



Malus

International Ornamental
Crabapple Society



Dr. Edward Hasselkus making observations of Fiala ornamental crabapples at Klehm Nursery in South Barrington, Illinois. (Photo by David Guthery)



Dr. Hasselkus' own selection of serviceberry, *Amelanchier x grandiflora* 'Strata', at the Longenecker Gardens (Photo by Edward Hasselkus)

Malus

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You are invited to join our Society. Please address all membership and other inquiries to the IOCS office:

International Ornamental Crabapple Society
c/o David Allen
The Holden Arboretum
9500 Sperry Road
Kirtland, OH 44094

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International Ornamental Crabapple Society
c/o David Guthery, Editor
Johnson's Nursery, Inc.
W180 N6275 Marcy Road
Menomonee Falls, WI 53051

Contents

- 2 President's Corner
by Norbert Kinen
- 3 Landscape Legend: Edward Hasselkus-A Man for All (A Tree's) Seasons
by Rommy Lopat
- 6 Evaluation of Crabapples for Apple Scab at the Secrest Arboretum in Wooster, Ohio: 1998
by Erik A. Draper, James A. Chatfield, Kenneth C. Cochran, Peter W. Bristol, and Charles F. Tubising
- 12 Comprehensive Aesthetic Evaluations of Crabapples at Secrest Arboretum in Wooster: 1993-1998
by James A. Chatfield, Erik A. Draper, Kenneth C. Cochran, Peter W. Bristol, and David E. Allen

Front Cover Photo: The fall fruit display of *Malus* Molton Lava® is spectacular and look at the clean foliage! (Photo by David Guthery)

Rear Cover Photo: (Top left) After frost the golden fruit of *Malus* 'Bob White' changes to a jewel-like, cider color at Boerner Botanical Gardens in Hales Corners, Wisconsin. (Photo by David Guthery) (Top right) *Malus baccata* 'Jackii' has performed extremely well in the NCEP plots at the Secrest Arboretum in Wooster, Ohio. No wonder look at its outstanding glossy foliage which offers an excellent contrast to its ripe fruit. (Photo by Jim Chatfield) (Bottom right) The firm fruits of *Malus* 'Prairifire' annually produce a spectacular display at the Secrest Arboretum. (Photo by Erik Draper) (Bottom left) The unusual bluish purple fruits of *Malus* 'Purple Prince', combined with its good disease resistance, make it an interesting up-and-coming ornamental crabapple. (Photo by David Guthery)

President's Corner

Dear Members:

Ornamental crabapples are on the comeback trail. Our organization's many years of evaluation and free sharing of research information is paying off. Gardeners across the country are expressing a renewed interest in crabapples. It's taken a couple of decades since Dr. Les Nichols led the campaign to develop a line of disease resistant crabapples with all-season appeal, but the word is finally hitting the streets; crabapples are better than they used to be.

Word is being spread by a dedicated group of garden communicators, many of them members of the Garden Writers Association of America. This organization of 1,500 plus is made up of journalists, authors, photographers, television personalities, public speakers and others who translate the business of growing plants into the pleasure of gardening. They are invaluable partners in our quest to spread the good word about superior crabapples.

Let me share some examples of collaboration between garden writers, the consumer gardening press and IOCS members and staff. Three articles featuring ornamental crabapples will appear in mainstream consumer gardening publications in the next few months.

A spring issue of *Martha Stewart Living Magazine* will recommend a dozen or so superior crabapples, in what I am sure will be beautifully photographed and written article. IOCS members and staff recommended superior taxa for the article as well as where to photograph them. Trees in bloom were photographed at the Morton Arboretum and the Longenecker Gardens within the University of Wisconsin-Madison Arboretum. *Gardening How-To Magazine*, which boasts a circulation of 600,000, will feature crabapples in their spring issue as well. In making their recommendations for suitable taxa to plant in this country's varied climates, the author depended on information supplied by our executive director, David Allen; Dr. Ed Hasselkus' evaluation reports; a Tennessee study based on one of our NCEP plots and information provided by IOCS member nurseries.

An allee of Red Jewel® crabapples crowns the garden remodel of Elvin McDonald, one of America's best-known and respected garden writers. His garden, as well as the crabapple allee, will be featured in the May issue of *Traditional Home Magazine*. McDonald chose Red Jewel® thanks to IOCS information provided him by a fellow garden writer, who markets trees for an IOCS-member nursery.

These are just a few examples of the collaboration that can take place between commercial nurseries, the IOCS and garden writers. We are all working toward a common goal to provide sound horticultural advice to the gardening public. I encourage IOCS members to share their expertise with the GWAA by joining them as an Allied Industry member. If your nursery has an employee with a flair for writing, encourage them to join GWAA. Sharing information with these talented garden communicators will be a win-win situation for all.

