Research Reports

Master Gardener Perceptions and Preferences of a Novel Horticultural Product—Do-It-Yourself Living Structures Kits

Erica Pagliughi^{1,3}, Yulia A. Kuzovkina^{1,4,6}, and Robert M. Ricard^{2,5}

ADDITIONAL INDEX WORDS. consumer segmentation, outreach education, *Salix*, survey research, willow

SUMMARY. An online survey was developed to investigate Master Gardener perceptions of and preferences for a novel horticultural product, “Do-It-Yourself (DIY) Living Structures Kits,” which include live willow (*Salix* sp.) stems, instructions on how to build various forms, ties, and cultural guidelines. The survey consisted of 37 items to assess the interest level in this product, to examine the likelihood of consumers’ interest in purchasing this product, and to evaluate preferred designs and potential price points. A total of 249 Connecticut Master Gardeners completed the survey. The respondents provided valuable insights on product popularity and potential. The majority of them were between the ages of 56 and 65 years, female, Caucasian, married, without children in the household, and own a house with a yard in suburban areas. Most of the respondents represented plant purchasers and experienced gardeners. The two most popular structures were the decorative fence and the arbor, and Master Gardeners indicated specific preferred price ranges for the products. Aesthetic appeal was perceived as the main attractive aspect of the product. Among the major factors affecting their decision to purchase DIY Living Structures Kits, most respondents indicated design/type and price as “very important.” Forty-four percent of people were interested in buying one of these kits as a gift for someone. Results revealed that there is potential for a niche market as this group of consumers was enthusiastic about the new product: 74.1% of Master Gardeners responded positively that DIY Living Structures Kits have potential to become new horticultural products. More in-depth product evaluation studies using trial kits and marketing research targeting additional segments of consumers should be conducted in future.

With the wide array of horticultural products already available to consumers, the exploration for various value-added crops is constantly in progress. Production of woody ornamental cut stems represents a specialty niche (Stahl, 2004), and the potential to significantly expand the market of woody cut stems has been recognized (Armitage and Laushman, 2003; Greer and Dole, 2008). Previous research of willow ornamental

cut-stem growers (Saska et al., 2010) revealed producers’ interest in the expansion of the crop with new markets and product offerings. The novel concept of using live, brightly colored willow stems to create living structural

elements and the possibility of its transformation into a new product is currently under investigation at the University of Connecticut.

The concept is based on a relatively recent adaptation of the traditional craft of basketry, and it has been introduced in the United Kingdom, Germany, and Denmark (Gro, 2004; Warnes, 2004). The living structures are planted in spring as dormant 6- to 10-ft-long willow whips and bent into different simple shapes and forms. By mid-June, they set roots and foliage, quickly naturalizing the area. Living structures will continue to grow and fill in for many years, changing according to the seasons, becoming more substantial and mature over time. They may be grown in both public and private landscapes including residential gardens, require only minimal maintenance, and once established can function as natural elements for children to play with, as accent features in ornamental gardens, and as decorative fences or shelters (Danks, 2010; Kuzovkina, 2008; Warnes, 2004).

The potential of living structures for playgrounds has been emphasized in the United States (Danks 2002, 2003, 2010), and our previous research evaluated the feasibility of their establishment and maintenance needs in Connecticut (Kuzovkina, 2008). While the production systems developed for willow biomass production (State University of New York, 2002) can be tailored to provide the adequate material with the required dimensions for the structures’ construction, research efforts have focused on development of the designs. With the help of Kim Vergil, an artist familiar with the technique, a portfolio of living structures as DIY kits that included a dome, wigwam, tunnel, fence, and arbor has been developed (Kuzovkina, 2008). Each kit includes live willow whips, step-by-step instructions on how to construct each form along with ties and cultural guidelines.

The production of fresh cut stems as a specialty crop for DIY Living Structures Kits may appeal to a wide

Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711
0.3048	ft	m	3.2808

range of agricultural producers. Willow can grow on marginal land with only basic input as predicated by organic principles and has sustainable off-season harvest time in early spring. Willow plantings grown for the production of willow cut stems can be strategically incorporated into riparian buffers along the edges of farmland. Riparian buffers are known to decrease nonpoint source pollution while improving water quality and provide a wide range of ecosystem services and conservation benefits (Jones et al., 2010). Willows are an efficient component of riparian buffers because of their high transpiration rates and extensive root systems, which trap runoff from agricultural fields, thus assisting farmers with nutrient management (Kuzovkina and Volk, 2009). Willows incorporated into buffers and harvested in early spring may serve as a unique production niche for farmers by offering opportunities to supplement incomes during the dormant season (Saska et al., 2010).

