

# MALUS

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Bulletin

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**MALUS**

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ORNAMENTAL CRABAPPLE SOCIETY  
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**Volume 8, Number 2**

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**MALUS**

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## LETTERS TO THE EDITOR

Gentlemen:

We have been having a problem with various crabapple cultivars suckering at the base.

We also recently acquired "Street Tree Factsheet", edited by H. D. Gerhold *et al.* and published by Pennsylvania State University in 1989. In reference to Malus (many species and hybrids) it states "own root plants are preferred." I think this would help solve the above problem. However, there is no definition or explanation of this and upon calling several suppliers and nurseries, I was told that the industry does not produce crabapples this way.

Could you help us with the following questions?

- Exactly what qualifies as "own root plants?"
- Are there disadvantages to this condition?
- Where is such stock available?
- If nowhere, what did the editors have in mind when suggesting this preference?

Thank you in advance for your assistance.

Elizabeth Warner, Regional Landscape Architect

### REPLY

"Own roots" means that the plant is on its own root system rather than grafted onto an understock of some other cultivar or species. This is most often done by treating cuttings with a hormone to induce root formation. It can also be done with tissue culture and grafting onto seedlings of understock of the same cultivar (such as sowing Sargent seed and grafting Sargent scions onto the understock). So far, tissue culture has not panned out for crabapples. If the tree is not apomictic (diploid female gametophyte that doesn't require pollen fertilization), then the seed will be a hybrid. If you graft a scion from a cultivar onto a seedling from the same tree, the understock will be genetically different. The advantage of own root is that if the tree produces suckers, they will be the same as the top (grow at the same rate, have the same leaves, flowers and fruit, etc.). In the Midwest multistem ("clump") crabapples are very popular.

I'm not sure that I know any disadvantages of own root trees. Theoretically, there could be less versatility to survival in all soil conditions, less versatility in hardiness, more susceptibility to disease or insect pests, or affecting of ultimate size. There is no evidence of any of these yet. The advantages included less suckering (often no suckering) and increased growth.

I am aware of two wholesale nurseries that specialize in "own root" crabapples, LaPorte County Nursery, 7657 W. State Road 2, LaPorte, IN 46350 (219-785-4303) and Beaver Creek Nursery, 6604 Randall Road, Poplar Grove, IL 61065-9005 (815-737-8758). There may be others.

Somehow we need to make it known to your suppliers and nurseries that "own root" crabapples are available. I was very impressed by a trial comparing several cultivars own roots vs. grafted. All the own root trees were growing faster. Try to contact the above nurseries. I hope they can be of help to you.

Tom Green, Executive Director

Dear Editor:

I recently bought a 2 1/2" caliper Snowdrift Crabapple tree. The road I traveled leading up to this purchase should be of interest to you.

It started when I was told by a horticulturist that a crabapple would be an appropriate tree for my soil conditions. At that time I didn't know what a crabapple was, but I began to become fascinated by the various shapes, fruits, and flowers of some of the cultivars that were available. I went to a local nursery where I found a crabapple that looked good to me, and I was told it was a Mary Potter that would have "yellow" fruit.

I decided to go to the library to read about this Mary Potter. There I made one of the most important finds on my journey. It was the telephone number for the International Crabapple Society through which I got in touch with Dr. Tom Green. What a bright spot he was in the quagmire I found myself in trying to get a good tree along with accurate information. Dr. Green helped me become better educated on the various cultivars, and I was able to confidently dispute the local nursery's claim that they were selling me a Mary Potter. It turned out to be a Silver Moon.

By this time I had decided that I wanted an Adams or a Donald Wyman. But here is where the story gets interesting. My attempt to track down the tree I wanted was impossible.

I had the Extension resource people send me a list of nurseries that carried the trees I wanted. The Moon Nursery in Yardley, Pa., the town I live in, was one I found out about that way. The Moon Nursery people told me they were only wholesale and wouldn't even give me the name of someone they sell to so I could buy a tree from them. I really tried to reason with them, but all they said was to find a landscape person on my own and go from there. But I didn't know who to contact.

I heard about Princeton Nursery, so I called them. They were wholesale also, but they did give me a name of someone they sell to. But that landscaper said he didn't like the crabapples at Princeton Nursery, so he wouldn't sell me a crabapple tree either.

I've found that these nurseries don't keep good records or are unwilling to let anyone know where they have sold specific trees. It has been a real struggle.

A somewhat happy ending to this story is that with some luck and a lot of footwork I found a local nursery with one Snowdrift Crabapple that I liked, so I bought it and am satisfied with what turned out to be my third choice after Donald Wyman and Adams.

Maybe some day it will be possible to find a specific crabapple cultivar and then be allowed to buy it.

Sincerely,

Stephen DiCarlo  
Yardley, Pa.

Response:

Your problem is not unique. My father in the early '30's tried to find as many different crabapples as he could to develop an arboretum and found problems in getting trees true-to-name or getting the cultivars he wanted. He ended up getting scions from other arboreta and propagating these trees on his own. That effort resulted in a lifetime hobby for him. I have also had experiences similar to yours these past few years in trying to help people here locally to get trees that I had recommended. The problem is being addressed by the Board of Directors of IOCS. Perhaps soon we will have an answer and will be able to help the public in locating trees they want. Editor.

## IOCS HONORS DR. EDWARD R. HASSELKUS

David E. Guthery



At the January 21, 1994 meeting, the IOCS Board awarded Dr. Edward R. Hasselkus an honorary life membership in recognition of his outstanding work with ornamental crabapples. An original founding member of the IOCS, Ed has served on the Board of Directors for many years.

Ed has been a member of the Department of Horticulture faculty at the University of Wisconsin - Madison since 1961, until retiring this past July. His teaching contribution can be best summed up by a quote from the J. Frank Schmidt family Charitable Trust of Boring, Oregon, "You have taught many horticulturists and landscape architects the value of good cultivars." In recognition of his excellence in teaching, he received the L. C. Chadwick Award from the American Association of Nurserymen (1979) and the University of Wisconsin - Madison Distinguished Teaching Award (1987).

Ed has also served as the curator of the UW-Madison Arboretum's Longenecker Gardens for the past 28 years, where he has conducted his field evaluation of woody plants. He and his graduate students have published results of their evaluations, including ornamental crabapples, serviceberries, birches, junipers, potentillas, spireas, winterberries, and many other groups of landscape plants.

At the Longenecker Gardens, Ed has proudly assembled the "most up-to-date" collection of ornamental crabapples cultivars in the world. While as of yet he has not introduced any ornamental crabapples, Ed has introduced the Whitespire birch, the Wisconsin juniper, the Petite juniper, the Strata serviceberry and the Flambeau serviceberry.

A frequent speaker, Ed is very active in promoting both ornamental crabapples and other "good cultivars" throughout the green industry. In 1991 his contributions to the horticulture industry were recognized with the Linnaeus Award presented by the Chicago Horticultural Society.

**DR. ELTON M. SMITH**  
**HONORARY LIFE MEMBER, IOCS**

John C. Pair



Well known for over 30 years as an adviser to the green industry through the Cooperative Extension Service until his retirement from Ohio State University in 1992, Dr. Elton M. Smith has enjoyed working with flowering crabapples since 1968. Having followed the late Dr. L. C. Chadwick in evaluating the Secrest Arboretum crabapples at the Ohio Agricultural Research and Development Center, Wooster, OH, Elton expanded the evaluation to include other collections at the Dawes Arboretum and Holden Arboretum, as well as several commercial nurseries. He often lectured on flowering crabapples to plant materials classes, and many of his 200 journals and other technical publications dealt with nutrition,

control of water sprouts, weed control, and other production topics. One of his greatest accomplishments was to help Ohio nurserymen to grow more of the disease resistant cultivars.

