

sure. The glasshouses as well as being environmentally controlled also have lights programmed to maintain a minimum of 18-h light, to enable growth all year round without letting the GM and G1 pots to go dormant.

The total number of pots generated in this way per year is shown in Table 1.

## CONCLUSION

Planting material is required for vineyard expansion or replanting with improved varieties, clearly this technique provides major advantages in substantially reducing the time between expression of demand and supply of sufficient planting material. It also allows for an increase in the scale of multiplication of improved genetic material. The elapsed time between identification or release from quarantine of a desired variety or clone and availability of commercial quantities of planting material has been reduced from 11 years to 4 years.

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## The Concept of Urban Horticulture, and Its Implications in the World of Plant Propagation<sup>®</sup>

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The world of ecosystems, interdependence of organisms, and interdisciplinary studies were all terms that began to take on new meaning in the late 1970s. In the early 1980s, the Center for Urban Horticulture (CUH) became the first formal academic and outreach institution affiliated with a major university to actually create a place where the traditional plant sciences were mingled with the social sciences. It embraced the idea of interdisciplinary studies and ecology.

Physical development of the CUH began in 1984 and four new buildings completed the site in 1987 with all the funds provided by private donors. CUH has served as a model for many other such programs in the years hence by providing a place where faculty, students, and the public can work together to create a showplace for environmental horticulture and urban forestry.

During the 1990s and into the beginning of this millennium, the program grew to include the contributions of seven full time faculty. Graduate enrollment averaged approximately 55 annually, and a newer undergraduate program had attracted 35 students. The outreach programs at CUH and the 230-acre Washington Park Arboretum site have reached over 35,000 annually, the second highest on the University of Washington (UW) campus (collegiate athletics is first). During this twenty years, many community organizations, both large and small, were formed that focused on environmental issues in contrast to the more traditional plant societies which were active during the mid and late part of the last century.

Also the Miller Horticulture Library became one of the foremost repositories of horticultural books for academics as well as the public, accumulating over 14,000 volumes. In addition, a comprehensive Master Plan for the Washington Park Arboretum (WPA) (proposed \$45 million) was unanimously passed after 7 years of planning and public process. The WPA is a 230-acre site, just south of the main UW campus. It is one of the more important collections of woody temperate plants in

the world. In existence for over 70 years, CUH was created to compliment academic research and teaching for the arboretum.

Unfortunately, a radical environmental group chose to target the main CUH building, Merrill Hall, as a firebombing target because of a research geneticist who was housed there on 21 May 2001. The nearly \$6 million building plus countless materials for research, teaching, and public outreach were destroyed and the entire program placed into chaos. Since then, this energetic program and dedicated leaders have only made the program even stronger and a new building with new environmental features will open in 2004.

The current academic teaching and research programs are composed of exciting interdisciplinary programs. The following account details some of the program thrusts.

The world of horticulture is indeed an ecological world. Professor Kern Ewing has established an outstanding program in urban ecology, both in teaching and in focusing research on wetland ecology and principles of ecological restoration. His laboratory classes combine techniques from horticulture with the understanding of ecological processes to restore, repair, and manage ecosystems. Current and past students have worked on coastal and freshwater wetlands, prairies, oak woodlands, oak savannas, thornscrub, riparian systems, steppe, streams, arctic and sub-arctic environments, eelgrass and kelp meadows, bioswales, venal pools, and capped landfills. One of the biggest issues often confronting restoration managers is the acquisition of the number and quality of plants for re-establishment, a factor for plant production consideration.

Associate professor Linda Chalker-Scott's program includes three areas of inquiry: environmental stress physiology, ecophysiology of plants in disturbed environments, and sustainable management of human-altered landscapes. Her combination course work and accompanying laboratories are built around a selected community site. During the quarter, the students secure materials, work with the community around the site, and restore it. They then work with the community who will need to keep up the site in future years. This has been a most successful way of getting hands-on instruction and for students to learn about interactions with communities. They have been involved with over 30 community landscape renovation projects. The students learn how to work with growers and suppliers of plants and products.

Sarah E. Reichard, Assistant Professor, is one of the newer members of the faculty. Sarah has established a worldwide reputation in the study of the biology of invasive organisms, especially plants. Her graduate work has grown into a comprehensive program that has brought her international notoriety. Research projects include work on the traits of invasive plants, prediction of invasive ability, early detection and rapid assessment of new invaders, and studies on the impacts of plant invaders on native ecosystems and plants. One of her current studies involves the biological study of *Geranium robertianum* and its effect on our native species. She is also working with the nursery industry in developing incentives to voluntarily reduce the distribution of invasive species.

Another of her thrusts is rare plant preservation, and the re-introduction of rare species. Her research includes studies on rare species of the Northwest, including the impact of anthropogenic disturbance on such species, and the use of horticultural techniques in rare plant re-introduction. Current interests include studies on *Castilleja levisecta*, a hemi-parasite, and *Hackelia venusta*, proposed for endan-

gered species listing. She is responsible for the establishment of the Miller Seed Vault, which will become the Northwest (U.S.A.) vault for seed preservation.

Professor John A. Wott leads the academic area of public gardens as well as functions as Director, WPA. The academic area trains both undergraduate and graduate students in the many possible areas of responsibility in a public garden, e.g., curation, administration, grounds maintenance, education and outreach, and public dimension. Students often use the Washington Park Arboretum as their laboratory site. This prominent institution offers on-the-job experience. Graduate research projects include planning and projections of community programs and new gardens, curatorial type projects, and community outreach experiences.

J. Alan Wagar is a Research Professor of Recreation and Urban Forestry. His programs include studies in ethnic differences and shifts and preferences for urban forest landscapes. He advises a number of students on community urban forestry areas and has been instrumental in working with student projects developed for the State of Washington in establishing urban forestry programs.

Two people provide leadership in teaching entomology and plant diseases in the program. Professors Robert Gara and Robert Edmonds are particularly involved with plant protection courses and research. Professor Iain Robertson is an Adjunct Professor of Landscape Architecture and is involved in landscape design, especially in the public garden area.

Professor Thomas M. Hinckley is a tree physiologist and is currently Director of CUH. His research is divided between fast-growing hybrid *Populus* and relatively slow-growing conifers. His studies on the genetic improvement of Black Cottonwood are extremely applicable to the pulp and paper industry. After all, a faster crop of materials to produce papers, including toilet and facial tissues, will lessen pressures on the traditional lumber production.

Both the academic and research programs of CUH as well as the new physical structure of Merrill Hall continue to pioneer ideas. The proposed Merrill Hall will become the first LEED certified building on the University of Washington campus. In its construction it will contain efficiencies in indoor environmental quality, use of local and recycled materials, will be energy efficient in heating, cooling, and lighting, and will contain water efficiencies. The use of a green roof and storm water retention will all result in reduction of runoff and wastes into the Puget Sound watershed. New plantings around the structure will also be water efficient.