To determine the viability and preference for this product, we evaluated if the production of willow stems for DIY Living Structures Kits has a promise to evolve into a profitable crop and identified the locations of a niche for this product. We verified that the kits are appealing to people interested in gardening and learned more about consumer's perceptions and preferences.

For the survey, we selected a consumer segment represented by Master Gardeners. Members of the Extension Master Gardener volunteer program, which is offered in the United States, receive extensive training in the field of horticulture provided by cooperative extension services.

Master Gardeners represent a sizable segment of the gardening public

[the number of active Master Gardeners in 2005 was 80,519 people (Meyer, 2007)] and a knowledgeable plant consumer group. Their opinions are often used in research projects as opinion leaders or data collectors (Brzuszek et al., 2010). Master Gardeners may also influence the gardening public and define the role of horticulture in their communities (Brzuszek et al., 2010) guiding the development and dissemination of new trends.

Materials and methods

Connecticut Master Gardeners were invited to be the target audience to assess the interest level in these products, to examine the likelihood of their interest in purchasing these products, and to evaluate preferred designs and potential price points. An online survey of the Master Gardeners in Connecticut was conducted consisting of 37 items, including open-ended, opinion-based, and closed-ended questions structured on a five- or seven-point scale (Dillman, 2000). The first set of questions included inquiries regarding respondents' demographics and plant purchasing behavior. The second set of questions was designed to identify preferences for various designs and their utilizations. We also included technical inquiries about pricing. Digital images of the seven structures, the prototypes of the final products, were integrated into the survey. A few pictures of the mature foliated structures were included for visualization of the structures' appearance (Fig. 1). The third set of questions requested information concerning the sales potential of this product for consumers.

The University of Connecticut Institutional Review Board approved

the survey methodology, and an e-mail letter of invitation detailing the project was sent to the Connecticut Master Gardener cooperative extension state coordinator. This letter requested the state coordinator to forward an attached letter to the members of the state Master Gardener e-mail list. The request letter included a paragraph explaining the goals of the survey and assuring the recipients' anonymity. It also contained a hyperlink to the online web survey address. The first page of the survey included a short introductory paragraph describing the new product line and included a few pictures. The request letter e-mails were sent on 22 Feb. 2011 to 550 Master Gardeners. Two weeks later a reminder letter was sent to survey recipients inviting those who had not completed the survey to do so. Two hundred forty-nine respondents completed the survey by 28 Apr. 2011 and these were included into the data analysis. Peak survey returns occurred within 7 d of the first mailing. Since not all respondents answered every question, analysis was performed using the total number of completed questions for each returned survey. Missing and incomplete responses were, therefore, excluded from calculation resulting in small variation between sample size analyses between questions. Survey data were analyzed using the SPSS (version 18.0; IBM Corp., Armonk, NY) for simple descriptive statistics.

Results and discussion

RESPONDENT PROFILE. The majority of respondents (36.1%) were between the ages of 56 and 65 years (Table 1). The demographic data of the survey indicated that most of the respondents were female (82.2%),

We thank Leslie Alexander for help in obtaining Connecticut Master Gardener contact information and the anonymous reviewers of this manuscript for insightful suggestions toward its improvement.

¹Department of Plant Science and Landscape Architecture, University of Connecticut, 1376 Storrs Road, Unit 4067, Storrs, CT 06269-4067

²Departments of Extension and Natural Resources and the Environment, University of Connecticut, 1376 Storrs Road, Unit 4067, Storrs, CT 06269-4067

³Senior Student

⁴Associate Professor

⁵Senior Extension Educator

⁶Corresponding author. E-mail: jkuzovkina@uconn.edu.

Fig. 1. Examples of mature Do-It-Yourself Living Structures made of willow stems at the University of Connecticut in Storrs in 2007: (left) living fence and tunnel 3 weeks after planting and (right) dome 2 years after planting.

Table 1. Selected demographic characteristics of surveyed Connecticut Master Gardeners participated in a 2011 online survey regarding a novel horticultural product Do-It-Yourself Living Structures Kits made of willow stems.