For his many contributions to the selection and use of crabapples Elton Smith was voted Honorary Life Member of I.O.C.S. at the winter meeting in Chicago. Other awards he has received include Award of Merit, Ohio Chapter of the International Society of Arboriculture, Award of Merit of the International Plant Propagators Society (serving on the board of directors, as vice-president and president), Outstanding Service Award, All American Rose Selections, and the Distinguished Contribution Award from the Ohio Nurserymen's Association. He is a member of many professional societies in addition to I.O.C.S., including the American Society for Horticulture Science, International Society of Arboriculture, Ohio Nurserymen's Association and the American Horticulture Society. The board of directors of I.O.C.S. congratulates Elton for his many contributions to the evaluation, production and use of better crabapples.

**DISTRIBUTION AND DIVERSITY OF**  
***MALUS* GERMPLASM RESOURCES**  
**IN YUNNAN, CHINA**

Wenbin Zhang and Junru Zhang  
Horticultural Institute, Yunnan Academy of Agricultural Sciences,  
Longtouje, Kunming, Yunnan, People's Republic of China

Xulan Hu  
Yunnan Agricultural Extension Center,  
Kunming, Yunnan, People's Republic of China

The Yunnan Province is situated in the southwestern region of China, between long. 97° 39' E to 106° 02' E and lat. 21° 09' N to 29° 15' N. The Province borders Burma to the west, Laos and Vietnam to the south, the provinces of Sichuan and Tibet to the north, and Guizhou and Guangxi to the east (Fig. 1). Yunnan is part of the Yun-Gui Plateau, with an average elevation of 2000 m. above sea level. Its topography slopes from the northwest to the southeast, with a complex terrain and vast altitudinal differences.

A subtropical monsoon climate prevails in the province, with varied climatic conditions; however, tropical, subtropical, temperate, and frigid climates exist throughout the province. The Yunnan people say that four seasons can be found simultaneously along the same mountain slope, and different weather conditions can be experienced over a distance of 5 km.

The province has a vast territory and is generously endowed with natural resources. It is renowned as "the kingdom of plants" in China because of the amazing diversity. There are 15,000 native species of higher plants in this area, which account for more than one-half of China's total plant germplasm. More than 200 fruit tree species from 41 families originated from Yunnan.

***Malus* spp. indigenous to Yunnan and their distribution**

According to Chinese plant taxonomist D. Yu, 23 *Malus* spp. are native to China. A new species, *Malus xiaoqinensis* (Cheng et Jiang), from Sichuan Province was reported, bringing the total to 24 species. Wu (1984) reported that 13 *Malus* spp.

were native to Yunnan. Since 1974, however, we have surveyed *Malus* germplasm throughout Yunnan and have found some new records of the genus, including wild *M. sikkimensis* Koehne and *M. sieboldii* Rehd. in the mountainous regions of northwestern Yunnan, which was the first record (1974) in the province. During 1983-84, wild *M. formosana* Kawak. et Koidz. trees were found in the forest of Funing Country, southeastern Yunnan. This species has several botanical forms, including one with 30 stamens and another with 45 to 50. Therefore, 16 native *Malus* spp. have been confirmed in Yunnan. Among the 29 provinces in China, Sichuan Province has the largest number of *Malus* spp., and Yunnan is second.

Table 1 shows the distribution, elevation, and use of *Malus* spp. found in Yunnan. *Malus pumila* and *M. asiatica* are the two cultivated species. Cultivated apple trees are distributed in 57 counties at elevations of 1850 to 2800 m., mainly in northeastern, eastern, central, and northwestern regions of Yunnan. The optimum elevation range for apple cultivation is 2200 to 2700 m., where trees produce high-quality and brightly colored fruit. Apple trees perform poorly when grown below 1800

Table 1. Status of *Malus* germplasm found in Yunnan, China

Species	Native geographical region	Elevation (m.)	Uses
<b>Cultivated</b>			
<i>M. pumila</i>	Most of Yunnan	1850-2800	Fresh fruit
<i>M. asiatica</i>	Moat of Yunnan	680-3400	Fresh fruit
<b>Semicultivated</b>			
<i>M. x micromalus</i>	North		Fresh fruit, rootstock, processing
<i>M. spectabilis</i>	Northwest and northeast		As above
<i>M. prunifolia</i>	As above		As above
<b>Wild</b>			
<i>M. rockii</i>	Northwest and northeast	2300-3300	Rootstock, ornamental
<i>M. hupehensis</i>	Central	1700-2500	As above
<i>M. halliana</i>	North	1900-2300	Ornamental
<i>M. transitoria</i>	Central	1900-2100	As above
<i>M. sieboldii</i>	Northwest and northeast	2300-3300	Rootstock, ornamental
<i>M. sikkimensis</i>	Northwest	=3600	As above
<i>M. yunnanensis</i>	Northwest and northeast	2300-3300	As above
<i>M. ombrophila</i>	Northwest		
<i>M. prattii</i>	Northwest and northeast	2300-3300	
<i>M. melliana</i>	Southeast		Fresh fruit
<i>M. formosana</i>	Southeast	930-1100	Fresh fruit

m., with a higher incidence of disease and insect damage, and at insufficient chilling hours during the winter. Apple production in the province occupies a total of 20,000 ha. 'Golden Delicious', 'Delicious', 'Starking', 'Fuji', 'Quinguan', and 'Winter Banana' are the major cultivars grown in this province. *Malus asiatica* has a wide climatic adaptability; trees can be cultivated from subtropical areas with a 680-m. elevation to the low temperate areas with a 3400-m. elevation.

*Malus x micromalus*, *M. spectabilis*, and *M. prunifolia* belong to a semicultivated group and are mostly grown in basins and hillsides of northwestern and northeastern Yunnan. *Malus x micromalus* is the most popular species in the region.

*Malus rockii* is widespread in northern Yunnan and distributed at 2300- to 3300 m. elevations. *Malus hupehensis*, *M. sieboldii*, and *M. yunnanensis* are commonly found at 1700- to 33 m. elevations. *Malus sikkimensis*, *M. ombrophila*, *M. prattii*, *M. formosana*, and *M. transitoria* are rare, and some are becoming extinct. *Malus hupehensis* is widespread in the mountainous forests and riversides at 1700- to 2500 m. elevations. In 1974, *M. sikkimensis* was found in the high mountains of northwestern Yunnan at a 3600-m. elevation, which is the highest elevation for *Malus* distribution. Wild and cultivated *M. halliana* can be found in some basin areas. *Malus melliana*, and *M. formosana* are located only at border areas between China and Vietnam in southeastern Yunnan. In summary, there are 13 *Malus* spp. distributed in the Hengduan Mountains of northwestern Yunnan, 11 species in northeastern, 5 to 7 species in central, and 2 to 3 species in southeastern Yunnan (Tables 1 and 2).

## Uses of *Malus* germplasm in Yunnan

***Malus pumila* Mill.** The local apple (Chinese apple or soft apple) has been cultivated for a long time in many areas of Yunnan, including Kunming, Lijiang, Zhaotong, and Dali. But there are few local apple orchards because of the apple's poor quality (soft flesh and little juice). The common apple (*Malus x domestica* Borkh.) called "Western apple" in China, was introduced into Yunnan in 1931 and replaced local apple cultivation.