Sincerely,

Norbert Kinen

Editor's Note: This article was previously printed in the Fall, 1999 issue of *Rommy Lopat's Weedpatch Gazette: Fine Plant & Garden Quarterly*. The *Weedpatch Gazette* also reprinted Dr. Edward Hasselkus' article, "57 Years of Ornamental Crabapple Evaluations at the University of Wisconsin-Madison Arboretum", which had been previously printed in *Malus* Volume 13, Number 1 (Spring, 1999). If you are interested in more information on the *Weedpatch Gazette*, you may either access them at their internet site:

www.weedpatch.com

or write them at:

Rommy Lopat's Weedpatch Gazette: Fine Plant & Garden Quarterly
P.O. Box 339
Richmond, IL 60071

Landscape Legend: Edward Hasselkus - A Man for All (A Tree's) Seasons

by Rommy Lopat

It was a beautiful, sunny spring day when I visited Ed Hasselkus in the Longenecker Gardens, the woody plant collection he has been developing and curating since 1966 at the University of Wisconsin Arboretum in Madison. Hospitable and gregarious, Ed spent virtually his whole day showing me around, despite the fact that he was overbooked. He needed to get ready to leave for the Magnolia Society convention; he was worried about the arrival (in his absence) of a crew from *Martha Stewart Living* ("I told them that under no circumstances could they cut samples of the crabapple flowers for a layout. No one prunes these trees except me!"); and he had a late afternoon meeting with a student intern. Given his schedule of guest lecturing throughout the country and the time needed to continue to curate the Gardens, it was hard to imagine that Professor Hasselkus is officially "retired".

To walk the grounds of this 60 acre garden with Ed Hasselkus is a real treat – and all-too-short education – on woody plants and what makes them worthy candidates for our landscapes. "This is a hybrid between the Japanese maple, *Acer palmatum*, and the Korean maple, *Acer pseudosieboldianum*", Hasselkus says as he stops in front of a gorgeous tree that I'm thinking looks like a purple beech. Waxing into sartorial splendor, he begins to list the tree's attributes: "Dr. Susan Wiegrefe of The Morton Arboretum is making similar crosses to create other forms and colors, but this cross is a real beauty. It has bronzy-purple foliage, deeply incised leaves, hybrid vigor and is beautiful red in the fall. And it drops its leaves rather than holding them into the winter." I glanced sideways at Hasselkus. Looking back, blue eyes twinkling, he rather slyly says, "I don't like trees that hold their leaves in winter – too messy looking."

Hasselkus strides across the lawn towards a 40' tall *Amelanchier x grandiflora* named 'Strata'. It's in full glorious white bloom. "That's one of my own selections of serviceberry", he states with obvious pride. "It has far less suckering than most others and blooms earlier. That tree's about forty years old now. Great shape, don't you think? I also introduced 'Flambeau'. By now, I could be considered an *Amelanchier* expert. Thirty-five years ago, *Amelanchiers* were hardly used and they were all called *Amelanchier canadensis*, although they might have been *A. laevis* or hybrids. It was a confusing situation. I strongly felt that introducing cultivars would solve the problem and now we have many – most of them selected in Illinois or Wisconsin. The 'Royal Family' series was introduced by Wisconsin's Tom Watson, for example. In fact, the original 'Prince Charles' is here at the Longenecker and the original *Amelanchier* 'Prince William is at my church."

As we walk, I begin to comprehend this man's prodigious ability to recollect the histories of each tree in the Longenecker's collection. He can rattle off the provenance of each cultivar ("the seed for that tree came from the Arnold Arboretum in 1968"; "that magnolia came from Mike Dirr and was a selection of Joe McDaniel"). Charmingly, Hasselkus will frequently respond to my question by asking, "Oh, do you want *that* story?" And, of course, I do, because it is the longtime camaraderie and exchange of opinion among Hasselkus and the country's nurserymen that has resulted in the selection of so many great trees for Midwestern gardens.

The Longenecker Gardens are unique in the Midwest because it emphasizes cultivars of woody plants. (Many arboreta only plant the species version of a tree or shrub, unless an evaluation is being undertaken. For example, you might see a river birch, but not its cultivar - 'Heritage'). In addition, Hasselkus says that he will cut down trees which have become poor performers. "Some public gardens have really geriatric collections of plants. They keep everything. But Longenecker's ornamental crabapple collection is the most 'up-to-date' in the world. I start with three examples of each cultivar and then eliminate them as we select the best performer." As we walk, Hasselkus points out a crabapple named Golden Raindrops™: "It's a cutleaf crabapple. And it's a fantastic maroon in fall," he beams.

Hasselkus notes that magnolias are experiencing a revival and lilacs are coming up too. He calls *Magnolia x Elizabeth*", "the ultimate yellow magnolia", but is quick to point out that legendary nurseryman, Roy Klehm, who is now growing many cultivars of yellow magnolias, prefers 'Butterflies': "It's more bush, less upright." The magnolias are in full flower as we walk. "If I could have but one magnolia," Hasselkus says, "it would be *Magnolia x loebneri* 'Leonard Messel'."

Given Hasselkus' prodigious ability to document the detail of every tree's life, I'm

not surprised when he tells me that he enjoys genealogy as well. I report that I heard that he is an Anglophile.

"Oh, do you want *that* story? Well, in 1955 I was in the Army and was stationed near Newbury, England. Ever

since I've loved England. My wife, Betty, and I go almost every year. My maternal relatives are Welsh and Cornish, and I've found most of the old family farms there. On my father's side, though, I'm German. In fact, my cousin Engelbert owns the hotel in Lennep, Germany, if you ever want to visit..."

It is not just Ed who values education; his wife, Betty, is a Ph.D and a professor of Occupational Therapy, who is also the Editor of the *Journal of Occupational Therapy*. Their daughter, Jane, is an MBA and Director of Worldwide Marketing for Kodak's Mammography Division; and their son, John, founded the highly successful firm, Visual Networks. John's family is relocating from Maryland to the Madison area. The move means that Hasselkus can truly dote on his three-year-old granddaughter, Carolyn.

