Apple CGC Minutes

March 5, 2026 12-2 ET (online)

Attendees: Pierre Bouillon, Peter Bretting, Susan Brown, John Bunker, Matt Clark, Gennaro Fazio, Anne Frances, Chris Gottschalk, Ben Gutierrez, Peter Herzeelle, Nick Howard, Gary Kinard, Neha Kothari, Todd Little-Siebold, Jim McFerson, Tori Meakem, Diane Miller, Cameron Peace, Greg Peck, Miles Schwartz Sax, Davis Upchurch, Steven Vannocker, Gayle Volk, Jessica Waite, Gan-Yuan Zhong

Introduction (Volk): Welcome, and minutes will be shared, updated, approved, and posted after the meeting.

Report: Office of National Programs (Kothari):

- NPGS metrics previously focused on accession counts and distributions. New metrics will include 1) collection health (losses, regeneration status/shelf life, acquisitions), 2) characterization data (integration of data into GRIN-Global), 3) System reliability (alignment between site records and GRIN-Global), and 4) Risk (backup coordination and data).
- Information about the new shipping procedures for NPGS materials will be released at the end of March.

Report: National Genetic Resources Laboratory (Kinard):

- Only one GRIN-Global programmer at NGRL (after 2025 retirements).
- Please continue to submit success stories for release in the GRIN-U Success Stories ebook (download template here: https://www.ars-grin.gov/CGC).
- There won't be a formal process for plant explorations in 2026. Please contact Ben Gutierrez (Ben.Gutierrez@usda.gov) and Anne Frances (Anne.Frances@usda.gov) to discuss possible exploration options for 2026 for *Malus* that will fill collection gaps (preferably within the U.S.). A. Frances will share more information when it is available.

Report: APHIS (Hurtado-Gonzales): No report

Report: Apple Collection (Gutierrez):

- PGRU maintains: 1453 cultivars + 20 new accessions, 3500 wild+23 new accessions, 2000 seed accessions, for a total of 4958 accessions in the field. 1000

trees will be renewed this year. The trees in the former W3 orchard have been removed, allowing space for 300-500 accessions in the remaining field space.

- Cryopreservation efforts continue for *Malus* and *Prunus* dormant buds through collaborations with NLGRP (Fort Collins, CO). 80 *Malus* accessions were processed in 2025 and 90 *Malus* accessions are in progress for 2026. There are currently 2403 *Malus* accessions cryopreserved at NLGRP.
- A collaboration with C. Gottschalk (USDA) to create admixed seed libraries to conserve and deliver diversity. Another collaboration to genotype wild and hybrid accessions (see Gottschalk report below).
- A collaboration between USDA and Acadia University resulted in an apple leaf morphometrics manuscript that is being submitted.
- Virus indexing (19 viruses) was performed for the 200 proposed core collection accessions in collaboration with APHIS. AHVd was the most common (74 accessions). The three accessions with ASSVd will no longer be distributed.
- Fruit quality evaluations continue, with a focus on apple in the upcoming years.
- Bloom phenology assessments will also be prioritized.
- Distribution requests must be submitted through GRIN-Global.
- Core collection subcommittee will convene a meeting this spring to discuss the new *Malus* domestica core set (200 individuals from the draft list) and the proposed replicated plantings (including a planting in the G1 block with three replicates). Contact Ben Gutierrez for more information.
- Attachments: Presentation PDF, draft list of accessions in the proposed apple core collection, and the accessions being genotyped in collaboration with C. Gottschalk.

Discussion:

- The status of the Dawes Arboretum *M. sieversii* collection (from Diane Miller's Kyrgyz exploration) was briefly discussed. SSRs were used to analyze the diversity in the Dawes collection (DOI: 10.21273/HORTSCI.44.2.516). Twelve individuals were acquired by the NPGS from the Dawes collection in 2009 (see GRIN-Global).
- Cameron Peace mentioned the Historic Fruit Tree Working Group focus on documenting and identifying heritage cultivars and the associated myfruittree.org genotyping website through Washington State University.
- There will not be an evaluation and characterization program through the CGCs in 2026. Please contact Ben Gutierrez, RL Gan-Yuan Zhong (GanYuan.Zhong@usda.gov) and Neha Kothari (Neha.Kothari@usda.gov) to discuss *Malus* characterization (genotyping/genomics) opportunities that are focused on improved collection management.

- Acquisition subcommittee will convene a meeting this spring to discuss the proposed *Malus* acquisition document.

Report: Apple Evaluation Grant (Gottschalk): 1) Evaluation of *Malus angustifolia* from the Southern U.S. for Traits Related to Abiotic Stress Resilience; 2) Development of genotypic resources to identify redundancy and reshape utilization of wild *Malus* accessions (1057 accessions, 49 taxa, including Malus hybrids with no clear taxonomic assignment—see attached list). See attached presentation PDF.

Report: Malus at Arnold Arboretum (Schwartz Saz): Plant explorations were performed in Japan to collect *M. hupehensis*, *M. spontonea*, *M. sieboldii*, *M. roseotakanabensis,* and *Malus tschonoskii*. Future targets are *M. florentina* (Italy) and *M. trilobata* (Greece). All explorations are performed without any limitations on distribution. Arnold Arboretum primarily backs up collections at other arboreta (such as Morton Arboretum). See attached presentation PDF.

Discussion: G. Volk mentioned that she is writing the manuscript that covers her exploration to Vietnam to collect *M. doumeri* and that seedlings from seeds collected in the 2018 exploration are being maintained at the NPGS Corvallis location.