Respondent characteristic	Respondents (%)
Age (years)	
Under 25	0
26–35	1.7
36–45	4.8
46–55	28.7
56–65	36.1
65 and above	27.4
Prefer not to answer	1.3
Gender	
Male	16.5
Female	82.2
Prefer not to answer	1.3
Marital status	
Single	15.0
Married	80.1
Prefer not to answer	4.9
Employment status	
Full time	17.2
Part time	29.8
Retired	36.1
Unemployed	8.0
Prefer not to answer	8.9
Type of work	
Related to horticultural industry	24.0
Not related to horticultural industry	41.6
Not applicable	34.4
Annual household income	
Less than \$25,000	0.9
\$25,000–\$49,999	12.1
\$50,000–\$74,999	13.0
\$75,000–\$100,000	14.8
Over \$100,000	24.2
Prefer not to answer	35.0
Neighborhood	
Rural	23.5
Small town	26.0
Suburban	44.5
Urban	6.0
Size of the yard around your residence	
No yard	0.9
Under 1/4 acre ^z	14.2
1/4–1/2 acre	14.0
1/2–1 acre	19.6
1–2 acres	21.6
2 + acres	29.7
Children in household (no.)	
0	75.3
1	8.6
2	13.5
3	2.2
4 or more	0.4

^z1 acre = 0.4047 ha.

Caucasian (80.1%), married (80.1%), and own a house with a yard (91.1%) located mostly in suburban (44.5%) areas. Many of them (29.7%) had

a yard larger than 2 acres. The majority of respondents (75.3%) did not have children in the household. Only 11 respondents had children between

the ages 6 and 12 years, while four of them had children under the age of 6 years. When asked if they frequently had guests or visitors under the age of 12 years, 68.7% of the respondents replied positively. For employment status, 36.1% were retired and 24.2% brought in an annual household income of over \$100,000, whereas 14.8% of the respondents earned between \$75,000 and \$100,000, and 26% less than \$75,000 per year.

A majority of the respondents (84.6%) represented experienced gardeners with more than 15 years of gardening experience. Twenty-four percent of the respondents work in the horticulture industry. Survey results indicated that many Master Gardeners were plant purchasers, and almost everybody (98.4%) has bought at least one plant in the past year. Many respondents (43.2%) bought 1–10 plants in the past year or 10–20 plants (19.8%), or even more than 20 (35.8%). Only four of the respondents did not buy any plants in the past year. These Master Gardeners most often buy their plants at local nurseries or garden centers. Sixty-six percent of them claimed to most often buy their plants at a local nursery, and 51.6% said they most often buy at a garden center. Many respondents (64.6%) also said sometimes they bought plants at national chains, internet sources (57.3%), retail nurseries, and farmer's markets (54.1%). Other popular sources included wholesale nurseries, local plant sales, and mail order catalogues.

EVALUATION OF VARIOUS STRUCTURES. After a visual presentation of digital images of the seven living structures (Fig. 2), the survey respondents were asked to select which one, if any, they would purchase. The two most popular structures were the decorative fence (76.5%) and the arbor (62.6%) followed by the wigwam and small dome (Table 2). Over half of the respondents said they would not be interested in purchasing the large tunnel, small tunnel, large dome, small dome, or wigwam. The large tunnel was the least popular with 79.0% of Master Gardeners saying they would not purchase one.

Among the most important factors affecting their decision to purchase the product, most respondents (60.2%) indicated design/type as “very important,” 46.2% listed the price of the product as “very important,” 37.8%

Fig. 2. Examples of the images of Do-It-Yourself Living Structures made of willow stems included into the Connecticut Master Gardeners online survey for visualization of the product: (left) arbor, (center) small tunnel, and (right) wigwam.

Table 2. Connecticut Master Gardeners' perceived interest in purchasing various Do-It-Yourself Living Structure Kits made of willow stems in a 2011 online survey regarding the product.

Kit	All respondents	
	Yes (%)	No (%)
Large tunnel	21.0	79.0
Small tunnel	31.0	69.0
Large dome	41.0	59.0
Small dome	42.7	57.3
Decorative fence	76.5	23.5
Arbor	62.6	37.4
Wigwam	43.3	56.7

ranked size as "important," and 39.0% ranked simplicity of construction as "very important" (Table 3).