If playing with his granddaughter portends to cut down on his busy lecture and travel schedule, it's one which he has already curtailed out of respect for his successor at the University of Wisconsin, Dr. Laura Jull. Hasselkus no longer lectures inside the state, for example, so that Dr. Jull can become better known. Dr. Jull has also taken Hasselkus' place as organizer of the Wisconsin Woody Plant Society. Hasselkus has, however, maintained his 25-year tenure on the boards of the Bickelhaupt Arboretum in Clinton, Iowa, and the Paine Art Center and Arboretum in Oshkosh, Wisconsin; and he often travels with the Wisconsin Hardy Plant Society. He works as a volunteer curator of the Longenecker Gardens on a half-time basis, and is hopeful that an endowment large enough to support a full-time curator will soon be developed.

By his calculations, Hasselkus has taught 3,000 undergraduates and 45 graduate students, many of whom have become well known in horticulture. Dan Krueger (Northwoods Nursery), Ray Prag (Forestfarm Nursery), Bill Thomas (Longwood Gardens), Kris Bachtell (The Morton Arboretum), Dave Guthery (Johnson's Nursery) and free-lance writer Kate Jerome are just a few of his memorable students. All of them speak of Hasselkus with great affection. They particularly note his kindness, his continuing interest in their careers and families, and his fondness for good restaurants.

"The ornamental crabapple is the most important small-scale tree for the northern Midwest."

Looking around at the thousands of trees and shrubs in the Longenecker Gardens, he credits McKay Nursery and Klehm Nursery with great generosity in donating plant material. Asked if he gardens at home and has ever bought a perennial, Hasselkus' eyes light up, "Oh, gosh yes. If I wasn't here with you today, I'd be over at The Flower Factory buying some!"

Evaluation of Crabapples for Apple Scab at the Secrest Arboretum in Wooster, Ohio: 1998

by Erik A. Draper, James A. Chatfield, Kenneth C. Cochran, Peter W. Bristol and Charles E. Tubesing

Summary

Crabapples in a replicated plot at the Secrest Arboretum of The Ohio State University's Ohio Agricultural Research and Development Center were evaluated for apple scab three times in 1998. Seventeen of the selections had no scab at any of the three ratings in 1998. Fourteen of the selections had scab that resulted in significant negative effect on aesthetics on at least one of the ratings.

Fifteen of the crabapples were removed from the plot in 1998 due to poor overall aesthetics over the past five years, and the summaries of scab ratings for these crabapples are reported. Scab ratings for the past six years are reported for the remaining 27 selections, and ratings for 14 newer plantings are averaged for the past two years.

Other diseases noted included bacterial fireblight, frog-eye leaf spot, sooty blotch and flyspeck.

Introduction

Apple scab (pathogen: *Venturia inaequalis*) is a major fungal disease problem of many crabapple species (*Malus* spp.). Although it generally is not a major health problem for the tree, it can severely impact ornamental effect and the marketability of highly susceptible crabapples.

Symptoms of apple scab on crabapple include olive to gray to brown to black

spots on foliage, yellowing and discoloration of foliage, leaf drop and scabby lesions on fruits. Apple scab can be effectively controlled with a fungicide spray program, and certain cultural and sanitary practices (thinning to avoid dense canopies, cleanup of leaves at the end of the season) are also beneficial for control.

However, the best method for control of apple scab is through the use of genetically resistant crabapple selections. The evaluations presented here are the latest in a series of apple scab evaluations for Ohio (1-3).

The authors emphasize that apple scab in particular and diseases and pests in general are not the only consideration relative to crabapple effectiveness in the landscape. This is the rationale for the inception of more comprehensive evaluations of a number of different aesthetic criteria. These include fruit, flower and foliage features; plant texture and shape; and disease and pest problems. These are reported in a series of publications from data collected in the Secrest plot (4-7). The comprehensive crabapple evaluations at Secrest are a continuing project and are being expanded to include a second plot with additional selections.

Materials and Methods

Forty-one crabapples in the replicated crabapple plot at Secrest Arboretum were rated for apple scab disease on June 9, 1998; July 24, 1998; and August 20, 1998. This plot is in a completely randomized design with three replications of each crabapple selection (except for *Mx zumi* var. *calocarpa* with two surviving replicates). The plot was planted in 1984 and is not treated with fungicides or insecticides.

Apple scab evaluations were based on the following rating system:

- 0 = No scab noted.
- 1 = Slight scab; less than 5% of leaves affected; no negative effect on aesthetics.
- 2 = Moderate scab; 5-20% of leaves affected; some yellowing; little or no defoliation; moderate negative effect on aesthetics.
- 3 = Extensive scab; 20-50% of leaves affected; significant defoliation and/or leaf yellowing; significant negative effect on aesthetics.
- 4 = Heavy scab; 50-80% of leaves affected; severe defoliation and discoloration of leaves; severe negative effect on aesthetics.
- 5 = Extreme scab; 80-100% of foliage is affected, and defoliation is complete or nearly complete

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Table 1: Apple Scab Ratings for Crabapple Selections at Secrest Arboretum (6-9-98, 7-24-98, 8-20-98) and the Average Rating for Secrest Arboretum from 1993-1998.