2 pm (ET): Adjourn

USDA-ARS Plant Genetic Resources Unit Apple, Grape, and Tart Cherry Collections

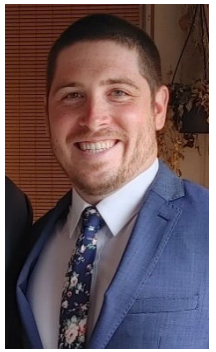
USDA TEAM





Cornell/NE9 TEAM



Report to Apple CGC

USDA Apple Collection

USDA *Malus*	Number of Accessions
Apple cultivars	1,452 + 20 new
Wild *Malus* (55 species)	3,500 + 23 new
Seed accessions	2,000
Field accessions	2,958
Total	**4,958**

McCarthy Farmland Use

Cryopreservation

Direct Cryopreservation (Apple and Cherry)

- Scions harvested at peak dormancy and cold hardiness
  - Early to mid-January
  - Priority is *M. domestica* (nearly complete)
  - Submit ~100 accessions (mostly apple some

Cryopreservation Activities

- 2025
  - 80 accessions
  - Few *M. domestica* but mostly *M. sieversii* and *M. orientalis* ~41% viability
- 2026
  - 92 accessions
  - Mostly wild species (Asian and North American)

Cryopreservation of USDA Plum and Cherry Germplasm

Mirabelle

Greengage

Damson plum

Black bullace

European plum

French (d'Agen) plum

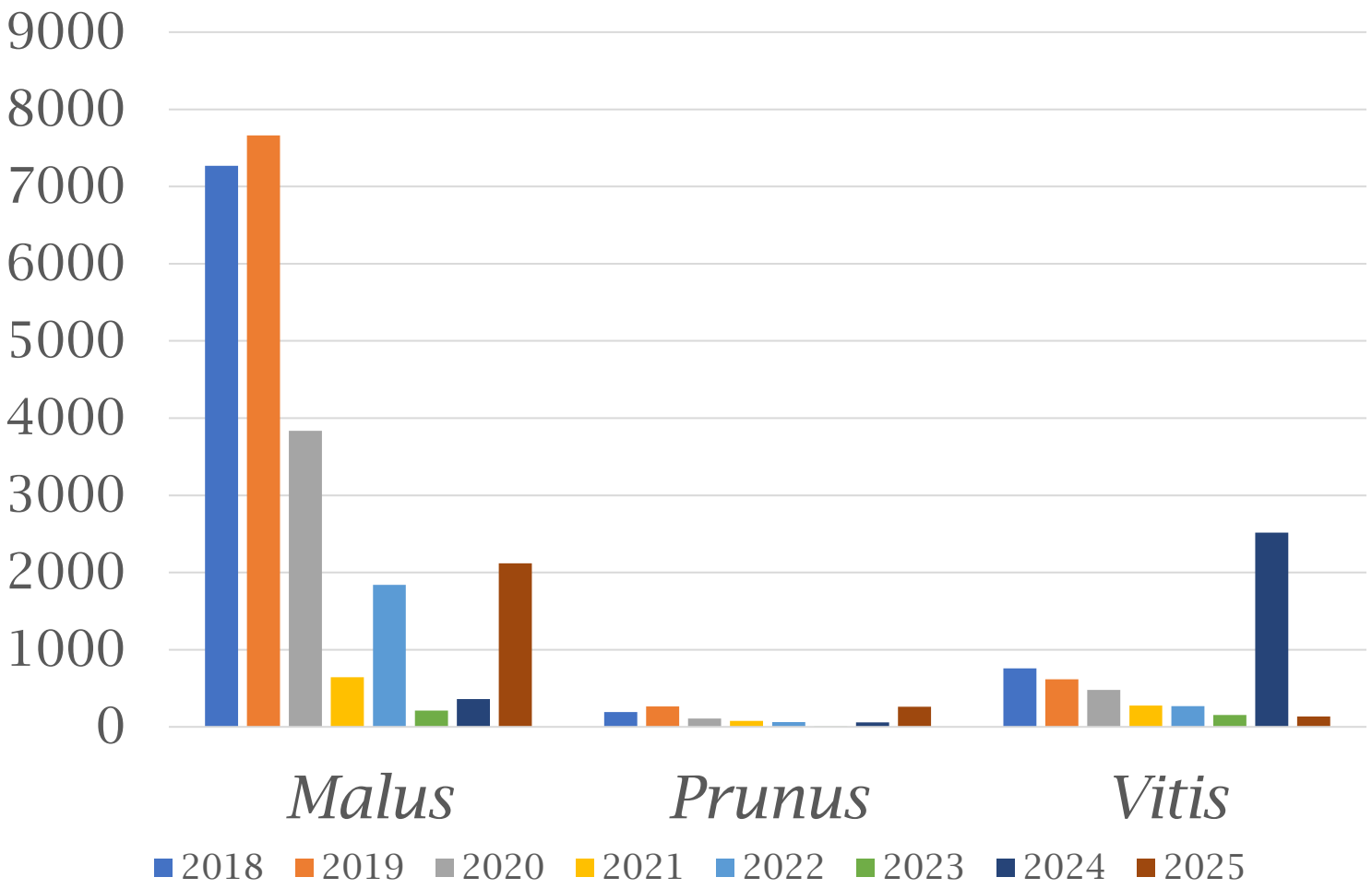
144 plum (*Prunus domestica*)

103 sweet cherry (*Prunus avium*)

Lack of dormancy hinders cryopreservation in USDA stone fruit genebank in Davis, CA.

Plums established in Geneva in 2025 and provide dormant buds for cryopreservation. Cherries will propagate in 2026.

USDA Apple, Grape, and Tart Cherry Collection Distribution



Increasing use of collection for research and trait characterization.

