Performance Evaluation Review of *Hydrangea macrophylla* at Heritage Museums and Gardens

The North American Hydrangea Test Garden – 2019 Summary Report, 'The Introduction' v.191202

Mal Condon, Curator of Hydrangeas

The Test Garden got its start at the Hydrangeas 2015 Conference that was held at Heritage in July of that year. This was the first major all hydrangea event in the US since 2005 and featured a strong technical program with supportive participants and attendees, and it took place in a very favorable cultural location for hydrangeas. All positives! The idea of creating a 'Test Garden' was conceived and initiated at the Conference by Dr. Mike Dirr. The idea fell on very fertile soil too as Heritage was already committed to expanding their hydrangea presence.

So fast forward to the following July. Great ideas move quickly and Heritage Museums & Gardens 'dug in' and began planting the first phase of a hydrangea test garden where new plant introductions would be planted, grown, and studied by professional hydrangea experts. This initial project phase was extensive in content and totally supports the Heritage goal of the North American Hydrangea Test Garden becoming the most comprehensive collection of the genus in the United States. Phase 1 of this 5-year development program was completed early in July and the Test Garden was dedicated and opened on July 12, 2016.

Designed by Horticulture Director Les Lutz, the Test Garden covers a very favorable planting site in terms of topography and sun / shade conditions. Significant hardscape was included - a major water feature, and stone steps and shell walkways that allow visitors to stroll among an unprecedented variety of hydrangeas and complimentary perennials. Strategically located across the main garden road from The Cape Cod Hydrangea Society's existing All Hydrangea Display Garden, the total hydrangea area showcases the depth and breadth of these iconic plants for Heritage visitors.

Plant-wise, the Test Garden will predominantly contain the newest hydrangea releases introduced to the retail market each year. Additionally, several significant 'old standards' have been included to provide direct and immediate performance comparisons. And, unlike the more widely spaced, hydrangeas-only planting format of the Display Garden, perennials have been incorporated into the total Test Garden layout to simulate a more conventional home landscape planting arrangement. This approach was chosen to offer home gardeners examples of which plants might pair well together.

Operationally, Heritage horticultural staff and dedicated Volunteers monitor many hydrangea plant performance criteria relevant to how these cultivars perform in our coastal New England setting, one of the country's major markets for hydrangeas. Documentation is an important function - photographing, collecting data, and reporting this information in a concise fashion that will assist participating hybridizers and growers in their analysis of significant attributes necessary to continue to explore and develop new hydrangea cultivars having superior blooming capability.

The Test Garden continues Heritage's collaboration with the Cape Cod Hydrangea Society. Begun in 2008 with a modest initial planting of the species *H. macrophylla*, this Display Garden now boasts 8 species and more than 160 varieties. The older, long established hydrangea varieties dominate this collection and will surely stimulate some interesting comparative assessments.

The North American Hydrangea Test Garden initiative is being led by Dr. Michael Dirr, horticulture professor emeritus at the University of Georgia and well known woody ornamental guru. Additional on-site direction and support comes from Les Lutz, Director of Horticulture and Mal Condon, Curator of Hydrangeas at Heritage.

The founding sponsors of the Garden include leading professional growers - Bailey Nurseries (creators of the Endless Summer® Series of Hydrangeas), and Star Roses & Plants (Ball Hort), Dr. Dirr and his wife Bonnie, The Cape Cod Hydrangea Society, and the American Hydrangea Society. This founding group have been strong supporters financially, provided significant plant material, and are totally participative with the entire program. Additional plant material has been furnished by Proven Winners / Spring Meadow Nurseries, Greenleaf Nursery, and Monrovia Nursery.