Crabapple	Secrest 6-9-98	Secrest 7-24-98	Secrest 8-20-98	Secrest 1993-98
<i>M. baccata</i> 'Jackii'	0.0	0.0	0.0	0.0
'Beverly'	0.0	0.0	0.0	0.0
'Bob White'	0.0	0.0	0.0	0.0
'David'	1.0	1.0	1.0	0.9
'Dolgo'	0.0	0.0	0.0	0.0
'Donald Wyman'	2.0	2.0	3.0	1.3
<i>M. floribunda</i>	1.0	2.0	2.0	0.6
Harvest Gold®	2.3	3.0	3.3	2.6
'Indian Magic'	2.0	2.6	3.0	2.7
'Indian Summer'	2.0	2.3	3.0	2.2
'Liset'	0.6	1.3	1.3	1.0
'Mary Potter'	0.3	1.0	1.0	0.6
Molton Lava®	1.0	1.0	2.3	1.3
'Ormiston Roy'	0.0	0.3	0.6	0.3
'Prairifire'	0.0	0.0	0.0	0.0
'Professor Sprenger'	0.0	0.6	0.6	0.8
'Red Jade'	1.0	1.0	1.0	1.2
Red Jewel®	0.0	0.3	0.3	0.1
'Red Splendor'	1.0	2.0	3.0	1.5
<i>M. sargentii</i>	0.0	0.0	0.0	0.0
'Sentinel'	0.0	1.0	1.0	0.7
'Silver Moon'	0.0	0.0	0.0	0.0
'Snowdrift'	1.0	2.0	3.0	2.2
'Strawberry Parfait'	0.0	0.0	0.0	0.1
Sugar Tyme®	0.3	0.3	1.0	0.7
'White Angel'	0.0	0.0	0.0	0.0
'White Cascade'	1.6	3.0	3.0	2.2
<i>M. x zumi</i> var. <i>calocarpa</i>	1.0	1.0	1.0	0.9

0 = No scab noted.

1 = Slight scab; less than 5% of leaves affected; no negative effect of aesthetics.

2 = Moderate scab; 5-20% of leaves affected; some yellowing; little or no defoliation; moderate negative effect on aesthetics.

3 = Extensive scab; 20-50% of leaves affected; significant defoliation and/or leaf yellowing; significant negative effect on aesthetics.

4 = Heavy scab; 50-80% of leaves affected; severe defoliation and discoloration of leaves; severe negative effect on aesthetics.

5 = Extreme Scab; 80-100% of foliage is affected and defoliation is complete or nearly complete.

Scab on crabapple fruits was factored into the overall scab ratings.

Table 2: Apple Scab Ratings for Crabapple Selections at Secrest Arboretum from 1993-1997. These crabapples were discontinued in the plot due to poor overall aesthetic ratings.

Crabapple	1993-1997 Ratings
'Adams'	1.8
Centurion®	1.5
'Henningii'	2.0
<i>M. adstringens</i> 'Hopa'	2.9
'Profusion'	2.8
'Radiant'	3.1
'Ralph Shay'	2.0
'Red Baron'	2.0
'Robinson'	2.5
'Royalty'	2.0
'Ruby Lustre'	1.9
'Selkirk'	1.7
Velvet Pillar™	2.8
Weeping Candied Apple®	1.8
'Winter Gold'	2.5

0 = No scab noted.

1 = Slight scab; less than 5% of leaves affected; no negative effect of aesthetics.

2 = Moderate scab; 5-20% of leaves affected; some yellowing; little or no defoliation; moderate negative effect on aesthetics.

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5 = Extreme Scab; 80-100% of foliage is affected and defoliation is complete or nearly complete.

Scab on crabapple fruits was factored into the overall scab ratings.

Table 3: Apple Scab Ratings for Crabapple Selections at Secrest Arboretum rated on 6-9-98, 7-24-98, 8-20-98 and the Average Rating for Secrest Arboretum from 1997-98.

Crabapple	Secrest 6-9-98	Secrest 7-24-98	Secrest 8-20-98	Secrest 1993-98
'Adirondack'	0.0	0.0	0.0	0.0
Camelot®	0.0	0.0	0.0	0.0
'Canary'	2.3	2.0	2.0	2.2
Lancelot®	0.0	0.0	0.0	0.1
'Louisa'	0.0	0.0	0.0	0.0
'Narangansett'	1.0	2.0	2.0	1.9
'Pink Satin'	0.6	2.0	2.3	1.7
'Prairie Maid'	0.0	0.0	0.0	0.0
'Purple Prince'	0.0	0.0	0.0	0.0
<i>M. sargentii</i> 'Candy mint'	0.0	0.0	0.0	0.0
'Silver Drift'	0.6	1.3	1.3	1.1
'Sinai Fire'	0.0	0.0	0.0	0.0
Golden Raindrops™	0.0	0.0	0.0	0.0
'Winter Gem'	0.6	2.3	3.0	2.2

0 = No scab noted.

1 = Slight scab; less than 5% of leaves affected; no negative effect of aesthetics.

2 = Moderate scab; 5-20% of leaves affected; some yellowing; little or no defoliation; moderate negative effect on aesthetics.

3 = Extensive scab; 20-50% of leaves affected; significant defoliation and/or leaf yellowing; significant negative effect on aesthetics.

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Scab on crabapple fruits was factored into the overall scab ratings.