Forty-four percent of the respondents were interested in buying one of these kits as a gift for someone. The decorative fence (43%) and arbor (33%) were the preferred choices. The filtered results, which included only the responses of Master Gardeners who work in the horticultural industry, indicated that 52% of the respondents were willing to sell these structures or incorporate them into a client's garden. Again, the majority of them were interested in the arbor or decorative fence. However, 17.2% of respondents said it really depended on the property and client's wishes, but they would be willing to use any of them. It was interesting that every one of the structures, even the large tunnel, was mentioned as an option to incorporate into a garden. One person was remarkably specific as to where each structure should be included in a client's yard: "Dome as child's play space; possibly arbor on properties where further buildout is prohibited; want a shaded sitting area.

Fence usefulness depends on maintenance needs."

Aesthetic appeal was perceived as the most attractive aspect of the living structures as indicated by 69.3% of respondents. Functional space separation/camouflage was another important aspect of structures' utilization as indicated by majority (65.3%) of the gardeners. In addition, 29% of people would use them for rustic furniture, 21.8% of respondents would use them as additional natural play elements to children's gardens, and 5.9% of people would use them as pet shelters.

LIVING STRUCTURE PRICING. The specified price ranges for each structure were based on the dimensions of the stems required for the construction (i.e., stem quantity and length). Thus, the large tunnel was priced highest because of the largest number of longer rods required for its construction; the arbor, fence, and small tunnel were priced lower because of the fewer quantity of rods required for the construction; and the small dome and wigwam were priced the lowest because of the shortest and fewest rods required for the construction (Table 4). For the large tunnel, the most frequent response (35.0%) indicated a range of \$50 to \$74 as an appropriate price. For the small tunnel, 32.6% of respondents priced it at \$35 to \$50. The large dome was most frequently priced at a \$30 to \$39 range by 39.6%. The small dome was priced between \$15 and \$25 by many of them (45.7%). The decorative fence was priced most appropriately between \$30 and \$39 by 34.4% of the respondents. For the wigwam, 42.2% of them said they would pay less than \$15 and 39.3% of the respondents

would pay between \$15 and \$25. The arbor was most appropriately priced between \$25 and \$34 for 32.1% of respondents.

HOW MASTER GARDENERS PERCEIVE THE PRODUCT. Visual appeal and the use of entirely natural materials were very important aspects of the product for the majority of Master Gardeners (53.8% and 51.4% of respondents, respectively) (Table 5). For many gardeners (32.5%), the unique design was important and 39.0% of them listed child friendliness as "very important" or "important." For other important aspects, Master Gardeners specified that DIY Living Structures Kits are "renewable natural resources," "have potential use for erosion control/riparian buffer," "function as a wildlife habitat," "would use as a sculptural accent," and several respondents liked them as "a source of materials for basket weaving." Durability, maintenance, and deer resistance were other important considerations for some of the respondents.

Among the main motivators to purchase the product, most of the respondents (51.4%) listed year-round aesthetics and novelty, 45.9% listed helping the environment as "most important," 28.8% listed supporting local farmers who grow living structure materials, and 16.6% listed providing children with a natural play area as "most important."

PRODUCT POTENTIAL. The most important findings were that 74.1% of Connecticut Master Gardeners responded positively that DIY Living Structure Kits have potential to become new horticultural products and 69.4% of them considered the products appealing to a consumer without formal training in gardening (Table 6).

Most respondents (74.4% of respondents) said they would be most likely to purchase DIY Living Structures Kits from a local garden center or nursery, 30.4% of them would order online from a supplier, and 26.0% would buy them at a local farmer's market. The majority of respondents (70.5%) were willing to make a trip to their local farmers' market to purchase a kit directly from a grower.

Conclusions

The introduction of a novel product represents a considerable challenge.

Table 3. Connecticut Master Gardeners' opinions about factors that would affect purchase of Do-It-Yourself Living Structure Kits made of willow stems in a 2011 online survey regarding the product (*N* = 249).

Factor	Respondents selecting each rank [no. (%)]							Mean (SD)	Total responding [no. (%)]	Total missing [no. (%)]
	Very important	Important	Neutral	Somewhat important	Not important	Not sure	No opinion			
Design type	150 (60.2)	59 (23.7)	9 (3.6)	4 (1.6)	2 (0.8)	0 (0)	10 (4)	1.67 (1.34)	234 (94.0)	15 (6.0)
Price	115 (46.2)	91 (36.5)	11 (4.4)	1 (0.4)	2 (0.8)	0 (0)	9 (3.6)	1.78 (1.26)	229 (92.0)	20 (8.0)
Size	94 (37.8)	98 (39.4)	19 (7.6)	2 (0.8)	3 (1.2)	0 (0)	10 (4.0)	1.95 (1.33)	226 (90.8)	23 (9.2)
Simplicity	97 (39.0)	83 (33.3)	23 (9.2)	9 (3.6)	2 (0.8)	0 (0)	10 (4.0)	2.0 (1.38)	224 (90.0)	25 (10.0)

Table 4. Connecticut Master Gardeners' willingness to pay a specific price range for various designs of Do-It-Yourself (DIY) Living Structures Kits made of willow stems in a 2011 online survey regarding the product.

