Missouri Botanical Garden

William L. Brown Center

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The William L. Brown Center (WLBC) is dedicated to the study of useful plants, the relationships between humans, plants, and their environment, and the conservation of plant species and preservation of traditional knowledge.

Humans depend on plant resources for food, shelter, medicines, materials, and elements of their spiritual world. There are about 10,000 species of edible plants, yet only about 100 species make up the majority of the world's food supply. Nature's bountiful plant diversity has barely been tapped for potential alternative crops and genes that could help improve today's important food plants.

Close to one third of modern prescription medicines contain a plant-derived ingredient, and chemicals from plants have contributed to the production of many synthetic pharmaceuticals. Yet only a tiny fraction has been evaluated for potential pharmaceutical use.

Our team of ethnobotanists is currently working mainly in Madagascar, the Himalayas, the Caucasus region, the Andes region, and the United States. We conduct botanical research and create multifaceted programs focused around ethnobotany, preservation of traditional knowledge, conservation, natural products discovery, and climate change. An overarching goal of the WLBC is to address the lack of adequate research capacity in developing countries that are home to the majority of the world's plant species. Training takes place in the field, at workshops, or through collaborating universities in St. Louis and ranges from informal hands-on training to formal graduate degree education.

Ethnobotany

As ethnobotanists, we study the interactions among people, plants, and their environments. This may mean studying a culture's health system, testing plants for their chemical constituents, monitoring the impact of climate change on traditional lifestyles, or working with communities to ensure the abundance of their useful plant species in neighboring forests for generations to come. Ethnobotanical research utilizes methods of many disciplines such as phytochemistry, taxonomy, anthropology, and education. Ethnobotanical data collection relies heavily on our collaborations with local experts: healers, elders, famers, and doctors, who in many instances are custodians of techniques and knowledge that have been passed down, innovated, and safeguarded for many generations. Their vast understanding of their ecosystem, combined with our global scientific experience, creates a more comprehensive knowledge of plants and their use and survival.

We work around the globe, from coasts to mountaintops. Our ethnobotany programs include: The Madagascar Ethnobotany Program, The Chacobo of Beni (Bolivia), Palm Ethnobotany (Bolivia), Diversity and indigenous use of plant resources in West Nepal, Wine, Beer, Snuff, Medicine, and Loss of Diversity – Ethnobotany in the Georgian Caucasus (Georgia), MHIRT Medicinal Plant Study (Peru), Chachapoyas Conservation (Peru), American Indian Ethnobotany (U.S.), and St. Louis Bosnian Ethnobotany Program (U.S.). Colleagues at our research sites are the stewards of ancient and evolving ecological knowledge. Whenever applicable, we engage our local counterpart communities in creating thorough documentation and beneficial programs that enable us to learn from each other and create pragmatic lasting outcomes for conservation.

Climate Change

As atmospheric greenhouse gases increase, temperatures are warming, sea levels are rising, snow and ice are decreasing, and there are local changes in extreme weather events such as droughts and storms. Across the world, these changes affect plants and the people that rely on them. These changes have already begun: ecosystems across the world have been affected by the recent decades of rapid climate change. Some of the strongest effects are felt at the highest and lowest elevations: mountaintops and coastlines. WLBC researchers work in both of these ecosystems to understand historical changes, monitor contemporary changes, and plan for future changes to plants and to ethnobotanical traditions. We advance these goals through studying changes in vegetation patterns and in plant phenology, and through interviews with traditional knowledge keepers.

Alpine Climate Change: With increasing temperatures, plants are already moving up in elevation. For the highest-elevation alpine plants, however, there's nowhere to go, and they are threatened directly by increased temperatures and indirectly by competition from lower-elevation plants extending their range. Indigenous mountain communities, already coping with the direct effects of climate change, also see traditional plant-based medicines becoming harder to find, alpine pastures declining as vegetation patterns change, and seasonal indicators falling out of synchrony. WLBC researchers and local collaborators track the impact of climate change both on the alpine flora and on traditional culture by setting up permanent biodiversity and climate monitoring plots on mountain summits. We pair this with ethnobotanical participation of indigenous mountain residents and local plant experts. Standardized, quantitative methods and close collaboration within our Himalayan network allows coordinated species identification and data analyses, enabling both a broad scope and detailed comparisons, dramatically increasing the value of this monitoring. Beyond this, methods for climate and biodiversity monitoring are identical to those employed by researchers on other sites across the world, allowing worldwide comparisons.

