Old and New Trends Influencing the Introduction of New Nursery Crops

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At the First National New Crops Symposium in 1988, I reported on four trends that were influencing the introduction of new landscape plants (Widrlechner 1990). These trends were:

1. increased interest in, and use of, low-input plantings;
2. edible landscaping;
3. \textit{in vitro} propagation methods; and
4. ways to overcome limitations caused by urban conditions.

But trends, by their very nature, are dynamic; what was timely twenty years ago can be passé today. The environment in which nursery producers and retailers operate continually evolves, and the trends that affect them and their consumers need periodic re-analysis. Thus, the objectives of this brief review are to examine how past trends have fared and to describe some trends that now supplant them or are poised to become more important.

LOOKING BACK

Of the four trends identified in 1988 (Widrlechner 1990), two remain quite relevant to the introduction of new cultivars of nursery crops: low-input plantings and ways to overcome site limitations caused by urban conditions. While they may no longer be considered trends due to their longevity and their gradual integration into the thinking and practice of both producers and gardeners, it is obvious that the rising cost and decreasing availability of skilled labor and of water and other inputs for landscape-plant care continue to drive demand for low-input plantings. And the United States of today is even more urbanized than it was in 1988, increasing the importance of plants and cultural methods selected to overcome urban-site limitations. This has been recognized widely both by urban natural-resource advocates and political leaders as concerted efforts are underway in many cities to expand tree planting for its resulting functional (biofilters for soil and air quality) and psychological benefits.

In contrast, interest in edible landscaping has waned somewhat, notwithstanding its proponents, such as Lee Reich (Reich 1991, 2005a,b,c, 2006) and Rosalind Creasy (Creasy 1999), and sporadic, community-based efforts to encourage edible landscapes, such as the Edible Estates movement (Haeg 2006), reducing its overall importance to the introduction of new nursery crops. I suspect that most gardeners find it easier to segregate woody plants for human-food production from the cultivation of ornamental trees and shrubs and that many of the food products potentially harvested from these ornamentals have not become widely appreciated, even in this day of adventurous cuisine.

The other trend identified in 1988 (Widrlechner 1990), \textit{in vitro} propagation, has become well integrated with a suite of other commercial propagation methods and is no longer the dynamic force for change in the range of new cultivar releases that it seemed to be in the past. This is not to minimize its importance, only to point out that there is now a clearer understanding of the technique’s limitations (reviewed by Hartmann et al. 2002) and how commercial tissue culture fits as just another tool in the propagator’s toolbox (cf. Hunter 2004; Thiart 2004).

CONNECTING OLD WITH NEW

In this section, I would like to discuss a few examples of how past trends have manifest themselves in ways only briefly noted or completely unforeseen in 1988. For example, in relation to low-input plantings, long periods of sustained “above-average” annual precipitation in certain regions since 1988, when much of

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the United States was coping with a serious drought, have encouraged a shift in gardening interest from xeriscaping to rain gardens (Marinelli 2003) and a gradual broadening of the discussion towards sustainable water use in managed landscapes. The importance of efficient water usage is important even in the less-arid parts of the United States, as demand for water continues to increase, often leading to specific restrictions on water use for landscape plantings. Recently, a complete issue of the journal, “Public Garden,” was devoted to this topic of sustainable water use (Michener 2005), including perspectives on both the supply and the quality of the resulting runoff.