DIY Living Structures Kit ^a	Response (%)
Large tunnel (10-ft long and 6-ft tall)	
Less than \$50	33.5
\$50 to \$74	35.0
\$75 to \$100	23.6
\$100 or more	7.9
Small tunnel (10-ft long and 4-ft tall)	
Less than \$25	22.8
\$25 to \$34	29.9
\$35 to \$50	32.6
\$50 or more	14.7
Large dome (6-ft tall in the center)	
Less than \$30	25.7
\$30 to \$39	39.6
\$40 to \$49	20.6
\$50 or more	14.1
Small dome, pet house (4-ft tall in the center)	
Less than \$15	23.5
\$15 to \$25	45.7
\$26 to \$40	27.7
\$40 or more	3.1
Decorative fence (5-ft tall and 10-ft long)	
Less than \$30	27.1
\$30 to \$39	34.4
\$40 to \$49	20.2
\$50 or more	18.3
Wigwam	
Less than \$15	42.2
\$15 to \$25	39.3
\$26 to \$40	14.6
\$40 or more	3.9
Arbor	
Less than \$25	26.0
\$25 to \$34	32.1
\$35 to \$44	25.0
\$45 to \$54	13.2
\$55 or more	3.4

^a1 ft = 0.3048 m.

It is important to identify if the product appeals to a population of consumers familiar with this type of good and if there is a potential for a niche market. Master Gardeners who are gardening savvy consumers and purchasers of horticultural products provided

valuable insights into the DIY Living Structures Kits popularity and potential.

Some consumer preferences were identified as appealing to this specific group of respondents. For example, regarding the design selection, the

arbor and the decorative fence were the two most popular designs which are likely to provide secluded and usable outdoor spaces for older adults. The fact that most of our respondents did not have young children, and were older adults, could explain their preferences in the design of structures that may exclude children's interest.

Most of our respondents stated that a combination of factors, such as design/type, price, size, and simplicity of construction, would affect their purchase decisions of living structures. In understanding this, retailers and growers can select and create products that best meet their consumers' demands. Master Gardeners identified the specific preferred price ranges for each structure, and it is likely that these products have the potential to generate some economic interest for the producers. More economic information regarding costs of production and profits are needed to assess the economic potential.

Perhaps, the most important finding from this research was the fact that the majority of Connecticut Master Gardeners believe that DIY Living Structures Kits do have potential to become a new horticultural product, thus indicating potential for a niche market. Master Gardeners believe that it would appeal to consumers who do not have formal horticultural training. Interestingly, the product may have the potential to be considered as a gift item. Also, the majority of the respondents working in the horticultural industry were willing to sell these structures or incorporate them into a client's garden. The intent to help the environment was listed as one of the important motivators to purchase the product. The survey indicated that most Master Gardeners would most likely purchase DIY Living Structure Kits from a local garden center or nursery, which is consistent with their plant

Table 5. Connecticut Master Gardeners' opinions on which aspect(s) of Do-It-Yourself Living Structures Kits made of willow stems is the greatest attraction for them in a 2011 online survey regarding the product (N = 249).

Aspect	Respondents selecting each rank [no. (%)]							Mean (SD)	Total responding [no. (%)]	Total missing [no. (%)]
	Very important	Important	Neutral	Somewhat important	Not important	Not sure	No opinion			
Unique design	81 (32.5)	91 (36.5)	25 (10.0)	13 (5.2)	6 (2.4)	1 (0.4)	15 (6.0)	2.29 (1.59)	232 (93.2)	17 (6.8)
Visual appeal	134 (53.8)	74 (29.7)	6 (2.4)	5 (2.0)	4 (1.6)	0 (0)	8 (3.2)	1.71 (1.28)	231 (92.8)	18 (7.2)
Child friendliness	43 (17.3)	54 (21.7)	53 (21.3)	23 (9.2)	24 (9.6)	2 (0.8)	23 (9.2)	3.13 (1.81)	222 (89.2)	27 (10.8)
Natural materials	128 (51.4)	75 (30.1)	8 (3.2)	9 (3.6)	4 (1.6)	0 (0)	7 (2.8)	1.76 (1.27)	231 (92.8)	18 (7.2)
Other	19 (7.6)	6 (2.4)	4 (1.6)	1 (0.4)	1 (0.4)	1 (0.4)	1 (0.4)	3.98 (2.76)	55 (22.1)	194 (77.9)

Table 6. Connecticut Master Gardeners' opinions about the potential and distribution of Do-It-Yourself (DIY) Living Structure Kits made of willow stems in a 2011 online survey regarding the product.