3,328 unique accessions utilized over the past 10 years, **representing about 65% of the collection**. Narrow set of high frequency accessions make up majority of utilization.

All requests need to be submitted through GRIN-Global.

USDA ARSx Project

SAFEGUARDING GERMPLASM IN ADMIXTURE SEED LIBRARIES

Admixture Apple Library

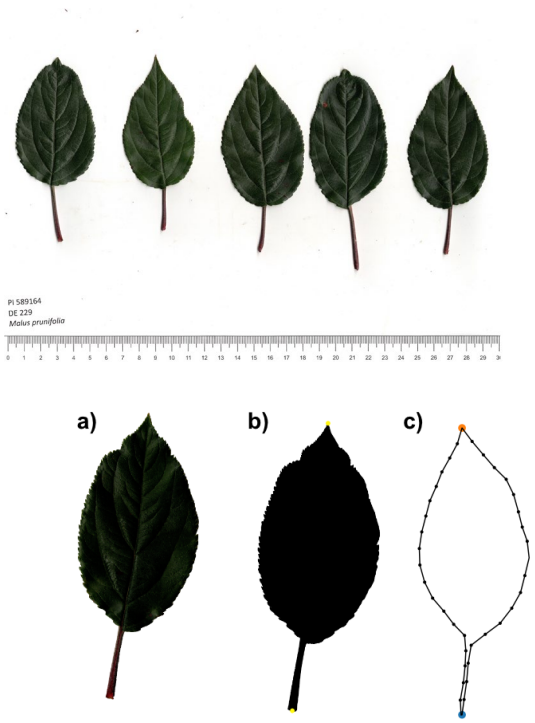
Transgene +

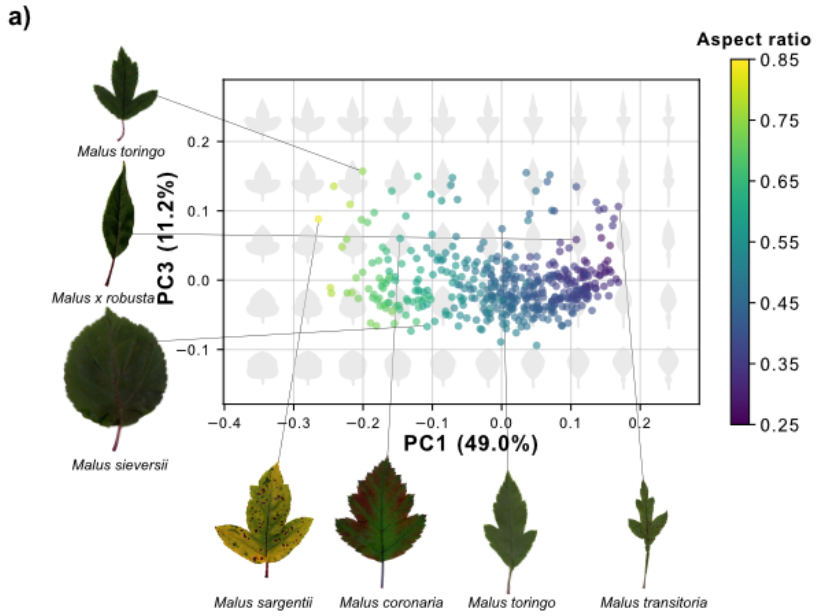
Collaborations to introgress genetics into stakeholders desired background @ AFRS (Academic/Industry)

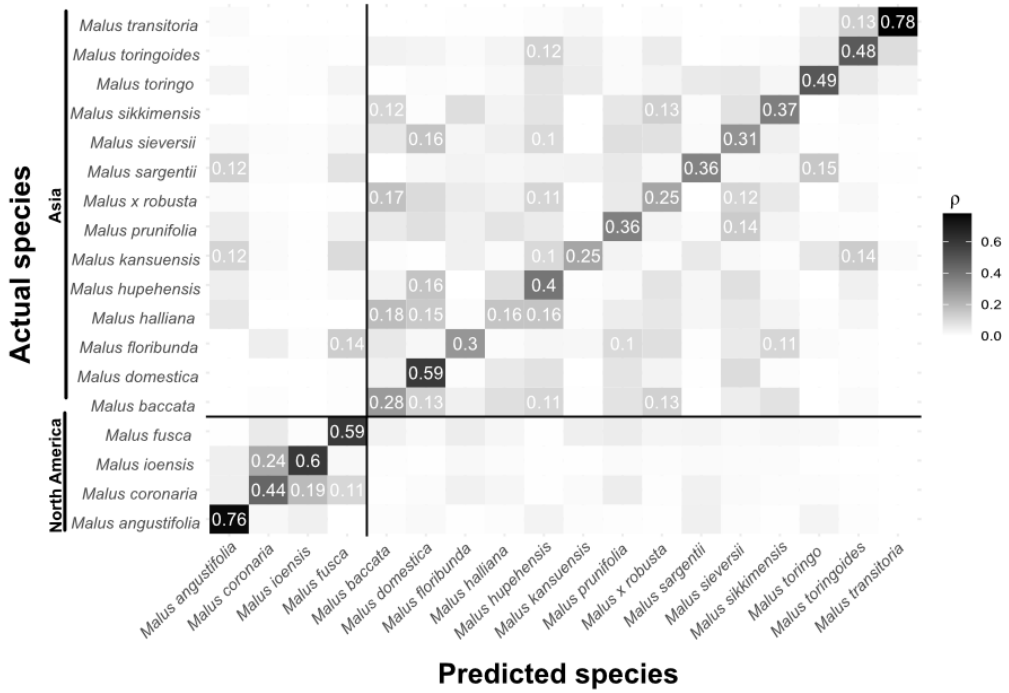
Transgene – (null-segs)

Available from Germplasm/GRIN for use in breeding (Academic/Industry/Private Citizen)

Apple Leaf Morphometrics







4,000 leaves from 18 *Malus* species.
Aspect ratio and lobing explain most the variation.
Combined with genetics/genomics, leaf morphometrics provides validation of taxonomic assignment.