Comprehensive Aesthetic Evaluations of Crabapples at Secrest Arboretum in Wooster, Ohio: 1998

by James A. Chatfield, Erik A. Draper, Kenneth C. Cochran, Peter W. Bristol and David E. Allen

Summary

Twenty-eight crabapples (*Malus* spp.) planted in 1984 were rated from 1992-1998 for aesthetic qualities, flower duration, season of fruit effectiveness, tree form and disease characteristics. Fourteen crabapple selections, which were planted in 1994, were also evaluated for those same parameters for only two years (1997-1998). Overall profiles of these crabapples developed from these ratings are presented in this report. Fifteen crabapples were removed from the evaluation plots due to their consistent lack of pleasing ornamental aesthetics.

Introduction

Crabapples are generally thought of and used mainly as a flowering tree, creating a welcome relief of blossoms in spring landscapes. However, this ornamental tree offers many seasonal impacts beyond the "flowering tree" label. Often ignored are aesthetic qualities like ornamental fruit effect and changing fruit color, leaf shape and fall color, bark exfoliation and tree form. The purpose of this on-going study is to develop an accurate year-round profile of commonly used ornamental crabapples. This profile benefits commercial landscapers, nursery owners, landscape architects and homeowners alike in their selection of a particular crabapple for a specific landscape use. Understanding the strengths and the weaknesses of each crabapple increases the likelihood of complementing the landscape, rather than causing a detraction.

Materials and Methods

Twenty-eight crabapples at The Ohio State University/Ohio Agricultural Research and Development Center's Secrest Arboretum were rated monthly for aesthetic characteristics from September 1992 through October 1998. Three ratings were taken each year during bloom and combined for one average value. Ratings were made on a 1-5 basis with 1=outstanding flower, fruit, foliage, form and other

qualities at time of rating. Results are presented as averages, over the six years, in Table 2.

Similar results for an additional fourteen crabapple selections, which were planted in 1994, and the monthly observations from November 1996 to October 1998 are also presented as averages in Table 2. These selections are noted with an * before the crabapple name.

From 1995 through 1998, crabapples were scrutinized for season of fruit impact every other week starting at petal fall. Effective fruit is defined as the period from when the tree's fruit first contributes to tree aesthetics until fruit is no longer ornamental.

From 1995 through 1997, crabapples were studied to determine days of effective bloom from mid-April through May. Effective bloom was defined as starting with the emergence of the first flowers and ending when overall flower effect was no longer ornamental. The average onset of first bloom is reported as E (Early) = last week of April, M (Mid-season) = first week of May and L (Late) = second week of May.

Apple scab is reported due to the significance of this disease on aesthetics of crabapples. Incidence of scab is derived from the accumulated disease ratings (three to four per year) on crabapples in the plot from 1993 to 1998, except for those indicated with an *, which only have two years of data (1997-1998).

The original crabapple was planted in 1984 with an additional 14 selections planted in 1994. The plot is in a completely randomized block design with three replications of each crabapple. The cultural practices used to maintain the crabapple plot are minimal pruning, a 6-8' diameter mulch ring of a 1-2" depth around each tree and removal of rootstock suckers and dead branches; thereby mimicking those cultural practices of an average landscape.

Results and Discussion

In the authors' opinion, there are some ornamental crabapples that should not be used in the landscape due to an overall lack of aesthetic qualities. This deficiency of aesthetics may be in part due to extensive defoliation or fruit deformation from apple scab, ungainly tree form, retention of mummified fruit, sparse clusters to no fruit, coarse or dull fruit finish, cluttered branching structure, or a general lack of ornamental appeal. Any combination of these aesthetic defects would be extremely difficult to overcome. The trees (listed in Table 1) have been removed from our evaluation plots.

The aesthetic qualities of 42 crabapples (Table 2) were evaluated monthly. Those preceded by an * only have two years of observations, from November 1996

to October 1998. All other crabapples have been rated for five years. Monthly ratings are combined and an average derived for each crabapple selection. This mean is useful in determining the true character profile of a crabapple. Although there are both high and low ratings during a single year, averaging the ratings should eliminate uncharacteristic fluctuations. This cumulative mean is therefore the best indicator of how a crabapple will perform aesthetically in the landscape.

When aesthetic quality is combined with disease resistance, then customer satisfaction and success will increase. However, this does not mean that any tree that fails to exhibit complete resistance to scab should be avoided in the landscape. There are trees that have a trace of scab that are absolutely superb and would be great additions to any landscape.

An observation worth noting was the impact that the "El Nino phenomenon" had on crabapple bloom. In 1996 and 1997, 'Dolgo' was the first crabapple to bloom - on the 27th of April. This year 'Dolgo' bloomed a full three weeks ahead of the past two years - on the 6th of April - with all the other trees following that general trend.

Also of interest was the conspicuous lack of foliage on some crabapples that bore copious amounts of fruit in 1997 and retained that fruit well into the winter months. During the growing season, it was observed that some branches, with last year's fruit mummies still present, had died. Some of these branches did begin to leaf out, but the foliage was small, stunted and never expanded to a normal size. With the mild winter experienced in the area, this condition was definitely not due to freeze damage. One possible explanation is that the large fruit load exhausted the carbohydrate supply, creating additional stresses on trees, resulting in branch dieback.

The authors believe enough observations have been conducted on the original 28 trees to confidently state that the crabapple profiles created are reasonably accurate representations of how that crabapple will perform. The other 14 crabapples, designated by an *, were evaluated for just two years, so the aesthetic mean and bloom length for these trees should be considered approximations. Therefore, the profiles of these "newer" crabapples may not be an accurate or complete representation of their aesthetic qualities. More research is needed to confirm these findings and/or correct the inaccuracies.

