Landscape Plant Development Center

A national, non-profit research institute dedicated to developing durable plants

SPRING 2006 VOL. 17, NO. 2

Landscape Plant News

Seeking Volunteers in Oregon and Minnesota

If you are interested in becoming a volunteer in Oregon or Minnesota, please call Teri Line at 952.443.1505, or email her at tline@landscapecenter.org.

With your help, we will enhance our efficiency in our offices and increase our productivity at the research stations!

Oregon
We need volunteers at the Oregon Research Station to help with:
- Planting
- Plant maintenance
- Potting
- Plant evaluation
- Making plant crosses

Minnesota
The Center is seeking volunteers to help in our administrative offices and at the Minnesota Research Station (see article page 6).

For office assistance, we need help with:
- Data entry
- Internet research
- Compiling mailings

For the Minnesota Research Station, we need help with:
- Planting
- Watering
- Weeding
- General maintenance

Unlocking the Genetic Potential of Goldenrain Tree

MICHAEL DOSMANN AND THOMAS WHITLOW

In his essay on plant evaluation and introduction, Harrison Flint (1994) wrote: "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." Since Flint's article, the proliferation of cultivars has increased at near exponential rates, with fewer nurseries selling "straight species" and instead opting for cultivars selected (hopefully) for one superior attribute or another. Although many top-notch cultivars have been introduced through thorough evaluation, one cannot help but encounter others that seem to differ little from average, falling below Flint's "Standards of Excellence." Despite the stability provided by growing a cultivar, if it is not any better than average, then all that is gained is uniform mediocrity.

Certainly, there are clones with unusual morphologies (e.g., laciniated leaves, atypical flower color, prostrate form) that require only casual comparison (if any) with the standard to warrant introduction. When it comes to selecting for stress tolerance, however, it can be a different story all together. Compared to other economic plants such as soybean, maize or tomato, a paucity of information exists on the physiological ecology of most woody ornamentals, particularly as it relates to infraspecific variation. Because our collective understanding of many species' responses to the environment is limited to a narrow genepool, the critical need for the exploration of infraspecific variation translates into wonderful research opportunities.

One of the aims of Cornell University's Urban Horticulture Institute (UHI) is to evaluate and select plants able to withstand, with stellar performance, the vagaries of the urban environment. Our approach applies stringent evaluation criteria across a diverse constellation of genotypes to ensure we can both identify the standard, and exceed it if making a selection. One species we, along with Dr. Nina Bassuk, are studying is *Koelreuteria paniculata,* goldenrain tree. This ornamental has been admired since its introduction into Western cultivation from China by Jesuit priest Pierre d'Incarville in the 18th Century. Its popularity rose in part due to its brilliant yellow midsummer floral displays and subsequent bladdery fruits that persist through winter. It functions best as a small- to medium-sized specimen that generally reaches 7 to 8 meters in height; even in dotage, few individuals reach shade-tree status. In addition to its aesthetic appeal, goldenrain tree has been celebrated for its tolerance to stress-prone sites, particularly

Bright yellow inflorescences on Arnold Arboretum accession 942-81A in the middle of July.

Goldenrain Tree continued on page 8

Michael Dosmann is a Ph.D. candidate in the Urban Horticulture Institute at Cornell University and Associate for Research at the Arnold Arboretum. Thomas Whitlow is a professor in the Urban Horticulture Institute.

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The Landscape Plant Development Center is a national, non-profit research institute that develops durable plants that are tolerant of environmental and biological stresses. The Center has assembled a nationwide network of respected leaders in the nursery industry and the research, academic and arboreta communities to assist in and support the Center's research. This network, the only one of its kind, ensures that the Center efficiently and economically develops new plant material.

An Update on the Center's Activities

BY HAROLD PELLETT

Although one usually thinks that horticultural activities tend to be slow during the winter months, the Center had plenty of work to do. Peter Podaras, the Center's plant breeder at Cornell University, continued throughout the winter to make many crosses in the greenhouse and was also kept quite busy growing out seedlings from last summer's crosses, making selections and propagating promising plants. Much of the Center's hybrid seed is also being propagated in the greenhouses at Washington State University – Puyallup.

We are seeing some very exciting seedlings in the Center's *Buddleia*, *Weigela* and *Diervilla* hybrids:

For *Buddleia*, we have many compact plant forms, with good flower and foliage qualities, with a wide range of flower color. Some of the compact plant forms might serve well in northern climates as annuals where they are not cold hardy. The prostrate forms could be useful in hanging baskets or over a retaining wall. Some selections also appear to be sterile or of low fertility. Because of *Buddleia's* invasiveness in some regions, sterility is an important criterion we are looking for.

For *Weigela*, we have a number of plants with various foliage color, which would add color to the landscape all summer. One of the Center's *Weigela* hybrid seedlings started flowering at a very young age and continues to flower profusely. We hope that the continual flowering characteristic will persist in subsequent years as the plant matures.