Zoe Migicovsky and Lachlann Simms – Acadia University, Nova Scotia, Canada

USDA Apple, Grape, and Tart Cherry Collection Genotyping

Wild and Hybrid WGS
- 1,057 Accessions
- 49 Taxa
- Includes *Malus* hybrids with no clear taxonomic assignment

Cider Apple Genotyping
- 282 Accessions (Greg Peck)

Skim-seq – Vitis Fruit Quality
- 340 *Vitis vinifera* (Davis)
- *144 Vitis* hybrids (Geneva)

Skim-seq
- 108 *Prunus avium*
- 100 *Prunus cerasus*
- 49 wild and hybrid

USDA Apple Collection
Virus Indexing

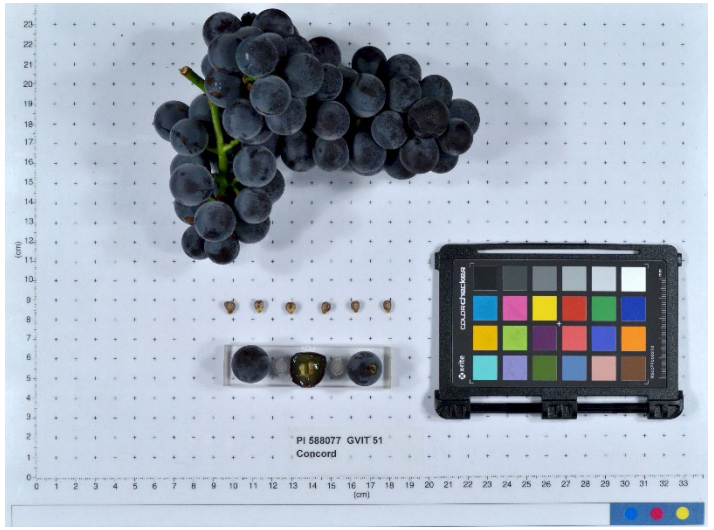
- Virus index testing for ~ 200 accessions
  - New Apple Core included
- 19 viruses indexed
  - Average was 1 virus
- AHVd was the most common (74 accessions)

- Three accessions with ASSVd
  - No longer distributed – seeking replacement material.

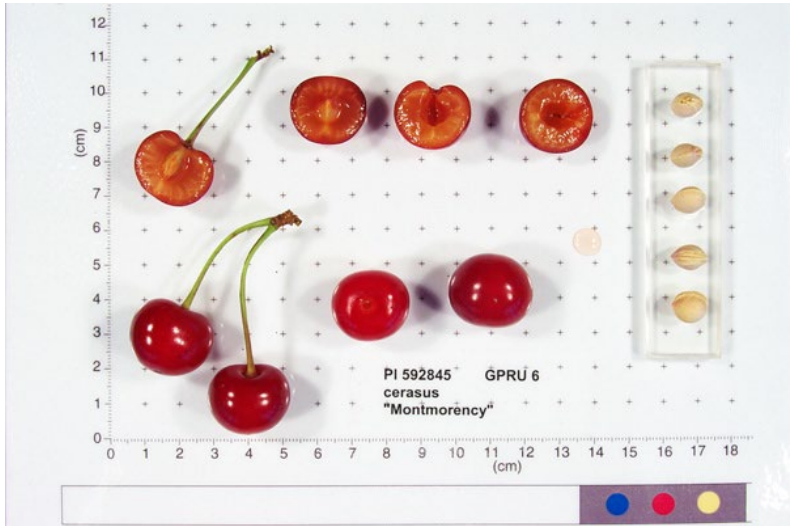
- Future goal: systematic screening through the collection.

USDA Apple, Grape, and Tart Cherry Collection
Fruit Quality Characterization

Fruit Quality Testing (2025)
- 150 accessions
- Phenolics
- Aroma



Fruit Quality Testing (2024)
- ~450 accessions
- Phenolics
- Aroma



Fruit Quality Testing (2025)
- 250 accessions
- Phenolics
- Aroma

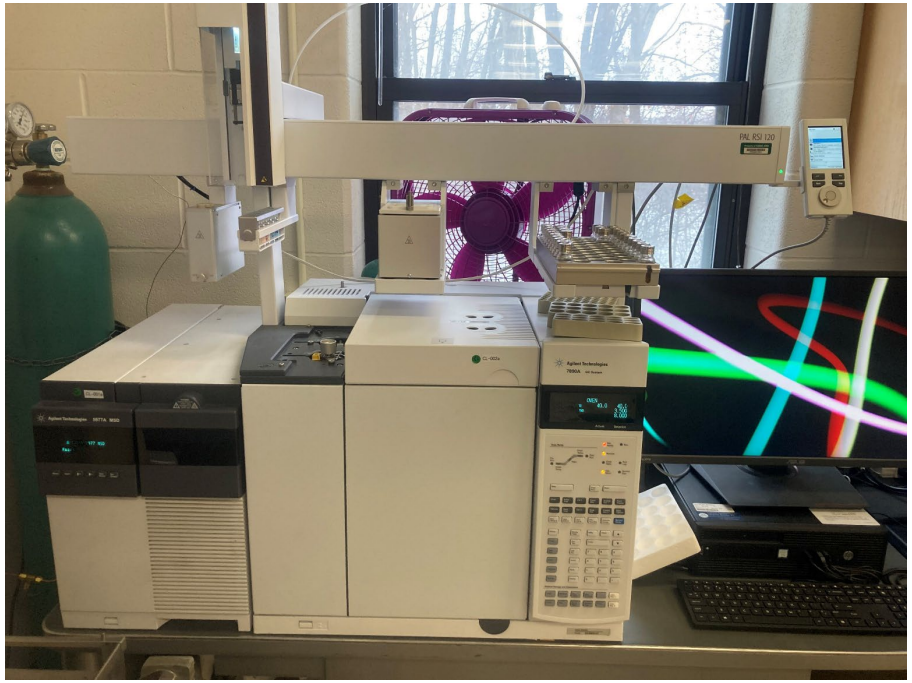
USDA Apple Collection
Fruit Characterization