It must be noted that these crabapple profiles of fruit, flower, form and disease observations are limited to one site, Secrest Arboretum in Wooster, Ohio. Other limitations of this study that can affect ratings are the preferential biases of the evaluators as well as the inability to keep environmental conditions uniform. The lack of control over environmental conditions can directly impact aesthetic aspects

like return bloom, bloom duration, fruit development and, ultimately, tree size and form, if conditions become severe.

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Table 1: Ornamental Crabapples Removed from the Evaluation Plot Due to Severe Scab Problems and/or Lack of Other Pleasing, Consistent Aesthetic Qualities

'Adams'	'Radiant'	'Selkirk'
Centurion®	'Ralph Shay'	Velvet Pillar™
<i>M. halliana</i> 'Parkmanii'	'Red Baron'	Weeping Candied Apple®
'Henningii'	'Robinson'	
<i>M. adstrigens</i> 'Hopa'	'Royalty'	
'Profusion'	'Ruby Lustre'	

Table 2: Aesthetic Evaluations of Crabapples at Secrest Arboretum : 1993-1998. A * preceding the crabapple selection indicates only two years (1997-98) of observations.

Crabapple	Fruit		Flower			Tree Form
	Fruit Color	Season of Impact ¹	Bloom Color ¹	Bloom Days ²	Bloom Time ²	
* 'Adirondack'	orange-red	late Aug. to mid-Dec.	white	12.0	L	narrow upright
<i>M. baccata</i> 'Jackii'	maroon-red	late July to mid-Dec.	white	10.3	E	rounded upright
'Beverly'	pink-red	late July to late Sept.	white	14.3	E	upright spreading
'Bob White'	yellow	mid-Oct. to late Jan.	white	14.5	M	rounded
* Camelot®	rose-pink	mid-June to late Oct.	white	14.0	L	low spreader
* 'Canary'	yellow	mid-Aug. to early Dec.	white	12.0	M	open spreader
* 'Candy mint'	red-purple	early July to late Dec.	pink	14.0	M	low spreader
'David'	scarlet	mid-Sept. to mid-Nov.	white	13.7	M	rounded
'Dolgo'	red-purple	early-Sept. to late Mar.	white	13.7	E	broadly rounded
'Donald Wyman'	bright red	mid-Sept. to late March	white	15.5	L	broadly rounded
<i>M. floribunda</i>	yellow	mid-Oct. to early Nov.	white	12.3	M	broadly spreading
'Winter Gem' ('Glen Mills')	bright red	late Aug. to mid-April	white	10.0	M	rounded spreader
* Golden Raindrops ¹⁰⁾	yellow	mid-Oct. to early Dec.	white	10.0	L	open spreader
Harvest Gold®	yellow	late Oct. to mid-Dec.	white	11.0	L	upright

Scab ³	Aesthetic Rating 1993-98 Avg. ³	Comments
		Positive Aspects: in regular type Negative comments: <i>in italic type</i>
none	2.8	Narrow upright form; red-tinged flowers; nice autumn fruit/foliage effect; fruit darkens with time to deep orange-gold. <i>Fruit scattered; leafhoppers like foliage.</i>
none	2.8	Glossy green foliage; wonderful fall yellow foliage accents the maroon fruits; bark has orange cast. <i>Sparse fruit clusters; mediocre winter appeal.</i>
none	3.5	Abundant fruit; consistent floral display is fabulous. <i>Fruits only half eaten by birds; large, persistent fruit mummifies into muddied, black blobs until spring.</i>
none	2.9	Abundant yellow-gold fruits mature to orange-gold; standout for winter landscape; unbelievable bloom. <i>Alternate bloom; lacking summer appeal.</i>
trace	3.0	Low spreading form; fuchsia-tinged flower; oblong fruit; foliage dark green with burgundy overtones. <i>Dull leaf appearance, slow growing.</i>
minor	3.1	Clusters of tiny fruit; nice autumnal fruit/foliage effect. <i>Some defoliation caused by scab; fruit deteriorates turning cider-brown then falls off.</i>
none	2.2	Great overall form; reliable fruit/flower display; purple-tinged leaves; burgundy stems and fruit; new foliage is burgundy red. <i>Slow growing; dull leaf appearance.</i>
trace	3.3	Snow-white flower display; impressive cherry-like fruits. <i>Alternate bloom; large mummies hang until mid-winter; mediocre appeal until bloom.</i>
none	3.9	Consistent early, large, fragrant blooms; edible, large neon red-purple fruit. <i>Rotten fruit is an intoxicating mess; big, brown mummies are ugly.</i>
minor	2.4	Excellent floral display; glossy, exfoliating trunk bark; persistent fruit a mud-red after freeze. <i>Mummies; heavy fruit scab repeatedly threatens overall appeal.</i>
trace	3.0	Commingle of yellow and cider brown fruit; wonderful airy floral display. <i>Three week fruit display; yellow flecking of foliage; mediocre tree most of the year.</i>
major	2.4	Petite, profuse fruit is sensational; long lasting fruit effects, fast growing. <i>Large tree; mediocre summer appeal.</i>
none	2.5	Interesting cutleaf foliage; petite abundant fruit; reliable fruit/flower display; great fall color; yellow-orange bark. <i>Bland green summer fruit.</i>
major	3.4	Yellow-gold fruit clusters accented by red pedicel. <i>Long period of green fruit; extensive scab yearly; awkward tree form; fireblight is a concern.</i>

Table 2 (Con't): Aesthetic Evaluations of Crabapples at Secrest Arboretum : 1993-1998. A * preceding the crabapple selection indicates only two years (1997-98) of observations.