For *Diervilla*, we are seeing striking foliage color in some of our selections. One is variegated with a white margin and the other has a diverse color palette of reds, oranges and greens.

The Center is also quite busy planning for the coming growing season. We are preparing for the expansion of field plots and irrigation lines at the Oregon Research Station, and we are preparing to begin activities at the new Minnesota Research Station in Lake Elmo. (See "Center Receives Land Grant to Establish Minnesota Research Station" on page 6.)

The Center's cooperative research with North Dakota State University is well underway. Many plant taxa have been successfully established in tissue culture and several of them have been treated to induce tetraploids in our efforts to develop sterile cultivars.

Buddleia **selection with prostrate, compact form**

Compact *Buddleia* selection with silver foliage

Weigela **selection that flowers continuously as a young plant**

Variegated *Diervilla* selection

A *Carpinus* selection with weeping form

The Center's research is producing some very exciting plants. Photos on these two pages show some of the diverse selection that we are evaluating for potential introduction.

***Diervilla* hybrid with colorful foliage**

A *Carpinus* selection with upright form

We have also been busy compiling all of our observation notes on the Center's hybrid plants that appear most promising. These are scheduled for propagation during the coming growing season so that we can evaluate them in more detail. As our research continues to expand, that list keeps growing exponentially. We have identified a number of *Carpinus* selections to propagate for testing in different geographic areas to determine their range of adaptability. These include plants ranging from weeping plant habit to very narrow, upright forms. Some have also been selected for their excellent foliage qualities.

We also have several shrubs developed through treatment with chemical mutagens and gamma irradiation that merit further evaluation for their dwarf, compact plant forms. These include compact selections of *Cornus sericea*, *Physocarpus opulifolius* and dwarf Forsythia from seedlings of cold hardy varieties.

Dwarf *Physocarpus* on right

Dwarf Forsythia

Viburnum Borer Research: 2002-

BY PAUL HARTMAN AND DAVID PARSONS

Problem:

The Viburnum Borer (*Synanthedon viburni*) is a destructive pest of viburnum populations in most areas where viburnums are widely used in landscapes including the northeast Wisconsin area. A research study was initiated in 2002 to gain more information on the life cycle of the viburnum borer, on relative susceptibility of various viburnum taxa and to evaluate various methods for control.

Study Methods:

During the duration of this study, several methods were used to gather information:

Trap used for viburnum borers

Trapping

To determine the "fly calendar" for adult males, pheromone traps were set on both the east and west side of Green Bay. Traps were set at the University of Wisconsin Green Bay campus, the Green Bay Botanical Garden, and the Agriculture & Extension Service Center – all more than five miles apart.

Planting & Treatments

In June 2003, a section of the Agriculture & Extension Service Center property, 1150 Bellevue St., Green Bay, WI, was planted with a viburnum collection of plants donated from local nurseries. *V. carlesii, V. dentatum, V. lantana, V. lentago, V. opulus, V. sargentii, V. trilobum and V. x rhytidophylloides* were included in the planting. The viburnums were arranged into seven rows with five plants per row. The plants were randomly mixed. Two rows were mulched only, two rows were treated with Permethrin (Eight) bi-weekly as the label directed; two rows, where possible, were physically protected with stem barriers – tree wrap, various tapes and aluminum foil; and one row was left untreated.

Collecting and Dissection

Observation and dissection of plants in the community were also part of the study. As plants became available, they were dissected in an attempt to assess the damage done by the feeding of borers and what stage of development the larvae were in at the time of dissection. Plants were dug and dissected from commercial, private and public locations. Dissections were recorded with photos, and all larvae were measured indicating "instars" of development.

Dissections – It has been our observation that some of the previously published observations need some clarification. The larvae do make galleries but most of our observations show this to be both in the cambium and in the wood of the host plant. This is in direct conflict with the literature. Included with that observation, we have found extensive galleries in the roots of the host plant. The feeding larvae seem to prefer the areas of the plant that are trying to callus over from previous damage. This growing plant material either in stem or root will often be the larvae feeding site in host plants as this plant material is very nutritious. It would be our observation that such stem areas would naturally be attractive to egg-laying females and locations that developing larvae would travel to in a plant. This would reinforce the notion that plants already having viburnum borers present would continue to be infected and continue their decline until final plant death.

The feeding galleries are filled with frass and the larvae use this frass to construct a cocoon at time of pupation. It has been our observation that an adult larva takes approximately 30 days to pupate into an adult clearwing moth. The moth will emerge leaving pupa skin at the site of emergence. The emergence event has still eluded us in our observations along with the egg laying of females. Both observations would greatly add to the natural history of this moth.