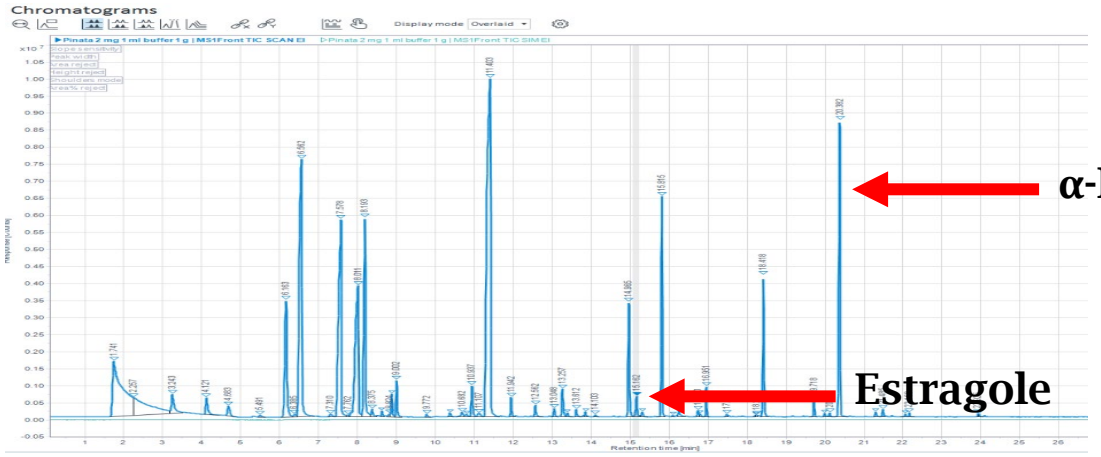
Fruit Quality Testing (2024-2025)

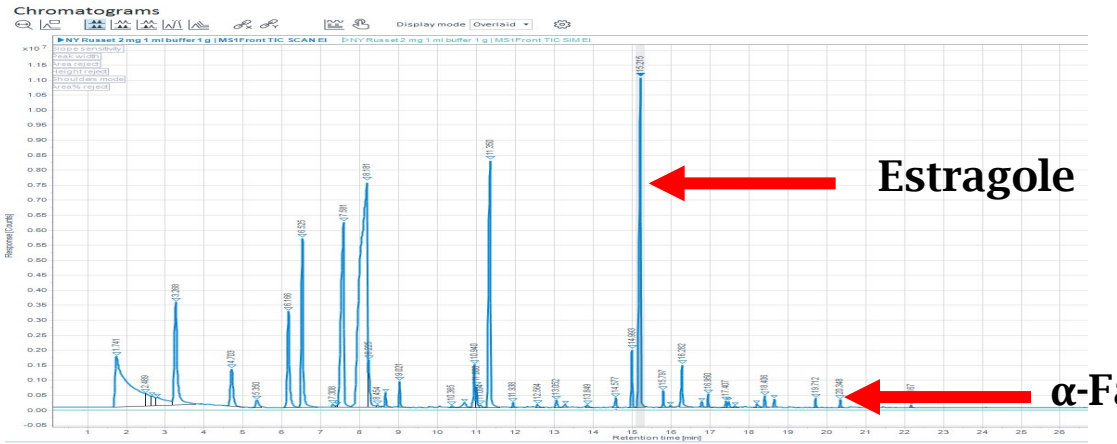
- Target is 200 accessions
  - ~150 characterized
- 11 descriptors
  - Added starch test, harvest date, colorimeter
- Imaging
- Phenolics (starting)
  - Peel and flesh
- Aroma (one year complete)