Coastal Climate Change: Island and coastal indigenous communities are on the frontline of climate change. With vulnerable territories and natural resource-based livelihoods, these communities have first-hand knowledge of climate change impact and mitigation strategies due to their long-term observations and engagement with their environments. Despite broad recognition of their vulnerability and unique knowledge and experiences, their voices have been largely unheard. We conduct research and organize activities in New England to bring the knowledge and concerns of these vulnerable communities into the global change discussions. WLBC researchers are working with some of the first indigenous peoples to be contacted by the earliest settlers in our country. They live along the Northeast coast and islands and are fighting for cultural and ecological survival. This new program begins by documenting and evaluating useful plants and threats, altered plant communities and land uses, and changing plant phenologies. We evaluate how these factors affect the traditional natural resource base of the coastal and island indigenous peoples of the Northeastern United States.

Discovery

Though humans consume thousands of species of plants, most remain poorly understood, and traditional knowledge about their uses is eroding. Many plants that are useful or might contain useful compounds will be at risk of extinction in the next few centuries. Habitat loss, climate change, unsustainable collection for commercial markets, spread of invasive species, and other effects of human activities will have tremendous impact. Never before has there been a more urgent need to discover, understand, conserve, and sustainably use the plant resources that will support future generations.

Stewardship of these plant resources will require rigorous science combined with respect for traditional knowledge systems, equitable compensation of all parties, and culturally sensitive participation. In ethnobotanical research programs, WLBC scientists work with local counterparts and communities to document the traditional uses of medicinal plants and develop mechanisms to give this knowledge back to the communities involved.

The discovery program of the WLBC links interested communities and partner countries to academic, government, and commercial partners in natural products discovery. Since 1986, the WLBC has supplied over 40,000 vouchered bulk plant samples to be screened via bioassays. The Garden has long been a leader in developing ethical collecting agreements; local partners in international projects always have benefit-sharing agreements and receive up-front compensation from the funding source to support local capacity-building efforts.

Collections

Biocultural collections comprise useful plants and their wild relatives, as well as artifacts, derivatives, and information related to their use. These collections include a wide range of materials, from typical herbarium specimens to commercial food products, DNA samples, archaeological plant remains, and cultural artifacts derived from plants. Biocultural collections serve a crucial function as sources of information about human use of plants throughout history. These collections ensure that knowledge of plant uses can be preserved and maintained, even as the cultures that produced it vanish or are assimilated.

Because these collections vary widely in size and form, they present curatorial challenges beyond more standard natural history collections. Standardized methods of curation include bringing the data and images of these collections online where the public, students, conservationists, and researchers can access them.

The WLBC manages the DNA bank for the MBG Herbarium. Since the removal of material from herbarium specimens to extract DNA for molecular studies results in destructive sampling, Garden botanists have begun to regularly collect samples specifically to support molecular phylogenetic studies. While MBG encourages the use of its collections to further scientific research, it must ensure that its collections serve the needs of both contemporary and future researchers. It is hoped that this material, collected specifically for molecular analysis, will promote phylogenetic research while easing the demand on herbarium specimens.

Text by Ashley Glenn, Wendy Applequist, and Robbie Hart.

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Science and Conservation at the Missouri Botanical Garden

With operations in over 35 countries around the globe, the Missouri Botanical Garden collaborates with local institutions wherever Garden botanists conduct research and field work, providing technical expertise, assistance with fund raising, and better communication with the worldwide scientific community.

The research division consists of 46 Ph.D. botanists assisted by 144 support staff and 20 graduate students. Studies concentrate on the plants of Meso- and South America, sub-Saharan Africa, Madagascar, China, Vietnam, and North America.

Individual Garden scientists are specialists in the plants of particular regions, in the systematics and evaluation of major plant families, and in the interactions between plants and people.

The Garden serves as the headquarters for the Center for Plant Conservation and for several major collaborative publications, such as *Flora of China* and *Flora Mesoamericana*.

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1. Sambucus intermedia neomexicana.
2. Sambucus nigra viridis.
3. Sambucus canadensis.
4. Sambucus melanocarpa.
5. Sambucus callicarpa.
6. Sambucus racemosa flavescens.

LITHOGR. KUNSTANST. WALTER MÜLLER, GERA