Cocoon made of frass

Flight Patterns Observations

Fly calendar - Adult *Synanthedon viburni* begin to fly in late May and continue to be present until early September in the Green Bay area. Males were found in a sticky trap on May 18, 2003 (earliest), and the latest was September 13, 2005. First fly times coincide with the blooming of Dames Rocket (*Hesperis matronalis*), *Viburnum opulus/trilobum*, and bearded iris. These plants were in bloom in two of the three years of the study when the first males were captured. The first year no indicators were identified. Additional flight calendar observations found July as the month when pheromone traps caught a great number of adult males. Some traps caught over 50 males in one week's trapping. We have also observed males entering traps and following traps as they were moved from one location to another.

Paul Hartman is a UW-Extension horticulture agent. David Parsons is a UW-Extension horticulture special investigator.

2005

Observations

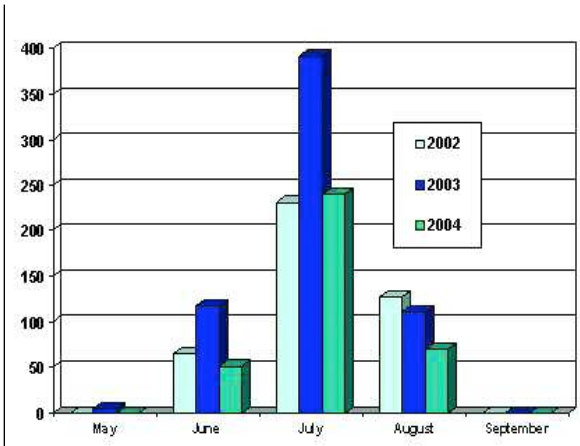
1. When slight damage is noted and no larvae recovered, that may have come in before planting while plants were in pots. From previous searching, larvae have been observed in potted plants at the nursery.
2. Plants were not being killed or even stressed from the damage observed. Perhaps another 2-5 years would have helped to determine which ones would be killed by viburnum borer.
3. Physical protection of the stems was difficult because of the multiple stems and vigorous side shoots. Tapes promoted girdling. Physical protection is not seen as a practical method to deter viburnum borer larval infestations.

Adult male

4. Spraying the bases to label directions (repeat sprays at approximately 14-day intervals) with Permethrin may have been effective (no larvae present) in two rows, but the untreated row with no Permethrin was also clean. On the other hand, if one just looks at *Viburnum trilobum*, the two treated with Permethrin did not have borers while in the six untreated ones, four had some damage.
5. In Row 106 with physical protection, four of the five plants were damaged. The one that was not damaged, *Viburnum lentago,* does not seem to be very susceptible from previous experience. Also from previous experience, *Viburnum trilobum* and *Viburnum lantana* are among the most susceptible.
6. All the plantings were mulched with 2 to 3" of coarse wood chips. For Permethrin-treated rows, the mulch was removed from the base of the plants to make sure the treatments covered the stems.
7. Biological control (ants, spiders and others) may have been involved in some suppression. Traps were catching many males each year. You might expect a higher infestation per plant.
8. More years of study (the plants were excavated and dissected to get larval counts) may have helped to build populations, giving better indicators of what plants would remain free of infestation.
9. Previous observation shows plants attacked in yard settings include all viburnums used in this study except for *Viburnum dentatum*. Yard viburnums were in place for a longer period of time and showed distress symptoms. All were excavated and had multiple larvae in each.

Conclusions

1. Basal applications of Permethrin during fly periods (May-August) at 14-day intervals is likely to keep plants viburnum borer free. No damage was observed in treated plots.
2. Some viburnums are more susceptible to viburnum borer (in these trials) than others. Chemically untreated *Viburnum trilobum* had 75% of plants damaged. Chemically untreated *Viburnum lantana* had 50% damage. *Viburnum trilobum* consisted of 25.8% of the plants and had 60%of the total infested plants.
3. More study is needed to get a complete understanding of relative resistance of viburnums to the borer. More study is also needed to test number of applications needed for adequate protection.



Viburnum borer flight chart, 2002-2004

Summary

Synanthedon viburni is a threat to viburnum planting of all kinds. It has been our observation that few members of this plant group are unaffected by this pest. The adults are in a mating cycle for most of the growing season. Plants that are currently hosts to the larvae will host future generations until the weakened plant dies. Only in a few cases have we found plants strong enough to outgrow the larval feeding and girdling. The long fly calendar requires constant pesticide application to deter the adults from egg laying or larvae from entering host plants. Physical barriers have not proven to be effective and can cause other problems. One can only suggest continued study of this clearwing if we are to find a solution to the possible demise of the use of the Viburnums in the landscape.

Special Thanks

We would like to thank the following for their assistance in this project:

Phil Pellitteri, Entomologist, UW-Madison, for technical and entomological advice.

Dean Flagstad, Jeff Tillmann, Ron Willems, and Gordy Vosters for financial assistance and plant material.

Jeff Vandenbush, Stacey Zak, and Pat Manning for help with the test plot maintenance.

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References

Englehardt, G.P. 1946. The North American clearwing moths and the family *Aegeriidae*. Bulletin 190. United States National Museum, Washington D.C.