USDA Apple Collection
Juice Aroma Characterization

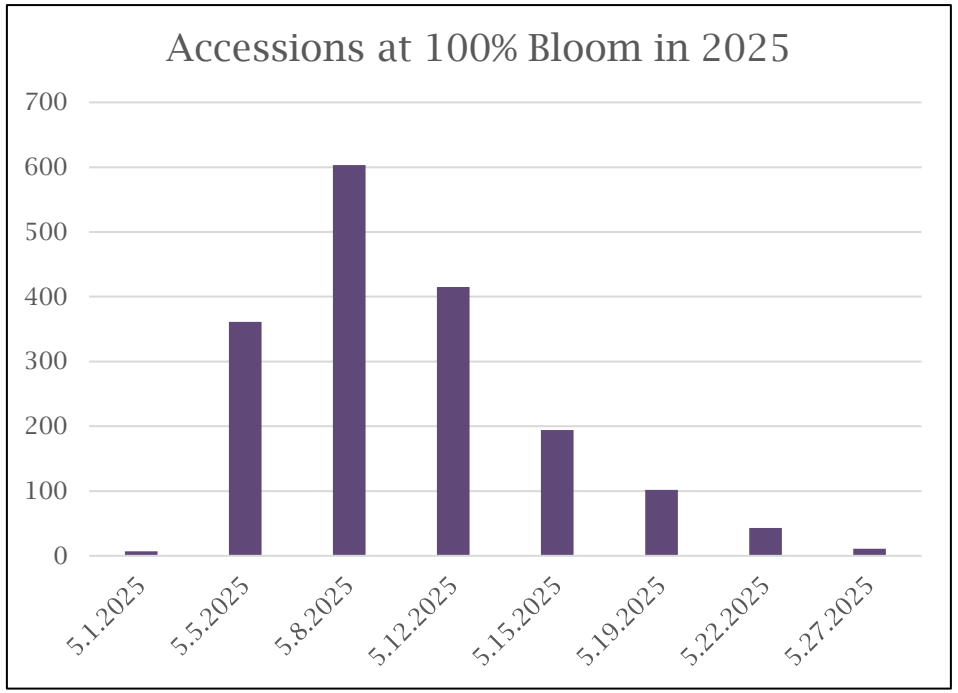
- GCMS
- Solid Phase Micro-Extraction (SPME)

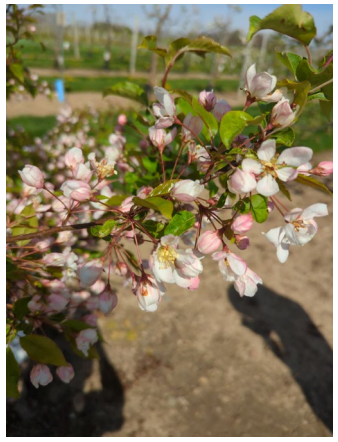






USDA Apple Collection
Bloom Phenology





Scored bloom phenology (0-100%) in 2024 and 2025. Repeat in 2026

Biweekly evaluation of M7 Block with 1,429 accessions across 46 taxa.

Align with NEWA data to calculate GDD for 50 and 100% bloom and upload to GRIN-Global.

Kenong Xu collecting budbreak phenological data.

Discussion

Malus CGC Evaluation Updates

USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

Dr. Chris Gottschalk
Appalachian Fruit Research Station
Kearneysville, WV

Projects

1) Evaluation of *Malus angustifolia* from the Southern U.S. for Traits Related to Abiotic Stress Resilience

2) Development of genotypic resources to identify redundancy and reshape utilization of wild *Malus* accessions.

Project 1

M. ANGUSTIFOLIA GENOME

PREPRINT

ACCESSION

PI 613880; used in previous work by myself and Steve van Nocker. Extremely late blooming

