habitat destruction threaten plant diversity and sustainability. For what's being done to save plants? Botanical gardens play a crucial role. Explore the challenges and solutions with Dr. Matthew Albrecht, assistant curator of conservation biology at the Missouri Botanical Garden.

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PROCEEDINGS OF THE ROYAL SOCIETY

Anthropogenic refugia ameliorate the severe climate-related decline of a montane mammal along its trailing edge

Toni Lyn Morelli^{1,2,*}, Adam B. Smith^{1,2,3}, Christina R. Kastely¹, Ilaria Mastroserio³, Craig Moritz¹ and Steven R. Beissinger^{1,2}

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Conservation of the most imperiled plants in the United States

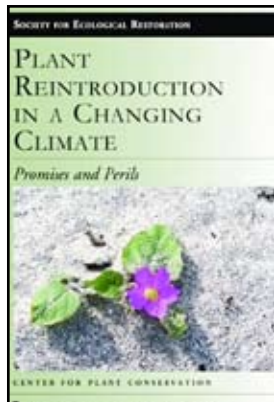
Through on-the-ground research, seed-banking, restoration, educational outreach, and partnerships with governmental and nongovernmental organizations, CCSD safeguarded from extinction 20% of the critically imperiled, imperiled, and vulnerable plant species in the North American Central Highlands (32 species).

CCSD scientists have also co-authored international scientific guidelines for reintroducing endangered plants and, applying these guidelines, have expanded long-term reintroduction efforts with the globally endangered Pyne's ground plum (*Astragalus bibullatus*). Discoveries from their studies of the habitat requirements and population dynamics of this species have helped transform policies for managing and restoring the species' habitat, which is also globally endangered and harbors numerous other rare and endangered plants that benefit from the new knowledge. The impact of this work extends far beyond Pyne's ground plum, which CCSD scientists are using as a model species to understand the restoration and recovery of endangered plants whose habitats have vanished because of changes in human land-use and historical disturbance regimes.



Selected achievements

- 32 endangered plant species in the North American Central Highlands safeguarded from extinction
- Five endangered plant species added to the National Collection of Endangered Plants
- A framework developed to use as a model for the restoration and recovery of endangered plants
- Publications in peer-reviewed journals: 12
- Book chapters: 3
- Reports and other publications: 11
 - Students
 - Long-term mentoring or collaboration, in particular with graduate students (including service on graduate committees): 3
 - Middle-term mentoring of interns or fellows (one to three months): 12
 - Advice to graduate students on specific issues on which CCSD staff have expertise that is unique in the St. Louis region: 1
- Workshops: three workshops conducted, at Kansas State University, the Missouri Botanical Garden, and the Conservation Biology North America Congress in California, on an introduction to best practices in species distribution modeling in conservation. A total of 65 graduate students, faculty, fellows, and resource managers attended the workshops.
- Lectures and conference presentations: 20
- Public talks and posters: 34
- Scientific collaborators: 23



Identification of priorities for policy and action through the conservation assessment of species

CCSD has developed a partnership with the International Union for Conservation of Nature (IUCN) to conduct evaluations of the conservation status of plant species using the criteria developed by IUCN for its Red List, which is widely accepted as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species.

CCSD also worked on preliminary Red List assessments of all species known to occur in Nicaragua and of the Asclepiadaceae (milkweed family) of Guatemala and participated in the preparation of Red Books of the plants of Ecuador, Peru, and Bolivia.



Selected achievements

- Two workshops to provide training in the IUCN methodology to conduct IUCN Red Listing assessments
- 14 workshops to assess the conservation status of plant species and to define important areas for plant conservation utilizing the IUCN methodology, held in the United States, Spain, China, Vietnam, Laos, Cambodia, Thailand, Georgia, Tanzania, and Kenya
- 607 species from Indochina evaluated for inclusion in the IUCN Red List
- 8,000 species from Nicaragua evaluated and preliminary assessments produced, results published online and partially in printed form, and the list of the 100 most threatened species prepared
- 16% of the most threatened plant species of Nicaragua (100 species) growing *ex situ* at the Jardín Botánico Ambiental-León, Nicaragua
- 62 species of Asclepiadaceae from Guatemala evaluated using the IUCN Red List criteria and the results published in printed form
- Contribution to the evaluation of:
 - o 5,500 species for the Red Book of endemic plants of Peru
 - o 4,800 species for the second edition of the Red Book of endemic plants of Ecuador
 - o 339 species for the first volume of the Red Book of Bolivia
 - o 2,800 species from the Caucasus for inclusion in the IUCN Red List
 - o 1,788 species from the Eastern Arc Mountains and Coastal Forests of Kenya and Tanzania for inclusion in the IUCN Red List

Studies of the impacts of climate change on biodiversity

As rapid climate change poses a serious threat to plant diversity, CCSD scientists have been at the forefront of developing novel analytical methods and tools to understand the vulnerability of imperiled U.S. plants to climate change. They have created techniques for analyzing rare species distributions in current and future climates, together with methods for applying their results in vulnerability assessments that incorporate climate change impacts with current threats.