Question	Yes (%)	No (%)	Undecided (%)
Do you think DIY Living Structure Kits have potential to become a new horticultural product?	74.1	8.2	18.1
Do you think this product would appeal to a consumer without formal training in gardening (not a Master Gardener)?	69.4	9.1	22.0
Would you make a trip to the local farmers' market to purchase a kit directly from a grower?	70.5	11.6	17.7

purchasing behavior. However, it appeared that many of them are willing to make a trip to a local farmers' market to support farmers that grow the materials, which would be very beneficial for sales through direct marketing.

In summary, the survey was valuable for gaining insights on the promise of DIY Living Structure Kits and indicative that there is potential for a niche market. For this survey, we selected a consumer segment represented by Master Gardeners. However, consumers of horticultural products are relatively diverse, and additional marketing research targeting various segments of gardening consumers should be conducted in future to assess their perceptions of a new product (Behe et al., 2010). Also, more in-depth product evaluation studies would need to be conducted if the product were available in retail outlets. The limitation for future investigation is the lack of availability of trial products. Therefore, production of trial kits is recommended for future marketing research.

Literature cited

- Armitage, A.M. and J.M. Laushman. 2003. Specialty cut flowers. 2nd ed. Timber Press, Portland, OR.
- Behe, B.K., B. Campbell, J. Dennis, C. Hall, R. Lopez, and C. Yue. 2010. Gardening consumer segments vary in ecopractices. *HortTechnology* 45:1475–1479.
- Brzuszek, R.F., R.L. Harkess, and L. Kelly. 2010. Survey of master gardener use of native plants in the southeastern United States. *HortTechnology* 20:462–466.
- Danks, S.G. 2002. Green mansions. *Landscape Architecture* 6:38–43,93–94.
- Danks, S.G. 2003. Green mansions: Living willow structures enhance children's play environments. *Child. Youth Environ.* 13:37–42.
- Danks, S.G. 2010. Asphalt to ecosystems: Design ideas for schoolyard transformation. New Village Press, Oakland, CA.
- Dillman, D.A. 2000. Mail and Internet survey. 2nd ed. Wiley, New York.
- Greer, L. and J. Dole. 2008. Woody cut stems for growers and florists: Production

and post-harvest handling of branches for flowers, fruit, and foliage. Timber Press, Portland, OR.

Gro, V. 2004. Lebende weidengeflechte im garten. Schäfer im Vincentz Network, Hannover, Germany.

Jones, K.B., E.T. Slonecker, M.S. Nash, A.C. Neale, T.G. Wade, and S. Hamann. 2010. Riparian habitat changes across the continental United States (1972–2003) and potential implications for sustaining ecosystem services. *Landscape Ecol.* 25: 1261–1275.

Kuzovkina, Y.A. 2008. Establishment and maintenance of living structures made of willow (*Salix*) stems. *Arboriculture Urban For.* 34:290–295.

Kuzovkina, Y.A. and T.A. Volk. 2009. The characterization of willow (*Salix* L.) varieties for use in ecological engineering applications: Co-ordination of structure, function and autecology. *Ecol. Eng.* 35: 1178–1189.

Meyer, M.H. 2007. The Master Gardener program 1992–2005. *Hort. Rev.* 33: 393–420.

Saska, M., Y.A. Kuzovkina, and R. Ricard. 2010. North American willow cut-stem growers: A survey of the business identities, production practices and prospective for the crop. *HortTechnology* 20:351–356.

Stahl, L. 2004. Woody decorative florals. 8 Oct. 2011. <<http://ruraladvantage.org/pdf/3rdCropOps-WoodyOrnamentals.pdf>>.

State University of New York. 2002. Willow biomass producer's handbook. State University of New York, Syracuse.

Warnes, J. 2004. Living willow sculpture. Search Press, Tunbridge Wells, UK.