Greenfield, M. 1978. Niche Segregation of Adult Clearwing Moths (*Lepidoptera: Sesiidae*) in Wisconsin. University of Wisconsin, Madison. pp. 53, 119, 120.

Taft, W., D. Smitley, J.W. Snow. 1991. A Guide to the Clearwing Borers (*Sesiidae*) of the North Central United States. North Central Regional Publication No. 394.

Solomon, J.D. 1995. Guide to Insect Borers in North American Broadleaf Trees and Shrubs. pp 94- 97.

New Jersey Tea — A little-known, underutilized native small shrub

HAROLD PELLETT

Right: New Jersey Tea in full bloom.

Below: Close up of flowers of New Jersey Tea

New Jersey Tea (*Ceanothus americanus*) is a small-growing shrub that is native in Eastern North America from Manitoba and Nebraska south to Texas and South Carolina. It has a compact, wide spreading rounded crown to 3-4' in height. Texture is medium, and the 2-3" long dark green leaves are borne alternately along the stem. Although the individual flowers are very small (<1/8") the 1-2" flower panicles are produced at the tips of the new growth in late June and early July and can literally cover the plant. The plant, which fixes atmospheric nitrogen, is quite tolerant of drought and poor soil. Because of its small size, compact growth habit, and very showy flowers, New Jersey Tea has potential for widespread use in residential landscapes and gardens. Its primary limitation is its requirement of a well-drained soil.

The reason why the plant is not used more widely is likely due to lack of knowledge about the plant's requirements by gardeners. Soils on many landscape sites are heavy and somewhat compacted following construction, and *Ceanothus* does not tolerate those conditions. For success on sites with heavy soil, efforts need to be made to improve drainage by using a raised planting bed and amending the soil with ample organic matter.

The Center is interested in selecting New Jersey Tea plants that have superior form. We are also attempting to identify plants that are more tolerant of heavy soils. We are currently growing out a population from seed collected in southeastern Minnesota and also have plants from a commercial source growing at our Oregon Research Station. Photos shown here are of the plants growing in Oregon where our soil is quite heavy.

Center Receives Land Grant to Establish Minnesota Research Station

The Landscape Plant Development Center recently received a land donation of 6.75 acres in Lake Elmo, Minnesota to establish a Minnesota Research Station. The land is a generous gift by Robert and Phyllis Engstrom of The Robert Engstrom Companies in Minneapolis, Minnesota. Robert Engstrom Companies are residential community developers that emphasize preservation of the natural environment in their developments. The land being given to the Center is in The Fields of St. Croix, a 241-acre development that clusters the homes on 40% of the land and maintains over 50% in open spaces through a permanent easement. The Fields of St. Croix Development utilizes some innovative approaches to land use:

- A constructed wetlands wastewater system that provides central collection and environmentally compatible on-site treatment;
- The preservation and restoration of a historic Civil War-era barn owned by the community association and used as a community center and gathering place;
- Energy-efficient homes built according to advanced energy standards and the Premiere Homes Program of Xcel Energy, the local utility;
- Forty-five acres of restored prairie featuring native plants indigenous to the area;
- Architectural standards for designs that ensure architectural integrity and encourage rural, Craftsman, and Prairie-style homes;
- A storm water management design that provides for on-site retention, evaporation, and percolation;
- The preservation of a wooded slope that constitutes a wildlife habitat.

Robert Engstrom, President of the Robert Engstrom Companies has received several state and national awards for his development skills and commitment to good stewardship of the land that his company develops. To read more about The Fields of St. Croix Development, other developments by the Robert Engstrom Companies and awards received by Robert Engstrom, visit www.nicholsprize.org/pressroom/CBP_Engstrom.htm and www.nahb.org.

The Center will begin planting a variety of selections this spring:

- Some of the Center's pear selections that have been propagated for the Center by Bailey Nurseries, Inc. and J. Frank Schmidt & Son. Co.;
- Second generation Japanese maple hybrids;
- Seedlings of *Acer ginnala* from tetraploid female parents that we hope are triploid and therefore also hopefully sterile;
- Several selections of *Buddleia* and *Weigela*.

The Minnesota Research Station will be the Center's primary cold climate growing facility for second generation hybrids. Based on the growing performance of the hybrids, the Center will select individual plants that combine good cold hardiness with superior aesthetic qualities of species that normally are not quite hardy enough for northern climates. The Minnesota Research Station will also provide a site for evaluating cold hardiness of plants selected from the Center's cooperative breeding program at Cornell University, from hybrid populations growing at the Center's Oregon Research Station and plants selected by our research partners in other geographic regions. In addition, the Center will propagate many additional selections in the coming year for evaluation of cold hardiness at the Minnesota Research Station. We will also be working to raise additional funds to support the expanded effort required to operate the station and to capitalize on the research potential created by the station.