SEQUENCING APPROACH

PacBio HiFi with Hi-C

Phased Diploid Assembly

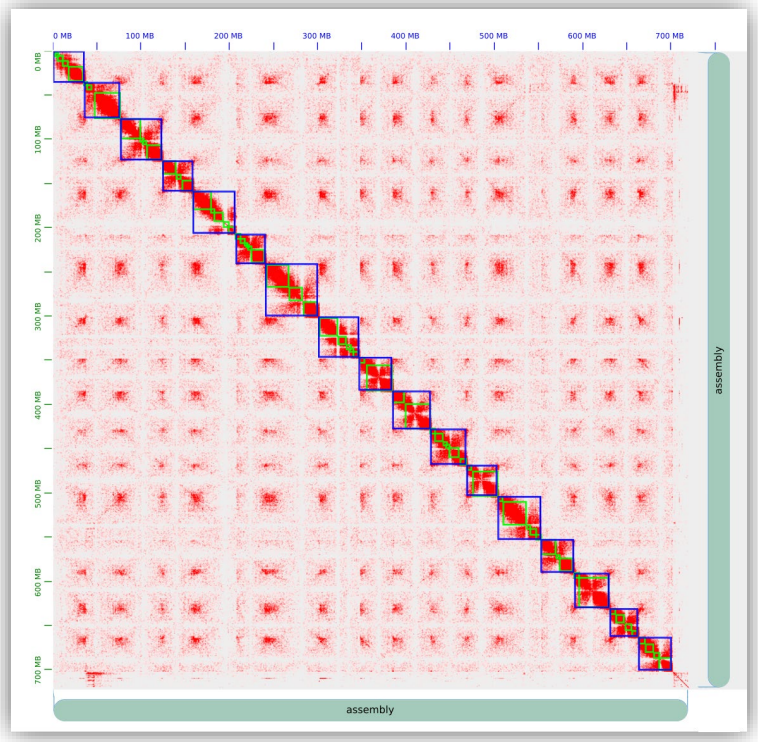
QUICK STATS

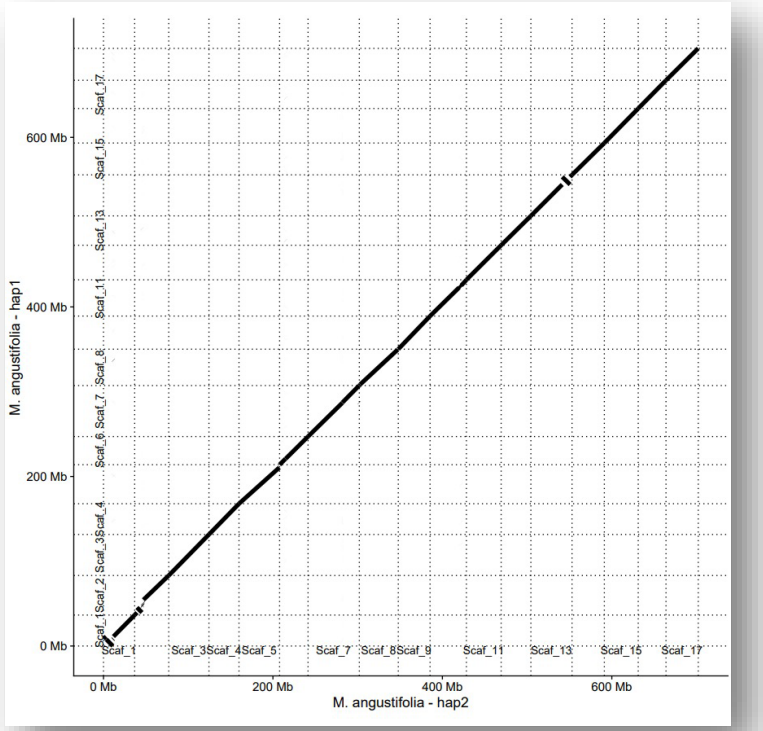
Pseudo molecule

705 and 703 Mb haplomes

N50 of 40.7 and 40.9 Mb

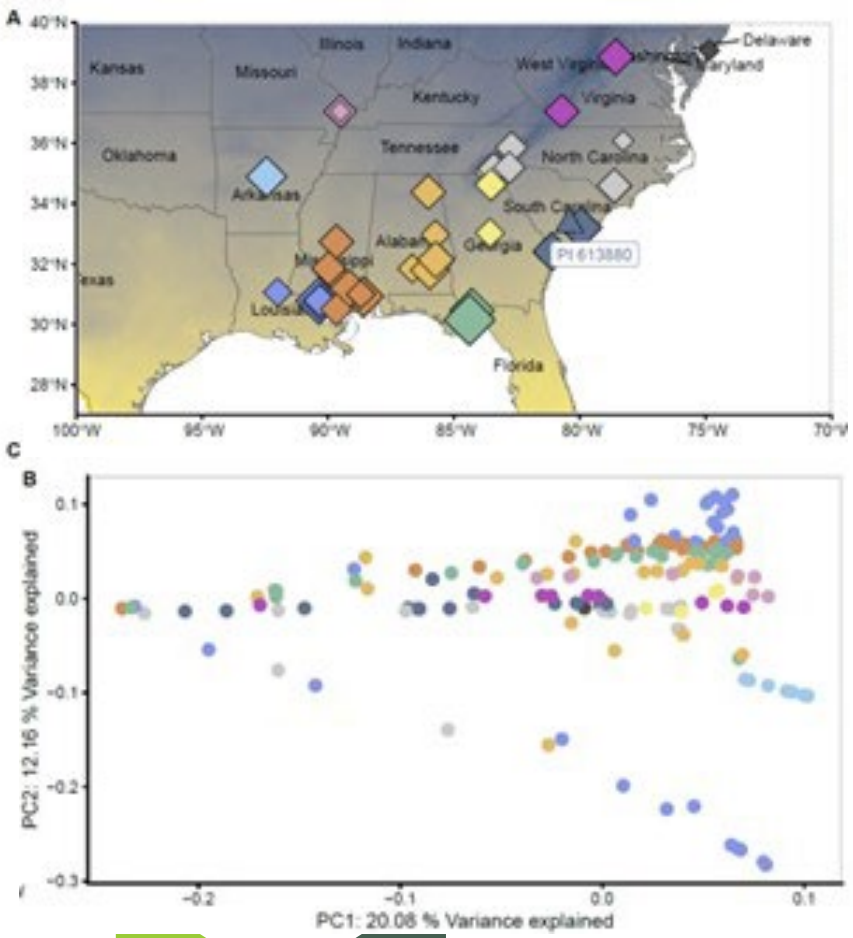
Busco of 98.8% Complete





Project 1

POP GEN



SEQUENCING

Illumina NovaSeq 6000
S4 flowcell 200 cycles

VARIANT CALLING

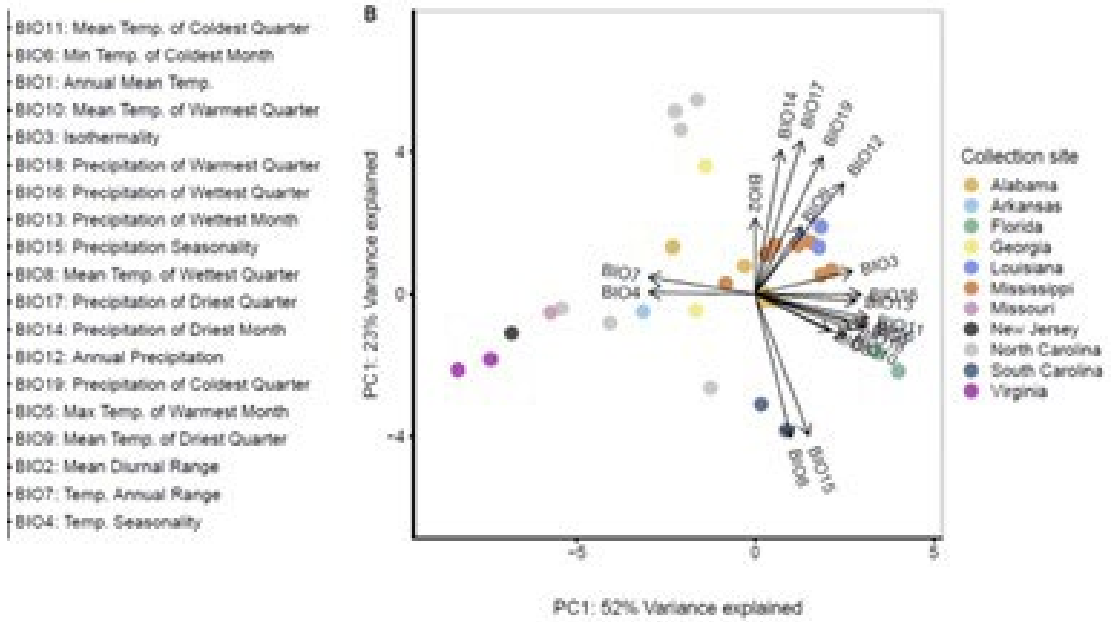
Map to *M. angustifolia* hap 1;
GATK – haplotype caller