***Malus asiatica* Nakai.** *Malus asiatica* (Huahong in Chinese) is widespread in central and northern Yunnan. It is very popular because of its early ripening (June to July), bright red pigmentation, and aroma. Fruit weighs about 20 to 50 g. and is eaten fresh or processed as preserves.

***Malus x micromalus* Makino.** *Malus x micromalus* is eaten fresh, canned, or processed as preserves. As a dried product, it is used as a Chinese medicine to suppress coughing. This species is one of the major apple rootstocks in Yunnan, and seedlings grow vigorously. Graft compatibility of *M. micromalus* rootstocks with local and common apples is very high, and grafted trees are productive. The seedlings, however, are not uniform and are susceptible to *Podosphaera leucotricha* (Ell. et Ev.) Salm. and *Armillariella tabescebs* (Scop. ex Fr.) Sing. This material can be useful for selecting superior rootstocks. In addition, it is a good ornamental tree, which produces a showy bloom in the spring and red leaves in the fall.

***Malus prunifolia* Borkh.** *Malus prunifolia* can be eaten fresh, canned, or processed as preserves. When dried, it is a Chinese medicine for controlling coughing. It also serves as an apple rootstock with good graft compatibility. In addition to seed propagation, clonal propagation can be conducted, using cuttings or suckers. This species has ornamental value, producing red blooms and red or yellow fruit.

Table 2. *Malus* spp. distribution in western Sichuan, northwestern Yunnan, and eastern Tibet

Species	Sichuan	Yunnan	Tibet
<i>M. baccata</i>	Y		P
<i>M. mandshurica</i>	Y		Y
<i>M. rockii</i>	Y	Y	Y
<i>M. hupehensis</i>	Y	Y	P
<i>M. sikkimensis</i>	Y	Y	Y
<i>M. xiaojinensis</i>	Y		
<i>M. halliana</i>	Y	Y	Y
<i>M. pumila</i>	Y	Y	Y
<i>M. asiatica</i>	Y	Y	Y
<i>M. prunifolia</i>	Y	Y	Y
<i>M. spectabilis</i>		Y	
<i>M. x micromalus</i>	Y	Y	P
<i>M. sieboldii</i>	Y	Y	
<i>M. kansuensis</i>	Y		
<i>M. toringoides</i>	Y		
<i>M. transitoria</i>	Y		Y
<i>M. yunnanensis</i>	Y	Y	Y
<i>M. pratii</i>	Y	Y	
<i>M. honanensis</i>	Y		
<i>M. ombrophila</i>	Y	Y	Y
Total number of species	19	13	10-13

<sup>a</sup>Y = yes, P = probably yes; the other three *Malus* spp. in other regions of Yunnan have not been listed here.

***Malus spectabilis* (Ait.) Borkh.** The fruit of this species can be eaten fresh. Seedlings grow well and have good graft compatibility with local and common apples. It is not widely used as a rootstock because seed collection is difficult.

***Malus sikkimensis* (Hook. f.) Koehne.** Local people use this fruit as a dessert apple. Seedlings grow vigorously and uniformly and show resistance to *P. leucotricha*. When used as a rootstock, graft compatibility varies widely among scion cultivars, a characteristic that should be investigated further. It is also a good ornamental tree, which produces pink blooms and bright red fruit.

***Malus melliana* (Hand-Mazz.) Rehd.** The fruit of this species ripens in July and can be eaten fresh. It has not been tested as a rootstock for local or common apple cultivars.

***Malus formosana* Kawak. et Koidz.** *Malus formosana* fruit is larger, and the flesh is firmer than that of most other *Malus* spp. It can be eaten fresh or processed as preserves, but has not been evaluated as a rootstock for apples.

***Malus rockii* Rehd.** Seedlings of this species grow vigorously and show resistance to *P. leucotricha*. Graft compatibility with scion cultivars is good, and grafted trees are productive, with resistance to drought and waterlogging. *Malus rockii* is one of the major rootstocks for apples in Yunnan.

***Malus hupehensis* (Pamp.) Rehd.** Seedlings of *M. hupehensis* grow well and uniformly and show resistance to drought and *P. leucotricha*. Graft compatibility with apple cultivars is variable. It is a good ornamental tree and tends to be apomictic.

***Malus sieboldii* (Reg.) Rehd.** Seedlings have low vigor and show resistance to drought and powdery mildew. A high level of graft incompatibility with common the apple has been observed, and the budding union is easy to crack. The grafted trees exhibit dwarfing characteristics.

***Malus yunnanensis* Schneid.** Seedlings are not uniform and have a high level of graft incompatibility. Grafted trees are dwarfed, fruit early, and develop an enlarged graft union. This is a good ornamental tree, which produces yellow fruit and large red leaves in the fall.

***Malus halliana* Koehne.** A major ornamental tree in Yunnan, *Malus halliana* is grown in central and northern regions of the province. It blooms in March with attractive heavy red and pink flowers produced either as a single flower or as multiple flowers per bud. Layering is commonly used for propagating cuttings.

***Malus transitoria* (Batal.) Schneid.** This beautiful tree produces attractive flowers, sawtooth leaves, and large quantities of small fruit.

Little research has been done with *M. ombrophila* Hand-Mazz. and *M. prattii* (Hemsl.) Schneid., although they are closely related.

### Possible role of northwestern Yunnan in the origin of *Malus*

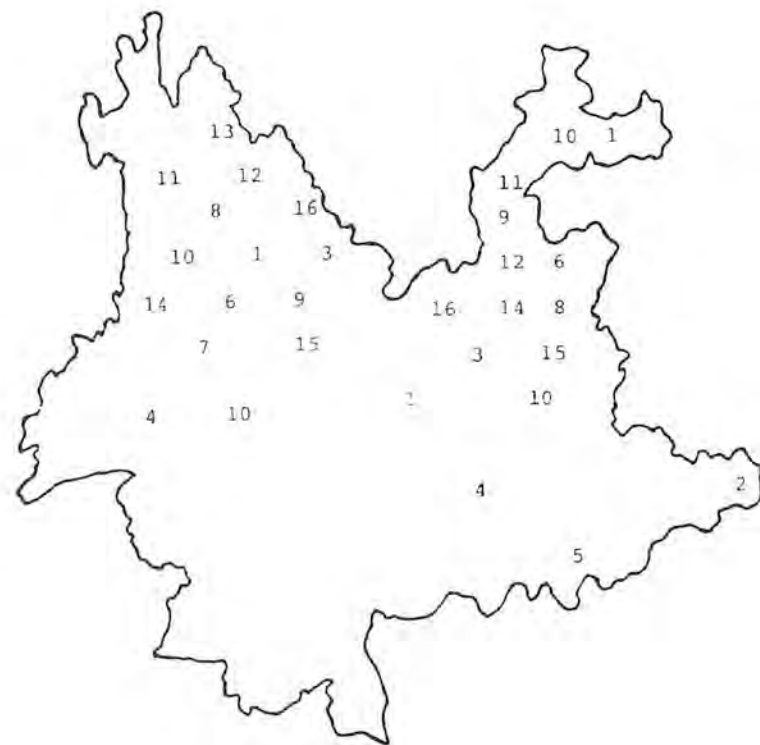
According to Yu (1978, 1979) and Li (1989), there are 37 to 60 species of *Malus* in the world, 24 of which are distributed in China. Most of the species can be found in the western parts of Sichuan and Yunnan provinces, a region called the Chuan-Dian Palaeoland. This area has the highest density of *Malus* spp. and is a major genetic center of *Malus* in the world. Our investigation shows that the southwestern region of China, including northwestern Yunnan, western Sichuan, and eastern Tibet, might be the largest center of *Malus* diversity in the world (Figs. 1 and 2). The following evidence supports the above conclusions.