Japanese maple summer color

Japanese maple fall color

Pear red foliage

Pear flowering

Pear fall color

MEMBER PROFILE

Mary Stanley

Though the ladyslippers didn't thrive, Mary Stanley, long-time contributor of the Landscape Plant Development Center, remains quietly passionate about every last wildflower, shrub and tree in the woodland garden on Mary and Dick Stanley's property in Dellwood, Minnesota.

Mary grew up in the country, outside of Milwaukee, where her parents tended a vegetable garden, rock garden and perennial gardens. Her father, a mechanical engineer, was very "in tune" with nature and planted lots of trees that he grew from seed. As a result, Mary was surrounded by and came to love plants early on. Mary recalls that as a child she would go on long hikes by herself and look for wildflowers. Those hikes have continued into her adulthood.

Since she was a child, Mary Stanley has had a love for all plants, but particularly wildflowers.

Mary began to work in the1970's as a volunteer naturalist at the Riveredge Nature Center in Newburg, Wisconsin. She worked with children to teach them the inter-relationship between plants and animals. It was as a naturalist that she began to learn a great deal about wildflowers. She took courses at the University of Wisconsin-Madison and a local technical college in public gardening, landscape design and the use of plant materials.

Since she and her husband owned their first home, she has always maintained her own gardens. Then her friends started asking her for help with theirs. Her informal advice to friends about their gardens eventually transformed into a bona fide landscape design consulting firm. A bit to Mary's chagrin, however, she became so busy with other people's gardens, that hers became neglected. She and her husband eventually moved to the Twin Cities and, along with the furniture and boxes, Mary moved all her wildflowers. Now in Dellwood, Mary maintains a woodland garden utilizing numerous native and non-native plants.

Mary has a long record of service in the plant world. She has served on the Board of Trustees for the Minnesota Landscape Arboretum. Mary is also very active in the St. Paul Garden Club, having served as its President. In addition to the SPGC, Mary has held many positions with the The Garden Club of America and currently serves as the GCA's Director for Zone XI.

Mary Stanley's woodland garden.

Asked why she has been supporting the Center since it was founded in 1991, Mary answers, "I'm impressed with the Center's research concept. The Center's research is conducted with plant material from around the country and significantly benefits from open communication between research participants. In this sense, the right hand knows what the left hand is doing. The Center is working, in many cases, with perfectly good landscape plants that have gotten a bad name, such as Barberry, and trying to modify those plants so our landscapes are not monocultures, devoid of plant diversity."

Goldenrain Tree continued from page 1

Although most of the populations we visited in South Korea were coastal, an inland provenance near the Buddhist Hermitage of Podogam on Mount Worak proved interesting. Here, Michael Dosmann measures gas-exchange in the canopy of a tree growing at a cliff's edge.

urban areas. However, this distinction is based more upon anecdote and observation than empirical evidence, and no inferences have been made on infraspecific variation to stress tolerance; its few cultivars (e.g., 'Rose Lantern', 'September', 'Fastigiata') are appreciated for aesthetic qualities.

A temperate species, *K. paniculata* is distributed in eastern China from Sichuan north-eastward to Liaoning. Its habitat certainly suggests adaptation to droughty conditions, particularly in the western part of its range. Ernest H. Wilson (in Sargent, 1913-1917) noted that *K. paniculata* var. *apiculata* (a variety no longer recognized) was "common in the hot, dry, almost desert-like river valleys of western Szech'uan." Photographs from Sichuan and Shanxi, taken by Wilson (1908) and Frank N. Meyer (1914), depict trees growing on steep, rocky hillsides. In his field notes from 1914, Meyer described one site as a "piece of thin and rocky land" and noted that the "tree deserves to become more widely planted, especially on rocky soils." A bit later in the century, Joseph Rock (1926) collected goldenrain tree in Gansu, the northern and western limits of its range, where it was frequent on high, gravely slopes. Unfortunately, scant genetic material from these collections of known provenance is extant in botanic gardens and arboreta, and none has been singled-out and introduced to the trade. However, the North America-China Plant Exploration Consortium has made recent collections from both Shanxi and Gansu, in 2002 and 2005, respectively. Because of deforestation in Shanxi, few trees were observed, although in Gansu the species was so prevalent in the rocky and craggy sites that the locals referred to it as 'the common tree' (A. Aiello, pers. com.). Since the late 1980s, Quarryhill Botanic Garden has also made several unique collections from steep valleys in mountainous Sichuan.

Outside of China, approximately a dozen populations exist on the Korean Peninsula and Honshu, Japan, most of which are coastal. Beyond their interesting cultural history, these populations are of ecological and horticultural significance. The Morris Arboretum's Paul Meyer collected seed from the Paengnipo population on the west coast of the Korean Peninsula, and described the trees as being "a dense scrubby thicket with few plants reaching more than two meters, the plants growing on sand dunes, just above the high tide level" and the site as "exposed to periods of sea water inundation, wind, drought and salt spray" (Meyer, 1987). Steve Spongberg (1978) also visited this site during a collecting trip with Richard Weaver for the Arnold Arboretum and noted the appeal of their wind-swept form and stature.