They also made a major contribution to understanding the effects of climate change through participation in a study and publication demonstrating that human activities may trigger irreversible tipping points in the biological organization of life on Earth. This study was adopted by the Governor of California as a policy brief to help guide legislation.



New program in conservation genetics

In 2012 CCSD engaged in a planning process to discuss its mission, vision, and values and to define CCSD's strategic development through 2020. Development of a program in conservation genetics emerged as the highest priority among the strategic areas of growth identified for CCSD. Subsequently, CCSD conducted a national search to hire an assistant scientist in conservation genetics and offered the position to Dr. Christine Edwards. Dr. Edwards, who has a strong background in plant systematics and population genetics of rare species, will begin her tenure with CCSD in September 2013. A conservation genetics laboratory constructed for the new program will be completed shortly thereafter.





Community-based Conservation Programs

CCSD's community programs aim, above all, to contribute to conservation of the flora of areas determined as priorities by MBG because they are rich in biodiversity and very much at risk. CCSD engages residents of the communities that inhabit these areas in conservation and sustainable management of their natural resources. In doing so, CCSD has advanced MBG's integrated approach to working in its priority regions, which builds links between scientific research (conducted by MBG botanists) and conservation work, including capacity building and community-based conservation in the same geographical area. This successful approach has allowed CCSD to implement science-based conservation programs.

Developing a trusting relationship with communities is an essential component in community-based conservation. From its inception CCSD, has dedicated substantial resources to building relationships with the two indigenous communities who inhabit regions of high conservation importance in which MBG and CCSD are conducting research and conservation work, the Cordillera del Cóndor in Ecuador and the Selva Central in Peru. CCSD has also developed conservation work with communities in other regions, including Bolivia and Mesoamerica, Madagascar, Vietnam, and, in the last year, the United States.



Conservation of the Shuar territories (southeastern Ecuador)

CCSD's program with the Shuar indigenous group has developed a zoning and management plan for the Cutucú-Shaimi Protected Forest (part of the Cordillera del Cóndor), in partnership with the Shuar organization Fundación Tsantsa and with the Real Jardín Botánico de Madrid, an undertaking that could not have been possible without the trust and participation of the Shuar communities. CCSD's capacity building programs in community-based natural resource management and land-use planning, developed in the region during the first and subsequent years of the program, laid the foundation for this accomplishment.



Selected achievements

- The Management Plan 2012-2017 for the Cutucú-Shaimi Protected Forest inhabited by the Shuar indigenous people. The Plan was officially adopted by the Ministry of Environment of Ecuador and its implementation mandated by Ecuadorian law.
- A well-trained Shuar professional conservation and resource management team
- Six management plans for six Shuar communities
- A project that compiled information on ancestral botanical knowledge and language and used the information in the development of management plans
- 16 workshops attended by 445 community members to raise awareness of environmental problems and build capacity for conservation

Conservation of the Yanesha territories (central Peru)

Chief among CCSD's conservation achievements with the Yanesha is the work under way for the preparation of a management plan for their Communal Lands. In 2002 CCSD initiated conversations with the Yanesha leadership to develop a partnership and, a year later, CCSD and the Yanesha signed a collaboration agreement. Conservation work in the region began in three communities, where CCSD developed school and community environmental education programs and vegetable gardens, and was later expanded to other Yanesha communities that requested similar programs. This joint work, together with other collaborative activities during the last ten years—e.g., identification of the most important plants used by the Yanesha, determination of threats to these plants and their habitats, and implementation of additional sustainable productive activities—has set the basis for the scientifically-based management plan now being developed in partnership with the Yanesha communities and the Ministry of Environment of Peru.