1) Twenty *Malus* spp. are found in southwestern China, 19 of which are in western Sichuan, 13 in northwestern Yunnan, and 10 to 13 in eastern Tibet (Table 2). The species in this area constitute about 83% of the total number of *Malus* spp. found in China and 50% to 55% of the total 36 to 40 species that exist in the world. This area, therefore, provides the most concentrated and largest gene pool of this genus. Occupying one-sixth of the total area of the Yunnan Province (60,000 km<sup>2</sup>), the Hwengdwang Mountains of northwestern Yunnan are the homes of 13 *Malus* spp. (eight wild species and five semicultivated and cultivated species). Different forms of each species have been identified. For example, there are 25 forms of *Malus rockii* and eight forms each of *M. sikkimensis* and *M. hupehensis*. Intraspecific diversity among those different forms required further investigation.

2) Nineteen genera of the *Rosaceae* family exist in China. All, including *Amygdalus*, *Armeniaca*, *Cerasus*, *Chaenomeles*, *Cotoneaster*, *Crataegus*, *Cydonia*, *Docynia*, *Eriobotrya*, *Fragaria*, *Malus*, *Padus*, *Photinia*, *Prinsepia*, *Prunus*, *Pyrus*, *Rosa*, *Rubus*, and *Sorbus*, are native to northwestern Yunnan. Other wild fruits and nuts, including 24 families, 43 genera, 138 species and varieties, and 81 types, are widespread in this area. Most of the above germplasm also exists in western Sichuan and eastern Tibet.

3) Northwestern Yunnan has a diverse topography and climate, ranging from subtropical river valleys to frigid high mountains. The Chuan-Dian Palaeoland was not affected by a great glacier. In addition, human population densities are sparse, and humans have had relatively little influence on the plant population. Many living plant fossils have been found in this area. For example, records of *Malus rockii* trees with

trunk circumferences of 2.7 to 3.1 m. were found at a 3400 m. elevation. In addition, fossil records show *M. sikkimensis* trees with trunk circumferences of 2.6 to 3.0 m., and *M. yunnanensis* with trunk circumferences of 5.0 to 5.4 m.



- |                           |                           |
|---------------------------|---------------------------|
| 1. <i>M. asiatica</i>     | 9. <i>M. prunifolia</i>   |
| 2. <i>M. formosana</i>    | 10. <i>M. pumila</i>      |
| 3. <i>M. halliana</i>     | 11. <i>M. rockii</i>      |
| 4. <i>M. hupehensis</i>   | 12. <i>M. sieboldi</i>    |
| 5. <i>M. melliana</i>     | 13. <i>M. sikkimensis</i> |
| 6. <i>M. x micromalus</i> | 14. <i>M. spectabilis</i> |
| 7. <i>M. ombrophila</i>   | 15. <i>M. transitoria</i> |
| 8. <i>M. prattii</i>      | 16. <i>M. yunnanensis</i> |

Fig. 2 *Malus* spp. distribution in Yunnan Province.



## GOLDEN RAINDROPS™ CRABAPPLE

Keith Warren

Relatively rare and unknown in American landscapes, the Tibetan Crab, *Malus transitoria*, has produced a cultivar that has become my favorite. While all crabs are beautiful in spring flower and fall fruit, this cultivar excels in the summertime as well. In summer foliage most crabapples are...sorry...just plain boring. Dense, round trees with medium textured foliage, they are rather "blocky" looking. Golden Raindrops™ is different. It's upright, open, airy, and elegant. Its cutleaf foliage gives it a lacy, fine textured appearance. It invites you to observe it from under its canopy, an experience that can be difficult under the head of most dense, rounded trees.

The species *Malus transitoria* is native to western and northwestern China. Because of its similar name, it is sometimes confused with *Malus toringoides*, a species which also has cutleaf foliage but is more shrubby in habit and lacks the elegance of *Malus transitoria*. Its native range indicates that this is a plant that will endure harsh environments.

A few years ago, in evaluating numerous crabs for potential nursery introduction, I became more and more fond of the selection *Malus transitoria* 'Schmidt Cutleaf.' One drizzling fall day, I passed under its canopy in our trial block. Looking up, the tiny yellow fruit sparkled, and the trademark name Golden Raindrops™ was created for it.

The tree's fruit is truly tiny, less than 1/4" diameter, almost raindrop size. Its small size makes it less obvious from a distance; it is best appreciated from below.

The flowers of Golden Raindrops™ are small white, and abundant. The petals are narrow, giving the flower a star-like appearance. It blooms about a week later than the majority of crab cultivars.

It is in its form and foliage that Golden Raindrops™ differs most from other crabapple cultivars. Its branching tends to produce an upright to upright-spreading primary structure with slender, horizontally spreading lateral branches. The result, when mature, is a tree you can walk under, with fine textured branches spreading overhead. Likewise, foliage is fine textured as well. Leaves are vibrant green and deeply cut into several narrow lobes. Light filters through the canopy. In early summer, between bloom and development of significant fruit, even knowledgeable plantsmen have been surprised to learn this is indeed a crabapple.

Disease resistance has been excellent in my evaluations in Oregon. Our frequent rains make scab a constant problem on susceptible varieties. But I have yet to detect the disease on Golden Raindrops™. We are less able to determine fireblight resistance, as the disease is extremely rare here. However, we have shipped the tree to numerous customers and test sites over the last few years, with no fireblight having been reported. We have been very encouraged by customer reports we have received on the tree's performance and appearance in other localities. Cold hardiness is excellent; no damage occurred after experiencing temperatures to -32° F last winter.

Golden Raindrops™ is definitely a crab with a difference, providing a unique look and a unique feel in a genus of hundreds of beautiful cultivars that sometimes seem a little bit too similar.

**FRUIT DESCRIPTIONS OF ORNAMENTAL CRABAPPLES  
AT THE LONGENECKER GARDENS,  
UNIVERSITY OF WISCONSIN-MADISON ARBORETUM**

David E. Guthery and Dr. Edward R. Hasselkus

During the summer of 1990 through the following spring of 1991, the fruits of the ornamental crabapples in the collection of the Longenecker Gardens in the University of Wisconsin-Madison Arboretum were described, using the Royal Horticultural Society (RHS) Colour Chart (in association with the Flower Council of Holland). The RHS Colour Chart had been previously used in this overall evaluation of ornamental crabapples for the descriptions of their flowers.

The table that follows is a comprehensive list of all the ornamental crabapples that produced fruit in the Longenecker Garden's collection. Following each crabapple taxon is first the fruit diameter in millimeters. Fruit size is an important criterion. Small fruits, generally less than 15 mm, are the most desirable; they reduce litter problems and are "bite-sized to birds." Crabapples such as 'Rosseau' and 'Ralph Shay' which are grown for culinary purposes, should have larger fruits; however, here fruit persistence is essential to reduce litter problems.