The UHI has assembled a diverse germplasm collection that comprises provenances from throughout the species' range in Asia, including some of those introductions described above. Variation in leaf morphology alone is tremendous, with some Chinese provenances sharply dissected and bipinnate (yet distinct from *Koelreuteria bipinnata*) compared to the typically pinnately-compound leaves. And, an unusual specimen at the Morris Arboretum that originated from coastal Korea has finely laciniated leaflets. In addition to a few cultivars, we have obtained genotypes of unknown origin that show horticultural potential, particularly those that may prove hardy in areas colder than USDA Zone 5b. In evaluating this collection, our interests and scope are wide ranging, and characterization includes ornamental as well as physiological traits. Although the bulk of our work takes place in the greenhouse and field plot, assessing specimens from arboreta and gardens has also been fruitful.

Much of our focus has been on material from the Korean Peninsula. Due to the selection pressures associated with coastal environments, these disjunct populations represent an opportunity to examine micro-evolution and adaptation; while seaside species tend to be ruderals, they also frequently have stress-tolerant life history strategies (Grime, 1979). Much of our experimental work is focused upon the impact of salt-spray on coastal provenances and the potential for adaptive phe-

A mature specimen of unknown origin in full bloom in mid-July in Ithaca, NY.

notypic plasticity. While greenhouse and field studies are a critical part of experimental work, nothing can take the place of studying trees in their natural habitat.

Thus, in the summer of 2004 we made our way to the Republic of Korea to conduct fieldwork in collaboration with Dr. Ho-Duck Kang, a forest geneticist at Dongguk University. We saw first hand how the species is able to survive exposure

to salt spray in the coastal environment: the serendipitous interplay between efficient carbon assimilation, leaf cupping, a wet monsoon, and vegetative regeneration via basal stem and root suckering (Dosmann et al., 2006). Witnessing these phenomena has been instrumental in interpreting experimental results as well as generating future hypotheses to test.

In cultivation, many individuals derived from coastal regions are smaller and denser at maturity than typical goldenrain trees. Notable examples can be observed at the Chicago Botanic Garden, Morris Arboretum, Holden Arboretum, and the University of British Columbia Botanic Garden. In our seedling populations grown under greenhouse conditions, those from China grow faster and have greater single-season extension growth than those from either the Japanese or Korean coasts. The difference is due to a combination of shorter internodes and fewer nodes per flush in the maritime sources. We are also studying an array of size morphs among an inbred, field-grown coastal population, some of which have remained dwarf (1-2 meters tall) despite being over 6 years old and sexually mature.

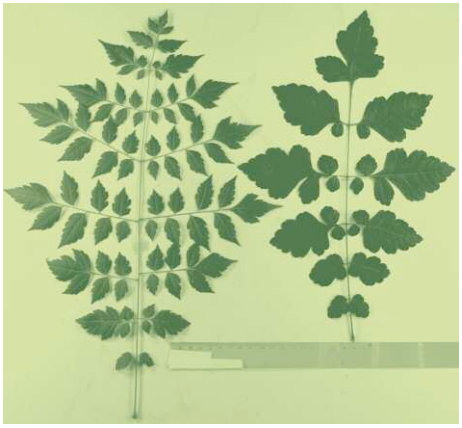
For long-term evaluation, we have established a replicated field collection that comprises various Chinese, South Korean, North Korean and Japanese provenances, as well as cultivars and unselected genotypes. In addition to evaluating cold hardiness, we can examine variations in growth rate and form, autumn leaf color, and floral morphology and phenology. With respect to the latter, we have recorded variation in flowering time among trees growing in botanic gardens and arboreta, with the Korean and Japanese trees reaching anthesis 1 to 2 weeks after the Chinese trees – but still ahead of the late-blooming 'September' and 'Rose Lantern'. Once our field collection matures to flowering age, we will have a better picture of bloom period, inflorescence size and fruit color.

Here at the UHI, we believe strongly that any evaluation program should examine the potential of plants to naturalize or, worse, become invasive. High fecundity is common in goldenrain tree, but because we have found that its sun-shade acclimation responses are akin to other shade intolerant, early successional species, it may pose a low risk as an invader of intact woodlands. Here in Ithaca, the two late flowering cultivars begin to bloom in the middle of August. While the fruits develop, the seeds within are usually still immature by the time freezing temperatures hit, rendering them nonviable in our screenings. Selecting from and breeding the late-blooming genotypes may mitigate weediness, at least in colder climates.

Goldenrain tree has been almost exclusively propagated by seed, due to its relative ease and the lack of cultivars; 'September', 'Rose Lantern' and 'Fastigiata' are almost always grafted. Research at the UHI has established methods for extending the window and improving the success rate of rooting for softwood cuttings using etiolation (Reiderer et al., in review). These techniques provide a means for growers to readily increase their stock once selections are made from our, or other, introduction programs.