Overall, promotion of low-input plants, such as new landscape roses (Hawke 1997b; Yee 2004; Ciesinski 2005b), shrubs for xeriscapes (Weinstein 2006) and those with compact growth habits (Acton 2005), and tough, North American native trees (Sternberg 2006), continues quite robustly. And, in the years since 1988, the establishment and growth of the Landscape Plant Development Center (LPDC), a non-profit collaborative research organization dedicated to the development of “durable plants,” has increased activity and general interest in the development of low-input plants (Pellett 2006) by creating inter-institutional research linkages for cooperative breeding and evaluation (LPDC 2006). Another notable group making contributions to this area is Cornell University’s Urban Horticulture Institute (Cornell University 2006), which conducts research on the selection, evaluation, and propagation of landscape plants with improved tolerance to biotic and abiotic stress (Whitlow 1991; Bassuk 1995) and enhanced functional uses in disturbed urban landscapes. Enhanced functionality, in the face of road salts, poor soils and drainage, artificial lighting and photoperiods, and physical abuse, remains a daunting challenge. But the improvements in water and air quality, energy usage, property values, and overall human well-being that can result from well-designed urban landscapes will justify continued investment in this area.

A rather different aspect of low-input plantings, examined in my earlier presentation (Widrlechner 1990), was a rising interest in the distinctive, regional character of managed landscapes. This trend led to a gradual expansion in native-plant nurseries that primarily serve specific geographic markets [e.g., California regionalism and native-plant nurseries in Wolfe (2005)] in support of regional differentiation, although many landscape designers continue to create plantings that seem oblivious to it. Be that as it may, increased interest in native landscape plants among the gardening public (Marinelli 1999) is now strongly interwoven with a newer trend, increased awareness of non-native, invasive plants (Mirsy 1999), a topic to be discussed in the next section. Regional differentiation should also be reinforced if fuel costs remain high, favoring regional nursery producers and marketers over their national counterparts, because of rising shipping costs for nursery stock.

As part of ongoing efforts to overcome the limitations of urban stresses, great strides are now being made in the use of artificial growth media, often referred to as structural soils (Smiley 2006), for urban sites (Grabosky and Bassuk 1995), and creative ways to grow landscape plants in very large containers both in acclaimed new parks, such as Chicago’s Millennium Park (Gilfoyle 2006), and on urban roof tops (Keith 2005), with the rise of the green-roof movement first in Germany and now also in the United States (Getter and Rowe 2006). Although green roofs and woody plants may not be compatible when handled in typical, low-maintenance, “extensive” applications with minimal substrate, there are also “intensive” green roofs, with deeper substrates and more opportunities for the use of woody plants (Getter and Rowe 2006).

In my past discussion of edible landscaping (Widrlechner 1990), I briefly noted the role that ornamental trees and shrubs with fruits have in landscaping for wildlife. A general rise in interest in landscaping for birds (Marinelli 2001), pollinating insects (Weatherbee 1999; Abell 2003; Roth 2003; Bruner et al. 2006), and other wildlife (Baird 2001) [but generally not deer or other mammals that are often viewed more as pests than as guests, cf. Lemieux and Maynard (1998)] has been a trend through the 1990s and into this decade as well. It has even been connected to branding through a relationship that Monrovia Nursery Co. established with the National Audubon Society to promote specific selections for backyard wildlife habitat as the Audubon Habitat Collection (American Horticultural Society 1999).

LOOKING AHEAD

Based on my personal experiences and a review of trade and popular gardening literature, I’d like to focus on four current trends that strongly influence the introduction of new nursery crops and are likely to remain important determinants of future research, development, and marketing decisions. These trends are:
1. the rise of branding and the protection of intellectual property rights (IPR);
2. increasing awareness of invasive species;
3. extending the season of garden interest; and
4. challenges caused by serious new pests and diseases.

Although the developers and marketers of new nursery crops have long had access to Plant Patents and various non-propagation agreements for vegetatively propagated cultivars, Plant Variety Protection for seed-propagated selections, and trademarks for attractive names (Elliott 1991; Jondle 1993), in recent years, such tools to protect IPR and promote brand identification have been applied more and more frequently. This may reflect broader marketing trends and an overall rise in the exercise of IPR for plant germplasm worldwide in the post-Convention on Biological Diversity marketplace (Pistorius and van Wijk 1999). But, more specifically, I suspect that much of it stems from the great success of the Wave™ series of Petunia Juss., Solanaceae, cultivars, beginning in 1995 (ARA Content 2005; Anonymous 2006), and its extensive, integrated Point-of-Sale marketing campaign.