The next two categories are first the fruit color, followed by the postfrost color. The fruit color is described first by the official corresponding RHS color number followed in parentheses by its tint. The fruit color was defined as when the fruit was at peak color before frost. For many crabapples this may be as early as July as with *M.* 'Indian Summer', *M.* 'Selkirk', and *M.* 'Prairifire.' Other crabapples are later. For instance *M.* 'Donald Wyman' and *M.* 'Professor Sprenger' do not develop fully colored fruits until September, while others such as *M.* 'Hargozam' do not develop their colorful fruits until October.

After frost, many ornamental crabapple fruits actually change color. Most yellow-fruited crabapples change from their brilliant golds and yellows to a lively cider color. Therefore, following the fruit color is another category listing the postfrost color. Here too, the postfrost color is described first by the RHS color number followed in parentheses by its tint. It should be noted that as part of the evaluation the fruit color was identified for every ornamental crabapple within the collection each month from July through April.

The final category relates to the final month in which the persistent fruits were judged to remain showy. Fruit persistence is another essential category in evaluating ornamental crabapples. The fruit of most taxa, such as *M.* 'Snowdrift' and *M.* 'Chrisozam' persist only through October or November. However, a few taxa, such as *M.* 'Amberina', *M.* 'Donald Wyman', and *M.* 'Profusion', have fruit that persists until April or even May when it is taken by birds as it softens. In combination with small size, persistence reduces a litter problem.

An annual display of fruit is the final important criterion to be met when evaluating ornamental crabapples. Several crabapples displayed a definite trend toward alternate bearing within the Longenecker Garden's collection. They were: *M.* × *arnoldiana*, *M.* 'Beverly', *M.* 'Dauphin', *M.* 'David', *M.* 'Dolgo', *M.* 'Ellwangeriana', *M.* 'Golden Hornet', *M.* × *hartwigii*, *M.* 'Jewelcole', *M.* 'Oekonomierat Echtermeyer', *M.* × *purpurea* 'Lemoinei', *M.* × *robusta* var. *persicifolia*, *M.* *sieboldii* 'Fuji', *M.* *sikkimensis*, *M.* × *soulardii*, *M.* *spectabilis* 'Plena', and *M.* 'Sutyzam.'

Taxon	Fruit Dia. mm	Fruit Color	Postfrost Fruit Color	Date Persistent Through
<i>M.</i> 'Adams'	13	59(B)	187(B)	April
<i>M.</i> 'Amberina'	9	53(B)	183(C)	March
<i>M.</i> 'American Beauty'	13	183(B)	—	September
<i>M.</i> 'Ames White'	9	183(B)	183(A)	December
<i>M.</i> × <i>arnoldiana</i>	12	25(B) 10(C)	183(A)	January
<i>M.</i> × <i>atrosanguinea</i>	8	53(A)	183(B)	November
<i>M.</i> 'Autumn Glory'	9	183(B)	—	October
<i>M.</i> <i>baccata</i> 'Columnaris'	14	53(D) 13(C)	183(C)	January
<i>M.</i> <i>baccata</i> 'Gracilis'	10	26(A) 16(C)	183(C)	November
<i>M.</i> <i>baccata</i> var. <i>jackii</i>	7	187(B)	187(B)	December
<i>M.</i> <i>baccata</i> var. <i>mandshurica</i>	12	183(C) 6(B)	—	October
<i>M.</i> <i>baccata</i> PI #213251	9	184(B)	187(B)	November
<i>M.</i> <i>baccata</i> 'Walters'	10	31(A) 16(C)	183(C)	March
<i>M.</i> 'Barbara Ann'	18	183(B)	—	September
<i>M.</i> 'Baskatong'	21	59(A)	187(B)	November
<i>M.</i> 'Beverly'	13	53(A)	183(A)	March
<i>M.</i> 'Blanche Ames'	9	53(B) 11(B)	183(C)	November
<i>M.</i> 'Branzam'	39	50(C) 145(A)	—	September
<i>M.</i> 'Callaway'	23	53(A)	183(C)	November
<i>M.</i> 'Cashmere'	22	17(D)	183(C)	October

Taxon	Fruit Dia. mm	Fruit Color	Post Frost Fruit Color	Date Persistent Through
<i>M.</i> 'Centennial'	32	53(D) 32(D)	—	September
<i>M.</i> 'Centzam'	13	59(B)	183(B)	March
<i>M.</i> 'Chrisozam'	9	53(A)	183(C)	October
<i>M.</i> 'Coralcole'	7	145(A)	183(A)	December
<i>M. coronaria</i> var. <i>dasycalyx</i>	38	144(B)	—	September
<i>M.</i> 'Dainty'	11	187(B)	187(B)	November
<i>M.</i> 'Dauphin'	27	53(B) 17(D)	—	September
<i>M.</i> 'David'	12	53(A)	183(B)	March
<i>M.</i> 'Dolgo'	26	187(B)	—	September
<i>M.</i> 'Donald Wyman'	13	53(A)	183(B)	April
<i>M.</i> 'Doubloons'	11	22(A) 13(B)	183(A)	December
<i>M.</i> 'Ellwangeriana'	15	53(B)	183(A)	December
<i>M.</i> 'Erie'	20	183(B)	—	August
<i>M.</i> 'Gibbs' Golden Gage'	20	13(C) 49(C)	183(C)	December
<i>M. x gloriosa</i>	15	183(B)	187(B)	October
<i>M.</i> 'Golden Hornet'	17	55(B) 17(D)	183(A)	January
<i>M.</i> 'Gorgeous'	15	53(B)	183(C)	January
<i>M.</i> 'Gwendolyn'	21	53(B)	183(A)	December
<i>M.</i> 'Henningi'	12	53(A) 24(B)	183(B)	January
<i>N.</i> 'Henry F. DuPont'	13	59(B)	183(A)	March
<i>M.</i> 'Henry Kohankie'	24	50(C)	183(C)	November
<i>M. hupehensis</i> 'Strawberry Parfait'	12	183(B)	183(B)	March
<i>M.</i> 'Indian Magic'	11	59(B)	183(B)	March
<i>M.</i> 'Indian Summer'	14	183(B)	183(B)	March
<i>M. ioensis</i>	29	145(A)	—	September
<i>M. ioensis</i> 'Klehm's Improved Bechtel'	29	145(A)	—	September
<i>M. ioensis</i> 'Nevis'	16	145(B) 51(D)	10(B)	October
<i>M.</i> 'Jewelberry'	30	53(A)	183(B)	January
<i>M.</i> 'Jewelcole'	13	45(A)	183(C)	April
<i>M.</i> 'Katherine'	10	53(A) 154(A)	183(A)	February
<i>M.</i> 'Kibele'	14	183(A)	187(B)	December
<i>M.</i> 'Kinarzam'	11	53(B)	183(A)	January
<i>M.</i> 'Kirk'	8	183(A)	183(B)	December
<i>M.</i> 'Liset'	14	187(B)	187(B)	February
<i>M.</i> 'Lullaby'	9	17(D) 53(B)	183(C)	December
<i>M.</i> 'Makamik'	23	183(B)	183(C)	February
<i>M.</i> 'Manbeck Weeper'	10	53A	183(B)	January
<i>M.</i> 'Mary Potter'	11	183(B)	183(A)	December
<i>M.</i> 'Molazam'	10	183(C)	183(B)	January
<i>M.</i> 'Mount Arbor'	22	183(B)	183(A)	December
<i>M.</i> 'Naragansett'	13	183(B)	183(A)	January