Plant Performance Evaluation, *Hydrangea macrophylla*

H. macrophylla, Endless Summer, Heritage, July, 2019

H. macrophylla, TwistNShout, Heritage, July, 2019

Why will *H. macrophylla* be the major species of study? We do have substantial plantings of *H. arborescens* and *H. paniculata* in the Test Garden too. The answer is simple – the latter species are essentially bullet-proof bloom-wise. They are totally cold-hardy, flower on 'new' wood, and in profusion every summer without fail. Overall plant growth is substantial as well – so much so that we are evaluating mid-spring pinch pruning strategies to better control stem growth without sacrificing bloom density. The photo below, taken on October 2, 2019, clearly illustrates the strong performance of the *H. paniculatas.* We will be issuing a separate Performance Report on the *H. paniculatas* and *H. arborescens* in the near future.

H. paniculata, Heritage, October 2019

But *H. macrophyllas* are by far the most significant commercial species with their great bloom forms, color, character, and likeability. But – and perhaps most importantly - they're the least cold hardy of the six popular species offered commercially. ~~in the country.~~ And – as often happens in life – we choose to try our hardest on that which is most difficult to achieve. Additionally, Cape Cod gardeners are

especially fond of them because our typically moderate maritime coastal climate can produce some excellent blooming years.

Cold Hardiness on the Cape is almost totally Zone 7 with a Heat Zone Index of just 1. These conditions are reflective of our generally maritime climate sustained by the substantial moderating influence of the ocean around three-quarters of our land mass – we're less cold in winter and less warm in summer.

But there is a small but important chunk of the Cape that is Zone 6, a modest triangle from Sandwich to Bourne along the Cape Cod Canal and extending eastward (and inward) toward Mashpee. This little cold spot is home to Heritage, and it has had a substantially detrimental effect on *H. macrophylla* blooming from 2014 through 2019 in our gardens. In fact, in the winters of 2015 and 2017, Heritage dropped to Zone 5b with temperatures as low as -13^{0}F.

As expected, flowering performance to date has definitely favored the repeat blooming (remontant) cultivars – like the Endless Summer Series. But a few of the older *H. macrophylla* varieties have exhibited good re-blooming capability - like 'Penny Mac', 'Lady n Red', 'Decatur Blue', 'David Ramsey' and 'Nikko Blue'.

Note the new late developing blooms on 'Penny Mac' on the left. Although it is unlikely these late summer inflorescences can develop fully before a killing frost (typically around Thanksgiving on the Cape), it does illustrate the cultivar's propensity for reblooming.

Cultural Practices at Heritage

H. macrophyllas at Heritage are commonly treated in the same manner – planting, pruning, fertilizing, irrigating, and winterizing. Planting-wise, we blend on-site produced compost with our inherent glaciated soil. In worse cases we screen the latter to remove the sometime major rubble content. Veins of clay are located throughout our property, and as part of the 'blend', the negative impact of the clay's drainage is favorably countered by its high minerality that has contributed well to the strong growth of our plants.

Pruning is a late winter, early spring 2-Step practice. Aging canes (only) are removed first (Regenerative Pruning) in March and early April. All vibrant wood is left 'til Step 2 in May (Detail Pruning) when the failed upper stem wood is removed, leaving only vibrant material. This seasonal pruning approach has sustained a very high percentage of vital wood while also maximizing flower bud development.

We take a somewhat minimalist position to fertilizing. Controlled release (CRF) products having low phosphorous content are commonly used. Dosage is a modest 3 to 4 ounces per established hydrangea plant (all species) applied just once after spring pruning in April. Our most used product's N-P-K formulation is 14- 3 -17. Our basic soils contain adequate aluminum and pH levels are normally low so adding an acidifier (aluminum sulfate) is only considered for some early plantings to establish / maintain the appropriate bloom color.

Virtually all the hydrangeas in the major garden areas at Heritage have surface / drip irrigation. Our standard is to install emitter 'rings' around each plant and link them to create effective zone loops for absolute control of applied water volume and frequency of application. It has become our practice to install irrigation within a few days of completing any planting project. Overall, this irrigation approach has had a very positive impact on plant vigor, uniformity of growth, and reduced leaf spotting.