Today, beyond the Audubon Habitat Collection noted briefly above, there are many other integrated marketing programs for the introduction of new landscape plants, involving both networks of commercial organizations, such as Proven Winners® (2006) and Star® Roses (2006), and consortia of public gardens with commercial partners, including Chicagoland Grows® (Ault 2004), Plant Select® (Klett and Slump 1995), GreatPlants® (Morrissey 1997) and The University of British Columbia (UBC) Botanical Garden’s Plant Introduction Scheme (UBC Botanical Garden 2004).

One negative aspect to marketing efforts that link the use of trademarks to patented cultivars with unattractive cultivar names, is the confusion that multiple names, one connected to the cultivar and the other to the source or supplier, can engender, especially for accurate recordkeeping (Cappiello 1999; Manners 1999; Trehane 2001; Aguilar 2006). For example, the popular Knock Out® rose, Rosa L., Rosaceae, is the cultivar ‘Radrazz’ (Conard-Pyle 2006), and the recent, long-blooming hydrangea, Hydrangea macrophylla (Thunb.) Ser., Hydrangeaceae, selection ‘Bailmer’ is much more easily marketed as Endless Summer® (Endless Summer Blooms 2006). But as Avent (1999) pointed out, things get quite complicated when multiple trademarks are associated with a single cultivar and a single trademarked name can get switched from one cultivar to another.

On a corporate level, increased use of branding has also become important in shaping future directions not only for garden centers and nurseries, but also for public institutions, such as botanical gardens, arboreta and universities, that support new plant development. For example, the journal, “Public Garden,” devoted an issue to marketing (Lee 2002) that included an overview of how branding can serve as a key tool for effective marketing (Bear and Lauby 2002).

There are two ways that I see this trend influencing the introduction of new plants. First, the rise of integrated marketing programs reduces the visibility of an independent introduction or one where the developer fails to use tools to protect IPR and promote brand identification. Second, the sheer number of new introductions through these programs makes it difficult for retailers, landscape architects, and gardeners to sort out the best choices. This topic will be discussed in the closing section of my report.

An increasing public awareness of invasive exotic plants and the serious threats they pose both to agriculture and to natural ecosystems is underway [contrast Colton and Alpert (1998) and Kelley et al. (2006) to gain a better understanding of this shift in awareness] through the popular press (Mirsky 1999) and a rapidly expanding base of professional (Bir 2001; Galbraith 2002; Harrington et al. 2003) and scientific literature (Mooney and Cleland 2001; National Research Council 2002; Myers and Bazely 2003). This dovetails with increasing interest in native plants among gardeners (Marinelli 1999; Sternberg 2006), producers (Neimeyer 2001; Landicho 2006), policy makers (USDA Forest Service 2006), and researchers. Researchers have recently begun to evaluate variation within potentially invasive plant groups to examine genetic and phenotypic differences related to reproduction and weediness (Aniśko and Im 2001; Knox and Wilson 2006; Lehrer et al. 2006). Threats of invasive plants perceived by nursery professionals (Gagliardi and Brand 2007) are also motivating new research interest both in identifying alternatives to commercially important, invasive species (Abbey 2004; Barton and Schwetz 2004; US National Arboretum 2005; Burrell 2006; Washington Invasive Species Coalition 2006) and in developing sterile landscape plants (Podaras 2005; Pellett 2006). Practical strategies for developing new tree and shrub cultivars with impaired reproductive capacity have been reviewed by Ranney (2004).
There has been much activity among gardeners in extending the season of garden interest, with an emphasis on plants that provide four-season color (Pellett 2006) and significant strides in the creative use of containers for woody and tender plants. Ways to employ dramatic colors, such as black (Ciesinski 2005a), and seasonal color schemes (Speichert 2005) have been featured recently in many trade and popular gardening publications. And the use of colorful, slow-growing evergreens for four-season color (Weatherbee 2003; Grotz 2006), along with deciduous woody plants with colorful winter bark or fruits (Burrell 2001; Hall and Anisko 2005; Martin 2005; Pelczar 2005; Simeone 2005) and even winter-flowering shrubs (rather remarkable from a Midwestern perspective) (Buffin 2005), has also been widely promoted. Creative demonstrations of the decorative roles of woody plants in containers can be found in attractive books by Ouellet (2003) and Williams (2004) and in articles by Kaplan (2005), who focused on conifers, and Randolph (2005), who offered a broader view.