Our multi-faceted research program with *K. paniculata* enables us to better grasp the biology of a well-recognized, yet poorly understood species. Our work includes its characterization *in situ,* description of the physiological ecology of unique provenances, and identification of unique ornamental genotypes. While this research is just the beginning, we hope that it will in the very least generate the necessary benchmarks, or "Standards of Excellence,"required for future comparative and improvement work with goldenrain tree.

We are grateful to the Landscape Plant Development Center for its financial support of this project.



Leaf morphology is highly variable, as can be seen in these leaves of Chinese (left) and Korean (right) provenance.

Literature cited

Dosmann, M.S., T.H. Whitlow, and H.D. Kang. 2006. The (un)natural and cultural history of Korean goldenrain tree. Arnoldia 64(1):16-30.

Flint, H.L. 1994. Standards of excellence. American Nurseryman 180(12):43-49.

Grime, J.P. 1979. Plant strategies and vegetation processes. John Wiley.

Meyer, F.N., 1914. Photograph of *Koelreuteria paniculata*, Hsi popo, Shansi Province, China, 10 July, 1914 (#7491). Photographic archives of the Arnold Arboretum.

Meyer, P.W. 1987. *Koelreuteria paniculata*. Public Garden 2(1):14.

Reiderer, M., N.L. Bassuk, and N. Amissah. Vegetative propagation of *Koelreuteria paniculata* using etiolated cuttings. Journal of Environmental Horticulture (in review).

Rock, J.F., 1926. Collection Notes, Expedition to China and Tibet, Papers of Joseph Francis Rock, 1922-1962. Archives of the Arnold Arboretum.

Sargent, C.S. 1913-1917. Plantae Wilsonianae: An enumeration of the woody plants collected in western China for the Arnold Arboretum of Harvard University during the years 1907, 1908, and 1910 by E. H. Wilson. Cambridge University Press, Cambridge (United Kingdom).

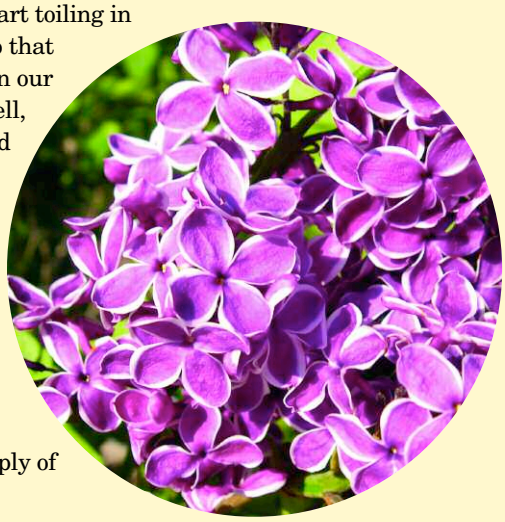
Spongberg, S.A. 1978. Korean adventure. Arnoldia 38:132-152.

Wilson, E.H., 1908. Photograph of *Koelreuteria paniculata*, Tung River, W. Szechuan, China. August 2, 1908. (#4428). Photographic archives of the Arnold Arboretum.

Spring Garden Checklist

LESLIE YOST, HORTICULTURIST

In Lake Elmo, Minnesota, from where I write, the tell-tale signs of Spring have begun to show: the days are lengthening, temperatures are rising, and my desire to dig in the soil is great. For many gardeners like myself, it's that special time of year when the yearning to get out of the house and start toiling in the soil is at its peak. It's also that time of year when the buds on our trees and shrubs begin to swell, if they haven't already started to leaf out, and we can see that life is once again emerging from our gardens. So, close the catalogs, pull out the gardening clothes and get busy! There's lots to do before we actually turn the soil and plant all those wonderful selections you've ordered from the endless supply of plant and seed catalogs.



Prune spring flowering trees, such as lilacs, after they complete their bloom cycle. *Syringa vulgaris* 'Sensation'.

- ☐ Pull mulch away from planting beds or work it into soil if it's well composted.
- ☐ If you didn't divide perennials in the fall, it can easily be done before new growth appears. Once the new growth appears, you can still divide, but it just won't be as tidy.
- ☐ Clean up any debris from plant dieback.
- ☐ Review garden plans and double check catalog order ship dates.
- ☐ Walk through the landscape to see if plants or hardscape materials have heaved. Replant or replace anything that is out of place.
- ☐ Prune spring flowering trees and shrubs after they complete their bloom cycle. Pruning sooner will remove this spring's bloom buds.
- ☐ Vegetable gardeners will want to put out onions, lettuce, radishes, and other cool season crops early in the spring.
- ☐ Start annual seeds inside for planting in the garden once the threat of frost passes.
- ☐ Bring out any tender rhizomes and bulbs, such as canna lilies or gladiolas, that were stored for the winter.
- ☐ If necessary, fertilize and put down a pre-emergent herbicide on your lawn.
- ☐ As the season warms and the threat of frost passes, enjoy planting all the wonderful selections you've made from catalogs and your spring shopping.
- ☐ Don't forget to mulch! Mulching helps reduce weeds and maintains soil moisture.
- ☐ Begin a gardening journal. Marking the date and weather conditions of gardening tasks in a notebook this year will help you decide when to tackle some of your gardening chores next year.