Taxon	Fruit Dia. mm	Fruit Color	Post Frost Fruit Color	Date Persistent Through
<i>M.</i> 'Ormiston Roy'	11	53(C) 6(D)	183(C)	April
<i>M.</i> 'Pink Beauty'	19	183(B)	—	August
<i>M.</i> 'Pink Cascade'	5	53(A)	—	August
<i>M.</i> 'Pink Dawn'	12	53(A)	—	August
<i>M.</i> 'Pink Spires'	14	53(A)	187(B)	January
<i>M.</i> 'Prairifire'	11	183(B)	187(B)	March
<i>M.</i> 'Profusion'	13	183(B)	183(B)	March
<i>M. prunifolia</i> 'Fastigiata'	34	45(D)	—	July
<i>M. prunifolia</i> var. <i>xanthocarpa</i>	18	13(B)	183(C)	December
<i>M.</i> 'Pygmy'	16	183(B)	—	August
<i>M.</i> 'Radiant'	13	183(B)	183(B)	December
<i>M.</i> 'Ralph Shay'	24	60(A)	183(A)	March
<i>M.</i> 'Red Barron'	14	183(B)	183(B)	April
<i>M.</i> 'Red Jade'	12	45(A) 20(C)	—	October
<i>M.</i> 'Red Splendor'	14	53(A)	183(A)	December
<i>M.</i> 'Red Swan'	10	53(A)	183(B)	November
<i>M.</i> 'Robinson'	15	183(B)	187(B)	January
<i>M. x robusta</i> 'Persicifolia'	17	53(A)	183(B)	January
<i>M. rockii</i>	12	183(B) 20(C)	187(B)	February
<i>M.</i> 'Rosseau'	24	53(A)	183(A)	March
<i>M.</i> 'Royal Ruby'	12	183(B)	—	September
<i>M.</i> 'Rozsuzam'	12	53(B)	—	October
<i>M.</i> 'Royalty'	13	187(B)	187(B)	March
<i>M. sargentii</i>	10	183(B)	187(B)	November
<i>M. sargentii</i> 'Rosea'	8	53(A)	187(B)	November
<i>M. sargentii</i> 'Tina'	8	50(C)	187(B)	November
<i>M.</i> 'Selkirk'	22	53(A)	183(B)	January
<i>M.</i> 'Sentinel'	11	53(A)	183(B)	April
<i>M.</i> 'Serenade'	11	53(A)	—	October
<i>M. sieboldii</i>	10	53(A)	—	October
<i>M. sieboldii</i> var. <i>arborescens</i>	8	53(B)	—	October
<i>M. sieboldii</i> 'Fuji'	14	6(B)	183(C)	December
<i>M.</i> 'Silver Drift'	10	53(B)	183(B)	March
<i>M.</i> 'Silver Moon'	10	183(B)	—	October
<i>M.</i> 'Sinai Fire'	12	51(A)	183(B)	February
<i>M.</i> 'Snow Magic'	15	183(B)	183(B)	January
<i>M.</i> 'Snowcap'	10	53(A)	—	October
<i>M.</i> 'Snowdrift'	11	53(B) 22(A)	183(C)	October
<i>M. x soulardii</i>	45	51(B) 145(A)	—	September
<i>M.</i> 'Sparkler'	12	183(B)	187(C)	January
<i>M. spectabilis</i> 'Alba'	20	53(B)	183(B)	January
<i>M.</i> 'Spring Song'	9	53(B)	17(D)	November
<i>M.</i> 'Susan'	17	53(B) 6(D)	B(C)	December

<u>Taxon</u>	<u>Fruit Dia. mm</u>	<u>Fruit Color</u>	<u>Post Frost Fruit Color</u>	<u>Date Persistent Through</u>
<i>M.</i> 'Sutyzam'	14	53(B)	183(B)	March
<i>M.</i> 'Thunderchild'	14	187(B)		August
<i>M.</i> <i>toringoides</i>	13	11(D) 45(B)	183(C)	November
<i>M.</i> 'Turesii'	13	31(A) 20(B)	183(A)	January
<i>M.</i> 'Van Eseltine'	14	183(B)	183(C)	February
<i>M.</i> 'Velvetcole'	13	183(B)	183(A)	February
<i>M.</i> 'Weepcanzam'	15	183(B)	183(B)	April
<i>M.</i> 'White Angel'	15	53(B)	183(C)	February
<i>M.</i> 'White Cascade'	10	183(C) 17(C)	183(C)	December
<i>M.</i> 'Winter Gold'	11	13(D)	183(C)	March
<i>M.</i> 'Zumarang'	9	53(A)	183(B)	February
<i>M.</i> <i>x zumi</i>	9	53(B) 11(B)	183(A)	January
<i>M.</i> <i>x zumi</i> 'Bob White'	10	13(C) 22(A)	183(C)	March
<i>M.</i> <i>x zumi</i> var. <i>calocarpa</i>	10	53(A)	183(B)	January
<i>M.</i> <i>x zumi</i> 'Professor Sprenger'	16	26(A) 7(D)	183(C)	December
<i>M.</i> <i>x zumi</i> 'Winter Gem'	9	53(A)	183(B)	January
<i>M.</i> <i>x zumi</i> 'Wooster'	13	59(A)	183(A)	November

## COLD HARDINESS OF CRABAPPLES

Steve McNamara and Harold Pellett  
University of Minnesota

There is very little information on relative cold hardiness levels on the many different cultivars of flowering crabapples. Research was conducted to determine the cold hardiness levels of crabapples at different times throughout the dormant season. Stem pieces of the cultivars were collected on different dates and cut into sections approximately 1 1/2" long. Three samples of each cultivar were placed into a series of plastic bags. The bags were placed into a low temperature freezer, and the temperature was lowered at the rate of 10° F. per hour. Bags were removed at 3.6° F. intervals. Samples were thawed overnight at near freezing temperatures and then stored at room temperatures for one week. The samples were rated visually for tissue browning to determine the lowest temperature that stem tissues of the various cultivars can withstand without suffering considerable injury. Hardiness levels were determined on November 11, December 18, January 22, and February 17. Table I lists the cultivars tested and their corresponding hardiness level on the dates sampled.

There was considerable difference in hardiness levels on the November 11 sampling date. The early season hardiness levels of many of the cultivars would leave them vulnerable to severe early season cold. By the mid-December sampling date there were fewer differences in hardiness. Most of the cultivars tested had acquired sufficient hardiness to withstand temperatures that might be encountered in Minnesota in that period.

Table I: Cold hardiness levels of crabapple cultivars at different dates throughout the winter season. Hardiness level is expressed as the lowest temperature (°F.) which did not result in severe injury to stem tissue.