Selected achievements

- Collaborative work with the 10 Yanesha communities living adjacent to the Yanesha Communal Reserve and with *colono* communities in the western buffer zone of the Yanachaga-Chemillén National Park
- 32 sustainable development activities developed with 10 communities, including raising “majaz” (*Agouti paca*), planting fruit trees, and cultivating medicinal plant gardens and vegetable gardens
- 46 school vegetable gardens developed with an average of six schools participating per year, engaging about 7,000 children during the 10 years of the program
- Work advanced towards the development of a management plan for the Yanesha Communal Lands, including:
 - Environmental education training reaching about 8,000 people in the communities
 - A socioeconomic survey and a resource use survey and analysis
 - Evaluations of plant and animal populations
- Two relevant publications in collaboration with the Municipality of Oxapampa and the Director of Peru's Protected Area System:
 - Identification manual of the most important plants for rural communities in the Palcazu Valley, central Peru
 - Identification manual of the plants used for honey production in central Peru



Conservation work in Bolivia

Since 2005, CCSD has worked in Bolivia with about 2,000 elementary and high school students from nine schools in the school system serving a densely populated (200,000 residents) and underserved urban community on the outskirts of the city of Santa Cruz. Two related accomplishments highlight the conservation program in Bolivia: the incorporation of an environmental component into school curricula, and teacher training in environmental sustainability and conservation.

CCSD also worked with the community of Bella Vista near Santa Cruz to develop a low-impact ecotourism program and built a partnership with the city government of Tarija to develop the management plan for the Reserva Natural Alarachi.



Selected achievements

- An environmental education module added to the curriculum
- Participation of 4,008 students from 33 schools in the program
- Three courses for 150 teachers
- One ecotourism program developed
- Plant data and conservation analysis for the preparation of the management plan for the Reserva Natural Alarachi in Bolivia

Conservation work in Mesoamerica: Nicaragua



Selected achievements

- A study of the interactions among humans, forest structure, and animal distribution in the Bosawás Biosphere Reserve in Nicaragua in partnership with the Saint Louis Zoo that generated information needed for a management plan for the north-central part of the Reserve. Information on hunting practices and forest use was provided to Conservation International for preparation of the plan.
- Seven community people trained as parataxonomists



Conservation work in Vietnam

CCSD worked closely with the Vietnamese government to conserve Bach Ma National Park. The programs implemented with this purpose include activities designed to raise awareness of the importance of the Park and its conservation, sustainable development initiatives implemented with communities living in the Park's buffer zone, and training opportunities for students with the twofold purpose of building capacity and increasing basic knowledge of the Park's rich biodiversity.



Selected achievements

- 147 park rangers and other National Park personnel trained
- 25 households trained in sustainable activities
- 27 sustainable development activities (medicinal plant gardens and rattan projects) conducted in six communities in the buffer zone of the Bach Ma National Park
- A brochure on the medicinal plants of the region published and 1,000 copies distributed to stakeholders



Conservation work in Madagascar

CCSD works with MBG's Madagascar program to raise awareness among local stakeholders of the importance of and the threats to their natural ecosystems. The collaborative work helps local people understand that there are tools available to achieve enduring conservation and sustainable development and that they have responsibility for the sustainable use of their own resources. The work centers on eleven sites considered priority areas for plant conservation in Madagascar.



Activities

- Organization of biodiversity festivals
- Development, printing, and distribution of brochures, t-shirts, and posters
- Organization of one community library
- Organization of eleven green clubs, one per community
- Educational radio and television broadcasts



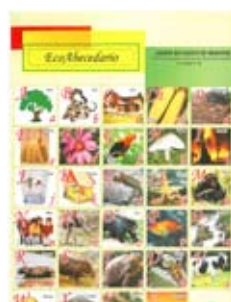
Raising awareness of the importance of biodiversity and the environment and the need for their conservation

In working with communities, CCSD has invested considerable resources in raising awareness for conservation and has developed interactive programs that include talks and discussions with adults and children, accompanied by videos and other visual aids. CCSD has also partnered with local governments and other institutions to produce printed materials supporting conservation and sustainability.



Selected achievements: books, booklets, and pamphlets

- A guide to the most common medicinal plants in Salento, Colombia (2005)
- A guide for the development of school vegetable gardens (Peru, 2005)
- A guide to the birds and plants of Bella Vista, Bolivia (2006)
- A guide to the useful plants of the Bosawás Biosphere Reserve, Nicaragua (online publication, 2006)
- A book about the useful plants of Sololá, Guatemala (2006)
- Technical guides for the development of vegetable gardens (Peru, 2006)
- “Conserving our resources” (Peru, 2007)
- A guide to neighborhood greening (Bolivia, 2007)
- “Learning about plants and their importance” (Peru, 2008)
- “Raising *Agouti paca*” (Peru, 2009)
- Identification manual of the most important plants for rural communities in the Palcazu Valley (Peru, 2009)
- A guide to the useful plants of the páramos of Zuleta, Ecuador (2009)
- Identification manual of the plants used for honey production in central Peru (2010)
- A guide to the medicinal plants of the Yanesha communities (Peru, 2011)
- A management plan for the Cutucú-Shaimi Protected Forest (Ecuador, 2012)
- “Achieving conservation in tropical countries: an integrated approach to capacity building” (*BGJournal*, London, 2013)