The final trend that I’d like to discuss is a disturbing one. Our increasingly mobile world has led to the more frequent movement of exotic pests and diseases into regions where neither our native flora nor the managed landscape has developed sufficient mechanisms to thwart them. Some of these emerging pests and diseases may have huge implications, which are likely to shape the introduction of new nursery crops for years to come. Two of the most devastating members of the latest cohort of pests and diseases are the Emerald Ash Borer, Agrilus panipennis Fairmaire, and Phytophthora ramorum (Werres, de Cock & Man in’t Velt), the causal agent of sudden oak death, ramorum leaf blight and ramorum shoot dieback (Davidson et al. 2003).

The first is a wood-boring beetle that coevolved with ash trees, Fraxinus L., Oleaceae, in northeastern Asia, but it also has the ability to attack and quickly kill healthy Fraxinus species native to eastern North America (McCullough and Katovich 2004). In many parts of the United States, Fraxinus pennsylvanica Marsh. and F. americana L. cultivars are as common along American streets as American elms, Ulmus americana L., Ulmaceae, were 50 years ago before the arrival of Dutch Elm Disease, caused by Ophiostoma ulmi (Buismans) C. Nannf. and O. novo-ulmi Brasier, since these ash cultivars were widely used as replacements for dying elms (MacFarlane and Meyer 2005). Considerable research is underway to develop strategies to control Emerald Ash Borers’ damage and dispersal from its current range in the North Central United States and Canada (Mastro et al. 2006), where it has already killed millions of trees (MacFarlane and Meyer 2005), and to develop resistant Fraxinus selections (Herms et al. 2003). In the meantime, there is much interest in identifying good alternatives to ash as a street tree (Cregg and Schutzki 2006; Giroux 2006).

The presence of Phytophthora ramorum is difficult to detect consistently, as it has an extremely broad host range, with many hosts that do not exhibit serious symptoms but others, such as tan-oak, Lithocarpus densiflorus (Hook. & Arn.) Rehder, Fagaceae, that are highly susceptible (Davidson et al. 2003; Appiah et al. 2004; California Oak Mortality Task Force 2006). As this pathogen spreads, tan-oaks and species of red oaks, Quercus L., Fagaceae, are rapidly disappearing from California and Oregon’s coastal forests, plant communities that are intercalated with human population centers, managed landscapes, and commercial nursery-crop production. This environment of forests, managed landscapes, and nurseries, combined with the pathogen’s broad host range (California Oak Mortality Task Force 2006), dispersal mechanisms (Davidson and Shaw 2003), and severe effects, creates new challenges for the efficient operation of local, commercial nursery-crop production and sales to unaffected areas (Rodda 2006).

There are many other serious pest and disease problems that can be noted here, but I will mention only two. The first is the Asian Longhorned Beetle, Anoplophora glabripennis (Motschulsky), which may influence future cultivar development like sudden oak death, as this large and destructive beetle also has a very broad host range (Morewood et al. 2004). The other is the decline of one of our nation’s showiest and most popular native flowering trees, the flowering dogwood, Cornus florida L., Cornaceae, in large part resulting from the spread of two fungal pathogens, dogwood anthracnose, Discula destructiva Redlin, and powdery mildew, Erysiphe pulchra (Cooke & Breck) U. Braun & S. Takamatsu (Ranney et al. 1995; Windham et al. 2005). This decline resembles the ash situation, since some degree of resistance to each of these biotic stresses exists within the genus under attack and could be enhanced through breeding.