Cultivar	11/11	12/15	01/19	02/16	03/17	04/26
<i>M.</i> 'Adams'	-11	-29	-36	-29	-26	-9
<i>M.</i> 'Beverly'	-33	-36	-36	-36	-33	-6
<i>M.</i> 'Bob White'	-11	-29	-36	-29	-22	+1
<i>M.</i> 'Cascole'	-8	-33	-33	-26	-18	+1
<i>M.</i> 'Centzam'	-11	-29	-36	-33	-26	-2
<i>M.</i> 'Chrisozam'	-8	-33	-36	-33	-22	-6
<i>M.</i> 'David'	-18	-36	-36	-33	-33	+5
<i>M.</i> 'Dolgo'	-33	-40	-40	-40	-36	-15
<i>M.</i> 'Donald Wyman'	-8	-33	-36	-33	-26	+1
<i>M.</i> <i>floribunda</i>	-8	-29	-29	-26	-18	+1
<i>M.</i> 'Hargozam'	-11	-33	-33	-29	-29	-2
<i>M.</i> 'Indian Magic'	-15	-36	-36	-33	-29	-9
<i>M.</i> 'Indian Summer'	-11	-36	-36	-33	-26	-6
<i>M.</i> 'jackii'	-26	-44	-47	-36	-26	-2
<i>M.</i> 'Jewelberry'	-8	-26	*-26	*-26	*-15	*-10
<i>M.</i> 'Liset'	-11	-36	-36	-36	-33	-15
<i>M.</i> 'Mary Potter'	-11	-33	-33	-29	-26	+5
<i>M.</i> 'Molazam'	-11	-36	-36	-33	-29	+5
<i>M.</i> 'Ormiston Roy'	-26	-33	-33	-33	-26	-9
<i>M.</i> 'Prairifire'	-15	-36	-36	-36	-33	-2
<i>M.</i> 'Professor Sprenger'	-11	-36	-36	-36	-29	-6
<i>M.</i> 'Profusion'	-8	-29	-36	-33	-29	-9
<i>M.</i> 'Ralph Shay'	-11	-33	-33	-33	-26	+1
<i>M.</i> 'Red Barron'	-15	-36	-33	-29	-26	-6
<i>M.</i> 'Red Jade'	-33	-36	-40	-33	-22	-9
<i>M.</i> 'Red Splendor'	-33	-40	-44	-40	-33	-9
<i>M.</i> 'Robinson'	-11	-26	-36	-29	-26	-9
<i>M.</i> 'Ruby Luster'	-15	-33	-33	-33	-29	-9
<i>M.</i> <i>sargentii</i>	-8	-29	-33	-33	-26	+1
<i>M.</i> 'Selkirk'	-33	-36	-44	-40	-33	-6
<i>M.</i> 'Sentinel'	-8	-33	-36	-29	-18	+1
<i>M.</i> 'Snowdrift'	-15	-36	-36	-33	-29	-6
<i>M.</i> 'Sutyzam'	-11	-33	-36	-33	-29	-2
<i>M.</i> 'Velvetcole'	-22	-33	-36	-33	-29	-9
<i>M.</i> 'Weepanzam'	-11	-33	-36	-33	-26	+1
<i>M.</i> 'Winter Gold'	-11	-33	-36	-33	-29	-6
<i>M.</i> 'Zumarang'	-15	-36	-36	-36	-26	+5
<i>M.</i> <i>x zumi</i> var. <i>calocarpa</i>	-8	-22	-33	-33	-29	+15

\* = Samples experienced cold injury in field prior to collection

## DEER BROWSE PREFERENCE IN THE GENUS *MALUS*

John Beckett  
The Morton Arboretum  
Lisle, Illinois

Deer damage is an increasing problem for homeowners, nurseries, and land managers throughout much of the eastern United States. An evaluation of deer browse in the National Crabapple Test Area at The Morton Arboretum suggests that deer may prefer certain cultivars and species of *Malus*.

The Arboretum's National Crabapple Test area is one of 23 similar collections established throughout the United States in 1984. Although the plants in the collection are evaluated primarily for disease resistance, fruit and flower characteristics, and habit, the collection lends itself well to other kinds of evaluation and study. The collection at The Morton Arboretum contains 51 species or cultivars, each represented by three plants (two for *Malus* 'Hargozam'). None of the crabapples is native to North America.

The crabapples were evaluated for browse in October 1992. This browse apparently occurred in middle-to-late summer, because new growth would have appeared after any earlier browse. Only twig browse was evaluated. Fruit browse, though decreasing the ornamental value of the tree, was not evaluated because it did not disfigure the plants.

Cultivars that have *Malus baccata* in their ancestry were often favored by deer. The following tables are a summary of the evaluation, listing plants that were heavily, moderately, and lightly browsed. The cultivars with a (\*) have *Malus baccata* in their ancestry.

Table I: Heavily browsed crabapples (more than 50% of twigs browsed)

<i>Malus</i> 'Dolgo' *	<i>M.</i> 'Royalty' *
<i>M.</i> 'Hopa' *	<i>M.</i> <i>sargentii</i>
<i>M.</i> <i>hupehensis</i>	<i>M.</i> <i>tschonoskii</i>
<i>M.</i> 'Red Jade'	<i>M.</i> 'Winter Gold'
<i>M.</i> 'Red Splendor' *	

Table II: Moderately browsed crabapples (10%-50% of twigs browsed)

<i>Malus</i> 'David'	<i>M.</i> 'Prairifire'
<i>M.</i> 'Henningi'	<i>M.</i> 'Professor Spenger' *
<i>M.</i> 'Indian Magic'	<i>M.</i> 'Ruby Luster'
<i>M.</i> 'Indian Summer'	<i>M.</i> 'Selkirk'
<i>M.</i> 'Mary Potter'	<i>M.</i> 'Strawberry Parfiat'
<i>M.</i> 'Ormiston Roy'	

Table III: Lightly browsed crabapples (less than 10% of twigs browsed)

<i>Malus</i> 'Adams'	<i>M.</i> 'Ralph Shay'
<i>M.</i> 'Beverly'	<i>M.</i> 'Robinson'
<i>M.</i> 'Bob White' *	<i>M.</i> 'Silver Moon'
<i>M.</i> 'Cascole'	<i>M.</i> 'Snowdrift'
<i>M.</i> 'Jewelberry'	<i>M.</i> 'Sutyzam'
<i>M.</i> 'Jewelcole'	<i>M.</i> 'Velvetcole'
<i>M.</i> 'Louisa'	<i>M.</i> 'Yellow Jewel'
<i>M.</i> 'Molazam'	<i>M.</i> x <i>zumi</i> var. <i>calocarpa</i> *
<i>M.</i> 'Profusion'	

In some cases, one plant of a species or cultivar was heavily browsed, while others were slightly to moderately browsed. The reasons for this are not clear, but location and plant vigor did not appear to be the cause. Trees in this group were: *Malus jackii*\*, *M.* 'Centzam', *M.* 'Chrisozam', *M. floribunda*, *M.* 'Prairie Maid', *M.* 'Radiant'\*, (*M. baccata* in ancestry), *M.* 'Weepcanzam', *M.* 'White Angel', and *M. yunnanensis* var. *veitchii*.

The plants of five cultivars are pruned such that the lowest branches are above the reach of browsing deer. These include: *Malus* 'Donald Wyman', *M.* 'Hargozam', *M.* 'Liset', *M.* 'Red Barron', and *M.* 'Sentinel'.

This study suggests that where deer browse is a problem, deer preference, along with disease resistance and other traits, should be considered when selecting a crabapple. Weather, location, and availability of other foods may influence the incidence of browse, but deer may browse some crabapples much more heavily than others.

## ULTIMATE SIZES OF CRABAPPLE TREES

John H. den Boer

The selection of a crabapple tree for planting involves many criteria, including color of flower and fruit, type of flower, and other characteristics. One of the most important characteristics is the ultimate size of the tree when it reaches maturity. It would not do to have a fast-growing, large tree planted near a house if a small tree is expected. Trimming a crabapple tree to hold back its size will not be satisfactory either because this mars the appearance of the tree and reduces the amount of blossoms. In planting under power lines it is imperative that large trees not be planted. A maximum tree height of 25 feet is recommended for such locations. Similarly, in planting trees near roadways, there has to be enough room for the tree to grow without growing into the roadway.