While winter protection in various contained and supported forms around individual plants can be beneficial to *H. macrophylla*, especially during the first in-ground winter, we refrain from this practice in the Test Garden so as to subject all plantings to the same unaltered conditions of exposure.

Plant Performance Evaluation Criteria

All *H. macrophylla* introductions are evaluated on several parameters - winter hardiness of plant & bud, bloom count & quality, reblooming capability, sun tolerance, general growth characteristics, and disease & pest attack.

Winter Hardiness – Plant & Bud

We believe cold and wind are equal threats to bud survival. Much of Cape Cod is a very windy place in winter and the desiccating effect of these often very dry and very cold winter winds – particularly from the northwest - can easily kill *H. macrophylla* buds. Exposed tip buds typically fail in the adversely cold and windy conditions so common to our winters. Stem bud survival is generally better, and those cultivars that bloom well off their lower lateral stem buds, can deliver quite good blooming come the following summer.

While *H. macrophylla* plants and buds prefer a mild, narrow temperature range, they can handle consistent cold, but NOT sudden or fluctuating low temperature events such as we have experienced on numerous occasions over the past 6 winters.

The other related and negative *H. macrophylla* characteristic is their often too rapid response to warming periods during the winter months. Just a few days of 50 degrees F in February – with increasing day length - can get the buds 'thinking spring'. Surely a cold snap follows, and bud loss can be significant.

Bloom Count & Quality

Normal Cape Cod summer weather allows plants to be grown in more direct sun given the typically moderate temperatures. Plants are somewhat reduced in size (less internode stretching) but flower bud count increases resulting in higher bloom count. On the downside, the increased sun does tend to scorch the blooms, particularly the paler colors. Cultivars susceptible to leaf spotting, particularly cercospora, also suffer from excessive sun.

Reblooming Capability

This is totally about how well and how quickly a plant develops new flower buds. 'Twist n Shout' is a very strong rebloomer, perhaps the best we've observed to date. 'Endless Summer-The Original' generally does well too. Other newer introductions, advertised as 'rebloomers', have shown mixed results to date.

Some older cultivars are good rebloomers as well and this fact has been known for some time. As previously mentioned, cultivars like 'Penny Mac', 'David Ramsey', 'Decatur Blue', even 'Nikko Blue', show this characteristic when grown well.

The duration of 'summer' is relevant to reblooming as well. Summers on Cape Cod are comparatively short. 'True' spring weather seldom arrives before mid-May and even then, nighttime temperatures remain in the mid-fifties. The real growing season is just 4 months long – June through September. Autumn can be lovely but day length is decreasing rapidly by mid-September. This 'short' season may not provide enough favorable growing time for some 'rebloomers' to fully express their secondary flowers.

Nevertheless, the 'reblooming' mantra has been very well marketed and well documented with selected cultivars. It is now almost a pre-requisite for a new *Hydrangea macrophylla* introduction. And why not - the ability to bloom at all following the recent damaging winters on the Cape strongly supports the benefit of this capability.

Sun Tolerance

Plants having medium green, matte finish leaves commonly wilt in the afternoon sun. This group of *H. macrophyllas* includes 'Nikko Blue', 'Penny Mac', 'Endless Summer-The Original', and several other well planted cultivars. As we have already noted, these are the same varieties that possess the best winter hardiness and reblooming characteristics. Watering does not cure the wilting problem; once the sun passes and the plants are in shade, wilting subsides quite quickly. Siteing these cultivars in a location providing afternoon shade is much preferred.

H. macrophylla plants having shiny dark green foliage - and dark bloom pigment – tolerate the same sun conditions much better. These attributes are common to several 'old-time' cultivars - 'Mathilda Gutges', 'Marechal Foch', 'Alpengluhen', 'Merritt Supreme'. Unfortunately these cultivars do not rebloom. Perhaps a great breeding opportunity might be awaiting.