This trend will likely lead new-crop development in two directions: one modeled after single-genus efforts resembling those underway to restore Ulmus americana (Townsend et al. 2005) and Castanea dentata (Marsh.) Borkh., Fagaceae [cf. Hebard (2005) for an overview of the American Chestnut Foundation’s breeding program];
the other working to identify formerly overlooked woody plants that happen to cope well with new pests or pathogens or with specific abiotic stresses, resembling the stress-tolerance approach of Graves (2004), which focuses on obscure trees and shrubs native to unusual habitats that engender resistance to stresses common in managed landscapes. The second approach, if successful, brings an extra benefit; it can lead to increased biodiversity in managed landscapes.

**A SPECIAL CHALLENGE**

Within this dynamic marketplace of plants and ideas, increasing numbers of new introductions are being promoted, but efforts to collect and share objective evaluation data on the long-term performance of these new cultivars under a wide range of garden conditions are insufficient to keep pace. Although it was written more than ten years ago, Harrison Flint’s comments on this subject ring true even more clearly today.

“The wide selection of landscape plants available today—as compared with past years—is good news. The bad news, however, is that the evaluation of prospective new plants is still often haphazard and incomplete, leaving us with new introductions that contribute little to diversity—and in some cases do not measure up to their older competitors” (Flint 1994, p. 43).

Within the United States, long-term programs to evaluate nursery crops, such as the longstanding, multi-sites network of the NC7 Ornamental Plant Trials focusing on the North Central United States (Ovrom 2001; Widrlechner 2004), and newer efforts, including shrub trials at the Chicago Botanic Garden (Hawke 1994, 1997a,b) and Longwood Gardens (Armstrong 2000; Aniško 2002; Metrustry 2006), the SERA-IEG-27 network for nursery-crop evaluation in the Southeastern United States (Dunwell et al. 2001), the Coordinated Education and Marketing Assistance Program (CEMAP) network in Texas (Arnold et al. 1998), and Virginia’s Beautiful Gardens™ evaluation network (Beautiful Gardens™ 2006) can only generate objective, quantitative data for a small proportion of new introductions and linkages between these efforts and the dissemination and marketing of their results are uneven.

The relative lack of objective evaluation data and of practical recommendations about relative merit and appropriate use creates special challenges for growers (Weerdenburg 2006), retailers, and consumers, and may give advantages to those organizations introducing new cultivars with well-understood branding that are supported by careful evaluation data. Building the connection between branding and evaluation data would seem to be a useful strategy for converting initial gains in perceived consumer value associated with successful branding into long-term, consumer brand loyalty.

Criteria for conducting such a coordinated evaluation program well-suited for integration with a branding program were outlined by Flint (1994), and they include:

1. the need for strategic evaluation and introduction plans;
2. well-defined, prioritized criteria for evaluation;
3. multi-site evaluation, representing a cross-section of pertinent environments, with clear responsibilities among participants; and
4. inclusion of superior cultivars as appropriate checks with appropriate experimental design to remove environmental biases.

To this end, in 2005, the Royal Boskoop Horticultural Society introduced PlantPlus®, a new brand for plant selections that are not only new or unique, but have also been subjected to expert review through a number of different evaluation systems (Weerdenburg 2006). The ability of this scheme, and other similar programs, such as CEMAP’s Texas Superstar™ program (CEMAP 2006), to build sufficient capacity to keep pace with introductions remains to be seen. To be effective across the broad range of environments here in the United States, the new resources required for such integrated evaluation and promotion schemes will be substantial, and will likely need to focus on diverse nursery crops for a network of regional markets, not a single set of national products.

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