Capacity Building Programs

Recognizing the urgency of improving capacity in plant science and conservation, CCSD places training the next generation of biodiversity scientists and conservation biologists at the core of its programs. The capacity building programs take a multi-tiered approach to training for people of different educational backgrounds—from professional botanists and conservationists to university students and recent graduates to people in rural communities in tropical countries. Training is central to CCSD's integrated approach to accomplish conservation goals and is a critical component of every initiative CCSD conducts. The success of CCSD's capacity building programs is measured not only by the number of people trained or courses taught but also, and most importantly, by the people trained by the programs, who through their work are achieving conservation.

Selected achievements

- Field-based short- and long-term courses and internships
 - Ecuador: 3 courses, 90 students
 - Peru: 9 courses, 115 students
 - Bolivia: 9 courses, 208 students
 - Vietnam: 8 courses, 121 students
- Mentoring and support for undergraduate thesis research
 - Ecuador: 18 students
 - Peru: 37 students
 - Bolivia: 81 students
- Support and mentoring for the most successful undergraduates to pursue graduate studies
 - Ecuador: 1
 - Peru: 6
 - Bolivia: 9
 - Vietnam: 3
- Specialized training for diverse groups, including park guards, government officials, conservationists, and members of rural communities
 - Ecuador: 250
 - Peru: 478
 - Vietnam: 147
- Environmental awareness-raising and training in conservation of biodiversity (reflected under community conservation programs)



Establishment of fellowships for professional development in systematic botany, biogeography, ecology, and conservation

CCSD takes great pride in its extremely successful training/practice fellowships at MBG, a program that has grown significantly in scope over the years.

The first fellowships, three per year, were the Elizabeth E. Bascom Fellowships. Later, CCSD instituted the Alwyn H. Gentry Fellowships and, three years ago, was able to expand the program with the new Shirley A. Graham Fellowships. In 2012, CCSD created the Elizabeth E. Bascom Conservation Fellowship.

The fellowships, which are well established and prestigious, provide opportunities for individuals who have completed their undergraduate degree and have achieved a certain level of professional development to carry out meaningful work in a first-class plant science and conservation institution. The fellows also have opportunities to interact with the scientific staff at MBG/CCSD, as well as with graduate students and other visitors, and to establish contact with faculty at local universities to explore possibilities for pursuing graduate studies. As a result of their visits and contacts, several fellows have been able to enroll in graduate programs in St. Louis.

Fellowships for professional development at MBG

- o Elizabeth E. Bascom Fellowships: 53
- o Alwyn H. Gentry Fellowships: 14
- o Shirley A. Graham Fellowships: 10



Partnerships

CCSD gives great importance to building partnerships that add value relative to operating alone, produce financial benefits, or drive efficiency. By complementing its strengths through partnerships, CCSD has been able to augment its achievements. The partial list below summarizes the most productive partnerships that CCSD has built or enhanced in the last ten years:

- Asociación para el Manejo de la Reserva Comunal Yanesha (AMARCY)
- Botanic Gardens Conservation International
- Center for Plant Conservation
- Conservation International
- Convention on Biological Diversity (Global Strategy for Plant Conservation; Ecological Restoration Alliance)
- Fairchild Tropical Botanic Garden
- Herbario Nacional de Bolivia, Universidad Mayor de San Andrés, La Paz, Bolivia
- Inter-American Institute for Global Change Research
- International Union for Conservation of Nature/Species Survival Commission
- Jardín Botánico Ambiental-León, Nicaragua
- Ministry of Environment of Ecuador
- Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima
- Museo de Historia Natural Noel Kempff Mercado, Santa Cruz, Bolivia
- National Protected Areas Service, Ministry of Environment of Bolivia
- National Protected Areas Service, Ministry of Environment of Peru
- Real Jardín Botánico de Madrid
- Saint Louis University
- Saint Louis Zoo
- Shuar communities and federations, Cutucú-Shaimi Protected Forest
- Southern Illinois University-Edwardsville
- Tennessee Department of Environment and Conservation
- U.S. Department of Defense
- U.S. Fish and Wildlife Service
- U.S. National Park Service
- University of Missouri-St. Louis
- University of São Paulo, Brazil
- Vietnam Academy of Science and Technology, Hanoi
- Washington University