Enjoy the season!

Oregon Research Station's Spring Wish List

The Landscape Plant Development Center's Oregon Research Station continues to expand its planting and the work performed at that facility. This requires more tools and equipment than the station currently has.

To maintain our high operating standards and to enable us to serve as a host for events in Oregon, we are in need of the following items:

- a pickup truck
- computer (CPU) and monitor
- riding lawn mower
- ATV
- high resolution digital camera
- squirrel cage attachment for tractor implement
- pneumatic pruners
- 12" auger bit for tractor
- irrigation big gun (small size)
- 2" and 3" aluminum irrigation pipe
- greenhouse benches
- wood chips/mulch
- picnic table for volunteers

If spring cleaning has you wondering what to do with extra greenhouse benches or a used riding lawn mower, please contact us. Your in-kind donation of tools and equipment is very valuable to us. Please contact Stacy Lynn Bettison at 952.443.1505 or sbettison@landscapecenter.org.

Tour the Oregon Research Station

The Center welcomes tours of its Oregon Research Station anytime! In the spring, summer and fall, we regularly host visits to the station. A tour is an excellent opportunity to see the variety of plants we are working with and to gain a greater understanding of the Center's research model. If you, your group, or your employees would like to visit the Oregon Research Station, see our plantings, and learn more about our plant breeding programs, please call Sarah Doane at (503) 816-6358 or send her an email at sdoane@landscapecenter.org.

How is our research funded?

100% of the Center's operating budget comes from private donations and research grants. This means that your support is critical to the Center's ability to continue its breeding programs and plant research. The more we increase our overall support from people like you, the more we are able to expand our plantings and the scope of our research.

Bottom line? Your financial support means that the Center can more quickly develop new, superior landscape plants that enrich our communities.

You can donate to the Center by completing the form below or by going on-line to www.landscapecenter.org.

Thank you for supporting the Landscape Plant Development Center.

Contact us:
p 952.443.2505
f 952.474.9440
info@landscapecenter.org
www.landscapecenter.org

"The greatest service which can be rendered any country is to add a useful plant to its culture."

THOMAS JEFFERSON

Please support the Center's work with a contribution today!

Complete and mail this form to:

Landscape Plant Development Center
PO Box 444
Mound, MN 55364

Individuals

- ☐ $30
- ☐ $60
- ☐ $150
- ☐ $500
- ☐ $1,000
- ☐ Other _____

Institutions/ Nurseries

- ☐ $200
- ☐ $500
- ☐ $1000
- ☐ $2,500
- ☐ $5,000
- ☐ Other _____

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CARD # EXP. DATE LAST 3 DIGITS ON BACK OF CARD

NAME ON CARD SIGNATURE

News and Events

Visit Our New Website

March 2006 — Center Launches New Website. The Center launched a newly designed, dynamic and colorful website at www.landscapecenter.org. The website is loaded with information about the Center's history, leadership, breeding focus, and current breeding programs. The site features the Center's Oregon Research Station and provides information about the timeline and steps of the breeding process.

Other significant features of the site include:

- Donor Spotlight, which profiles the Center's significant donors;
- Breeding Programs, which feature many of the plants we work with (along with lots of pictures) and provides a detailed description of the Center's goals for each plant;
- Support pages, which allow donors to make secured contributions to the Center using their credit card.

We hope you'll visit www.landscapecenter.org soon! Use the "Send To A Friend" feature as a way to introduce others to the Center's work of developing new stress tolerant landscape plants.

June 26-28, 2006. The 14th meeting of the Metropolitan Tree Improvement Alliance (METRIA) and the Landscape Plant Development Center will be held at the University of Minnesota Landscape Arboretum, Chanhassen, Minnesota. The conference is entitled "Recent Advances in the Breeding, Production and Culture of Trees for Urban Landscapes," and will include a wine tasting, dinner, tours and numerous presentations by industry professionals and university researchers.

The conference has the generous support of J. Frank Schmidt & Son Co., Bailey Nurseries, Inc. and the Minnesota Nursery & Landscape Association.

Program and registration information is at www.landscapecenter.org. The registration deadline is Monday, June 19, 2006.
Questions: call Teri Line, Landscape Plant Development Center, at 952.443.1505 or email the Center at info@landscapecenter.org.
We hope to see you at METRIA 14!

Landscape Plant Development Center
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