Information on tree sizes is available on about 340 crabapples. It is possible that in the future some trees listed in the small or medium size range may be upgraded to the next size because of new information becoming available. The following lists crabapples in three categories, Small - less than 15 feet, Medium - 15 feet to 25 feet, and Large - over 25 feet in height. In order to conserve space, the crabapples are listed by their presently assigned trade name.

### SMALL (Less than 15 feet)

Ambergold	Coralene	Fringepetal
Angel Choir	Coralglow	Golden Dream
Ann Marie	Cotton Candy	Golden Galaxy
Autumn Treasure	Cowichan	Gypsy Dancer
Bechtel	Crimson Brilliant	Gypsy Gold
Bluebeard	Crimson Comet	Helen
Bonfire	Egret	Hillier
Bridal Crown	Elfin Magic	Honan
Butterfly	Exzellenz Thiel	Hoser
Calvary	Fairy Fire	Jewelberry
Candy Pink	Firebelle	John Edward
Cardinal's Robe	Firebrand	Joy
Carmine	Firecloud	Karen Murray
Carnival	Firecracker	Katherine
Cathy	Firedance	Kibele
Charlotte	Fireglow	Kingsmere
Color Parade	Flamingo	Koi
Copper King	Fountain	Lemoine

SMALL (Less than 15 feet) Cont.

Leprechaun	Pink Princess	Serenade
Little Troll	Pinkbud Sargent	Sheila
Lullaby	Plena Dwarf	Shinto Shrine
Luwick	Prince Charming	Sikkim
Maria	Purple Wave	Spring Song
Matador	Red Peacock	Sundog
Michael	Red Snow	Sunset
Ming Dynasty	Red Swan	Tanner
Mollie Ann	Redbird	Tina Sargent
Molten Lava®	Ross's Double Red	Tiny Tim
Moonglow	Royal Fountain	Veitch
My Bonnie	Royal Splendor	Wildfire
Nieuwland	Ruth Ann	Woven Gold
Parkman	Sargent	Wynema
Pauline	Satin Cloud	Yellow Fruited Pearleaf
Peter Murray	Sea Foam	Zumarang®
Peter Pan	Sensation	Zumi

MEDIUM (15 to 25 feet)

Abbondanza	Centennial	Eleyi
Adam	Centurion®	Elk River
Adams	Cheal's Crimson	Ellen Gerhart
Aldenham	Cheal's Golden Gem	Fiesta
Allegheny	Christmas Holly™	Fireburst
Almey	Columbia	Flame
Arnold	Column Cherry	Franz Lipp
Astracan	Column Siberian	Garden View
Autumn Glory	Coral Cascade	Georgia
Ballerina	Coralburst™	Gibbs' Golden Gage
Barbara Ann	Cranberry Lace	Golden Candles
Beauty	Cutleaf	Golden Harvest
Behrens	David	Golden Hornet
Beverly	Dawson	Goldilocks
Biltmore	Donald	Guiding Star
Blanche Ames	Donald Wyman	Gwendolyn
Bob White	Dorothea	Halliana Spontanea
Brandywine™	Double Flowering	Halls
Burgandy	Doubloons	Halward
Cardinal (hupehensis)	Dunbar	Hartwig
Carol Ann	Dwarf Siberian	Henning
Cashmere	Echtermeyer	Henry F. DuPont

MEDIUM (15 to 25 feet) Cont.

Henry Kohankie	Ormiston Roy	Silver Moon
Hoopes	Palmer	Simcoe
Hopa	Patricia	Sinai Fire
Indian Magic	Pearleaf	Snow Magic
Indian Summer	Pink Cascade	Snowcap
Irene	Pink Dawn	Snowdrift
Jack	Pink Spires	Southern
Joan	Prairifire	Sparkler
Kelsey (adstringens)	Prince Georges	Spring Snow
Kelsey (floribunda)	Professor Sprenger	Street Parade
Kirk	Purple	Striata
Klehm's Improved Bechtel	Purple Prince	Sugar Tyme®
Kola	Pygmy	Taliak
Lady Northcliffe	Radiant	Tea
Late Hyslop	Red Barron	Tetragold
Limelight	Red Edinburgh	Thomas Roland
Liset	Red Jade	Tops-In-Bloom
Louisa	Red Jewel™	Toringo
Macrocarpa	Red Sentinel	Turesi
Madonna®	Redbud	Van Eseltine
Manchurian	Redflesh	Vanguard
Mandarin Magic	Renee	Velvet Pillar™
Margaret	Robinson	Virginia
Marshall Oyama	Rondo	Volcano
Mary Potter	Rosseau	Wabiskaw
Maybride	Royal Ruby	Weeping Candied Apple™
Maysong	Royalty	White Angel
Mount Arbor	Schaefer	White Candle
Neville Copeman	Scugog	White Cascade™
Nicholene	Seafoam	Winter Gold
Niedzwetzkyana	Selkirk	Yellow Autumn
Normand	Sentinel	Yellow Jewel
Orchid Beauty	Shaker Gold	Young America
		Zita

## LARGE (Over 25 feet)

Adstringens	John's	Printosh
Baskatong	Keo	Profusion
Birdland	Leucocarpa	Quaker Beauty
Brier	Lisa	Red River
Cherry	Magdeburg	Red Silver
Chilko	Magenta	Red Splendor
Chinese	Makamik	Rivers Chinese
Chinese Double Flowering	Martha	Rock
Clark's Double Flowering	Midget	Rosedale
Dainty	Montreal	Scheidecker
Dolgo	Nome	Severn
Ellwanger	Nancy Townsend	Siberian
Erie	Nertchinsk	Sissipuk
European Wild	Nikko	Soulard
Evelyn	Nipissing	Strawberry Parfait
Formosa	Oporto	Timiskaming
Freeman Hybrid	Oregon	Tree Toringo
Fuji	Peachleaf Cherry	Tri Lobed
Gorgeous	Pink Beauty	Tschonoski
Hopa Austrian	Pink Eye	University
Japanese Flowering	Prairie	Wild Red
John Downie	Pratts	Wild Sweet
		Yunnan

## IOCS DIRECTORS

Mr. Brian Bunge  
LaPorte County Nursery  
7657 W. State Road 2  
LaPorte IN 46350  
219-785-4303

Dr. Edward R. Hasselkus  
Extension Horticulturist  
University of Wisconsin  
1575 Linden Drive  
Madison WI 53706  
608-262-1450

Mr. William Hendricks  
Klyn Nursery, Inc.  
3322 South Ridge Road  
P.O. Box 343  
Perry OH 44081  
216-259-3811

Dr. James E. Klett  
Department of Horticulture  
Colorado State University  
Fort Collins CO 80523  
303-491-7179

Mr. Alan Michael  
Dauphin County Extension Service  
1451 Peter's Mountain  
Dauphin PA 17018  
717-921-8802

Ms. Maria Zampini-Pettorini  
Lake County Nursery  
P.O. Box 122  
Perry OH 44081-0122  
216-259-5571

Dr. John J. Sabuco  
White Oak Group  
Box 1  
Flossmoor IL 60422  
708-747-1900

### LIFE MEMBERS

Jef van Meulder  
William Muetze  
Gary Moller  
Michael Yanny

Catherine Olver  
John H. den Boer  
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