Crabapple	Fruit		Flower			Tree Form
	Fruit Color	Season of Impact ¹	Bloom Color ¹	Bloom Days ²	Bloom Time ²	
'Indian Magic'	red-orange	mid-June to early April	pink	13.7	M	rounded
'Indian Summer'	red	early June to mid-Feb.	rose-red	14.0	E	rounded
* Lancelot®	yellow	early Oct. to early Dec.	white	12.0	L	dense upright
'Liset'	maroon-red	early July to mid-Dec.	rose-red	14.5	L	open rounded
* 'Louisa'	lemon-gold	late July to mid-Dec.	pink	13.0	E	true weeper
'Mary Potter'	red	mid-Aug. to late Nov.	white	11.5	L	weeper spreader
Molton Lava®	red	early Aug. to mid-Dec.	white	13.0	M	broad spreader
* 'Naragansett'	cherry-red	early Sept. to mid-Dec.	white	15.0	M	broadly rounded
'Ormiston Roy'	orange	late Aug. to late March	white	13.0	M	broadly rounded
* 'Pink Satin'	dark red	mid-Aug. to mid.-Oct.	pink	10.0	L	upright spreading
* 'Prairie Maid'	rosy-red	early June to late Nov.	deep pink	13.0	L	rounded
'Prairifire'	purple-red	late June to early Dec.	coral-red	13.2	L	rounded
'Professor Sprenger'	orange-red	late Sept. to mid-Nov.	white	12.2	M	upright spreader
* 'Purple Prince'	blue purple	late June to late-Dec.	rose-red	13.0	E	broadly round
'Red Jade'	red	late Aug. to mid-Nov.	white	13.0	M	weeper spreader

Winter, 1999

Scab ³	Aesthetic Rating 1993-98 Avg. ³	Comments
		Positive Aspects: in regular type Negative comments: <i>in italic type</i>
major	2.6	Incredible fruit display; consistent, profuse floral display; persistent fruit; fall foliage color. <i>Yearly leaf scab and defoliation by mid-summer.</i>
major	3.0	Prolific fruit display; consistent large blooms; orange fall foliage; flaky bark on trunk. <i>Yearly extensive leaf scab; persistent mummies.</i>
none	2.9	Diminutive size; consistent tree form; fruit mix of yellow and cider. <i>Tight dense branching structure; fruit/flower mostly bidden on the interior of the plant.</i>
trace	3.3	Attractive fruit display; red-maroon new foliage turning bronze green. <i>Awkward splayed form; mummies; minimal fruit to foliage contrast.</i>
none	1.8	Outstanding tree form is its greatest asset; arching, graceful branches upswept at ends; fruit darkens to gold-orange with a rose blush. <i>Scattered, sparse fruit.</i>
trace	2.2	Consistent, petite, abundant fruit; fantastic floral display; elegant arching, spreading tree form; salmon-colored underbark. <i>Mummies distract mid-winter.</i>
minor	1.8	Outstanding fruit/fall foliage combination; excellent horizontal layered branching; consistent bloom. <i>Somewhat cluttered with maturity; dense; lacks summer appeal.</i>
major	3.1	Consistent bloom; abundant firm fruit. <i>Cluttered dense branching structure; severe fruit scab; scabby leaves remain on the tree; tree form awkward.</i>
trace	2.6	Great glossy, oval-shaped persistent fruit with rosy blush; orangish bark deeply furrowed; good floral display. <i>Mummies may remain up to year.</i>
minor	3.5	Nice true pink bloom. <i>Abundant persistent blackened mummies are overwhelming; heavy fruit scab; cluttered branch structure.</i>
none	2.6	Reliable wonderful bloom; abundant clusters of fruit; new foliage is burgundy red. <i>Lacks winter appeal; waxy coating dulls fruit finish until coating weathers off.</i>
none	2.3	Firm fruits slowly age to cherry-red before dropping; yearly spectacular bloom; airy structure; peach-orange fall color. <i>Lacks winter and early summer appeal.</i>
trace	3.6	Consistent, large flower display. <i>Dull large yellow-green fruits in summer; muddied mummies persist until late winter; awkward form.</i>
none	2.6	Dark large unusual colored fruit; consistent flower/fruit display; fast growing; leaves deep purple green. <i>Lacks fruit/foliage contrast; lacking winter appeal.</i>
minor	2.2	Large, prolific bloom; reliable fruit/flower display; graceful arching, spreading habit. <i>Unightly fruit rot in Jan.; scab on fruit can dull.</i>

Malus

Table 2 (Con't): Aesthetic Evaluations of Crabapples at Secrest Arboretum : 1993-1998. A * preceding the crabapple selection indicates only two years (1997-98) of observations.