Autumn on the Cape – with nighttime temperatures falling back into the 50's – triggers an 'antique' color change for most *H. macrophylla*s. Rich 'washed' tones of green, pink, mauve and even reds, develop in the predominantly blue sepals of a maturing blossom's sterile florets – a condition that is particularly striking on mophead flowers. Best

'antiquing' occurs on mature blooms that have had favorable shade conditions during August and September coupled with adequate moisture. Even a modest 'blue' can develop into a splendid complex mix of colors.

General Growth Characteristics

Ultimate plant maturity – plant size – may take more growth seasons than were trialed initially by the breeders / developers. And plant size is important especially in current times as gardens are getting smaller and so must the plants.

Stem count in a mature plant is a characteristic that can be quite variable. Modest stem density can make for a loose 'open' plant – Twist N Shout would be a good example as it develops long unbranched stems. On the other side, dense stem development may appear favorable but often creates expansive basal crown growth, making for more difficult pruning, and poorer total plant form. Pruning is a true best practice for virtually all hydrangea species and proper application on the *H. macrophyllas* will definitely promote improved plant form and increased bloom numbers.

Disease & Pest Attack

Two fungal and one insect problems persist with *H. macrophylla* plants at Heritage. Leaf spotting – Cercospora - is typically a late season condition from late August onward. Overhead watering worsens the situation and for this reason all hydrangeas at Heritage receive surface irrigation. Powdery mildew is a lesser aliment in our climate but does develop later in the summer – late August, and especially into early September. And we have noted strong correlation with certain cultivars.

Chili Thrips have become more of a problem since their identification a few years ago - especially during our warmer and dryer stretches in late summer. These thrips are identified as 'raspers' and attack the tender uppermost stem tip leaves, sucking them dry. In the most severe cases, the leaves become embrittled, easily crumbling into pieces. Mid-August into September is the peak attack period and again we see some cultivar specificity - particularly on the fleshier, shiney-leaved varieties. It is not fatal but does create a poor looking plant specimen with sad and disfigured foliage by early autumn.

The photos below are good examples of these maladies. It should be noted that fungicides and insecticides are not used at Heritage.

Cercospora – Sep.2019

Powdery Mildew – Oct.2018

Chili Thrips – Sep.2019

Looking Ahead

This fall we began planting a new all *H. arborescens* garden in our Display Garden area. A collection of both new introductions and older varieties – many no longer in commerce – are being included. This species has become increasing popular with Cape Cod gardeners over the past several years owing to their consistent blooming. The new introductions offer significant attributes, like soft greens, tones of pink, and even mauve bloom colors. Several cultivars smaller in stature with better plant habit – plus many are moderate rebloomers.

The summary below provides some numbers about our current hydrangea species content in the two major collections at Heritage. We will continue to add and evaluate new introductions as they become available. Plants that do not perform – after 3 years of evaluation – will be removed.

Overview of Heritage Museums and Gardens Dedicated Hydrangea Gardens

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	North American Hydrangea Test Garden	The Cape Cod Hydrangea Society Display Garden
Hydrangea Species:	5	7
Number of Specific Varieties per Species:		
H.arborescens	8	4
H.aspera		2
H.involucrata		1
H.macrophylla	21	91
H.paniculata	11	2
H.quercifolia		9
H.serrata	1	17
Number of Specific Varieties, All Species	41	126
Number of Plants of Each Species:		
H.arborescens	35	25
H.aspera		2
H.involucrata		1
H.macrophylla	136	149
H.paniculata	67	16
H.quercifolia		16
H.serrata	3	17
Total Number of Plants:	241	226

Some Final Comments

While we've had our climatic challenges, the Test Garden location at Heritage is a good one in terms of having sufficiently difficult conditions from which to better judge plant performance. True, all our winters from 2014 through 2019 have produced selected weather events contrary to normal and definitely less than ideal for the *Hydrangea macrophylla* species. But our blooming successes have been definitive and good performance in Sandwich speaks well for so many other like-kind marginal locations.

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