Crabapple	Fruit		Flower			Tree Form
	Fruit Color	Season of Impact ¹	Bloom Color ¹	Bloom Days ²	Bloom Time ²	
Red Jewel®	cherry red	early Sept. to mid-April	white	13.0	L	narrow upright
'Red Splendor'	red	late May to mid-Nov.	rose pink	15.5	E	upright spreading
<i>M. sargentii</i>	red	mid-Aug. to early Nov.	white	11.2	L	wide spreader
'Sentinel'	red	late Sept. to early Mar.	white	13	M	narrow upright
* 'Silver Drift'	cherry red	mid-Sept. to mid-April	white	13	E	broadly round
'Silver Moon'	burgundy	early Sept. to mid-Dec.	white	9.2	L	oval upright
* 'Sinai Fire'	red-orange	mid-August to late Oct.	white	14	M	unique spreader
'Snowdrift'	salmon-red	mid-Aug. to mid-Nov.	white	10.2	M	broadly rounded
'Strawberry Parfait'	red-cream	mid-Aug. to mid-April	pink	14.7	E	open spreading
Sugar Tyme®	bright red	early Sept. to mid-April	white	13	M	rounded
'White Angel'	red	mid-Oct. to early Feb.	white	9.7	M	broadly rounded
'White Cascade'	yellow	None-scab ravaged	white	14.2	M	true weeper
<i>M. x zumi</i> var. <i>calocarpa</i>	bright red	late Aug. to mid-Dec.	white	12.2	L	rounded spreader

* Denotes crabapple selections for which there are only two years (1996-98) of observations.

¹ Season of fruit impact derived from biweekly observations from 1995-98 only. Effective fruit impact is defined as the period from when the tree's fruit first contributes to tree aesthetics until it is no longer ornamental.

² Bloom days and bloom time are derived from daily observations from April-May in 1995-97 only. For bloom time, E(Early)=onset of first bloom in April, M(Mid-season)=onset of first bloom in first week of May, and L(Late)=onset of first bloom in second week of May. Bloom days are defined as starting with the emergence of the first flower and ending when overall flower effect was no longer ornamental.

³ Scab and aesthetic ratings are from 1993-98 unless an * is present by the name (See note above).

Scab ³	Aesthetic Rating 1993-98 Avg. ³	Comments
		Positive Aspects: in regular type Negative comments: <i>in italic type</i>
none	2.5	Phenomenal persistent firm fruit; great flower display; can become alternate bloomer. <i>Tree is somewhat upright and ungainly.</i>
major	3.3	Exceptional profuse red fruits; fruit matures to orange-salmon color; reliable fruit/flower display. <i>Heavy scab may defoliate tree; severe Japanese beetle feeding.</i>
none	2.8	Petite firm fruits; attractive low-spreading form; reliable fruit/flower display. <i>Fruits rapidly deteriorate and shrivel like raisins.</i>
minor	2.9	Persistent firm small fruits; spectacular pink-tinged bloom; reliable fruit/flower display. <i>Persistent mummies detract; fruit scab dulls.</i>
trace	2.7	Nice persistent showy fruit; nice fruit/new leaves contrast; fast-growing tree. <i>Some fruit mummies; fruit obscured by foliage.</i>
none	3.0	Glossy unique colored fruits; good late floral display; peculiar tree form. <i>Erratic alternating bloomer; densely cluttered growth; fireblight can be a problem.</i>
none	2.5	Uncommon growth habit; good specimen plant; large flowers; consistent bloom. <i>Scattered sparse fruit; unique form can limit use; slow grower.</i>
major	2.9	Reliable excellent flower display; distinctly colored, small round fruits and pedicels. <i>Fruits shrivel by late fall; chlorotic summer foliage; extensive leaf scab.</i>
trace	2.3	Unbelievable floral display; red-tinged newly emerged foliage; unusual growth form; firm persistent fruits. <i>Persistent fruit mummies.</i>
trace	2.4	Reliable fruit/flower displays; abundant persistent fruits; stunning sugar white flowers; good tree form. <i>Fruit drops all at once before bloom.</i>
none	3.2	Abundant fruits; reliable fruit/flower display; attractive bloom. <i>Awkward growth form until tree matures; mummified fruit hangs until spring.</i>
major	3.0	Exquisite flower display on cascading branches; appealing weeping form. <i>Dingy summer appearance due to extensive fruit and foliage scab.</i>
trace	3.0	Reliable fruit/flower display; abundant tiny red fruits; excellent floral show; nice tree form. <i>Shriveled fruits; lacks winter appeal.</i>

Scab Rating Scale: **None** = No scab noted; **Trace** = A few leaves affected, no negative effect on aesthetics; **Minor** = 20-50% of leaves affected, significant defoliation and/or leaf yellowing, negative effect on aesthetics; **Major** = 50-90% of leaves affected, severe defoliation and discoloration of leaves, almost complete negation of any aesthetic effect.

Aesthetic Rating Scale: Ratings included flower, foliage, form and fruit characteristics, and effects of disease and pest problems. The rating system is as follows: **1** = Exceptionally ornamental crabapple, based on flower, foliage, fruit, or form at time of rating; **2** = Highly ornamental crabapple, good flower, foliage, fruit or form at time of rating; **3** = Adequate as a landscape crabapple, not highly ornamental at time of rating; **4** = Substandard as an ornamental crabapple at time of rating; **5** = Ornamentally unacceptable as a landscape crabapple at time of rating. Not recommended for use in the landscape.

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Dr. Hasselkus calls *Magnolia* x 'Elizabeth' the "ultimate yellow magnolia". (Photo by David Guthery)

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The National Crabapple Evaluation Program plot at the Secret Arboretum in full bloom in the spring of 1999. (Photo by Erik Draper)