GWAS

Looking for association with climatic data based on population origin

Project 1

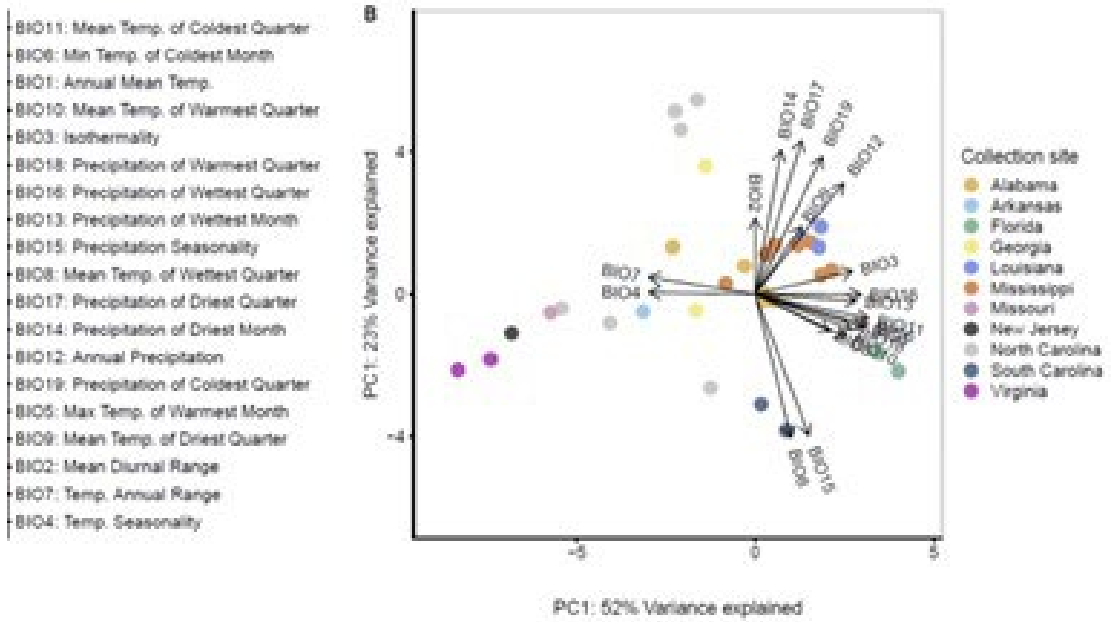
LOCAL ADAPTION



Linked variants with their climate of origin (BioClim variables)

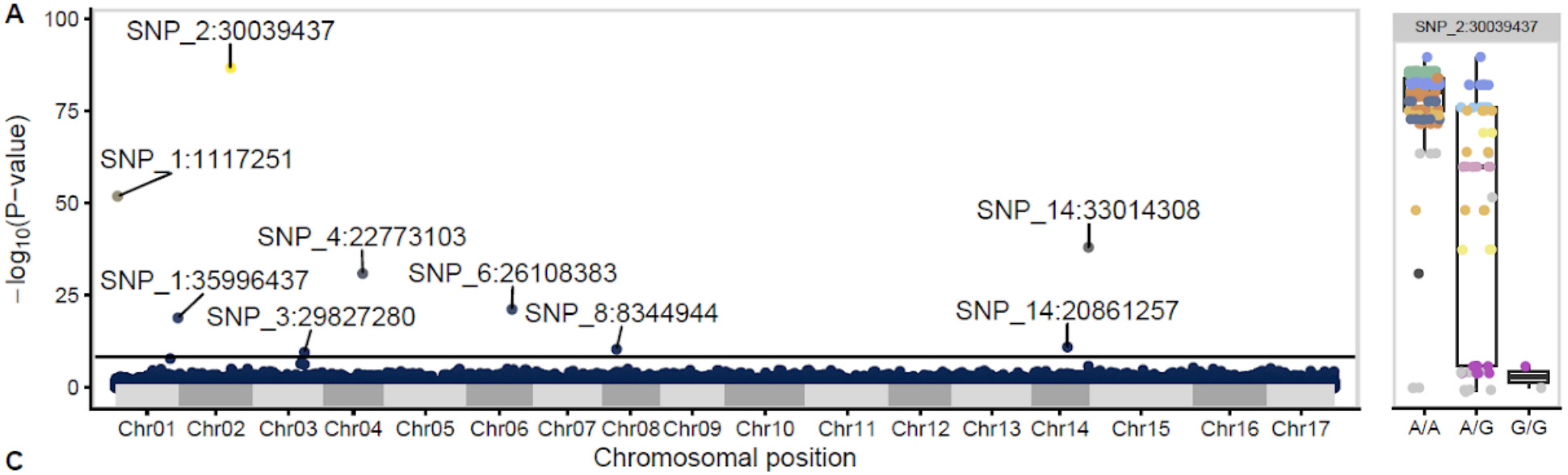
Project 1

LOCAL ADAPTION



Linked variants with their climate of origin (BioClim variables)

Project 1 Abiotic stress resiliency



- SNP resides in 3’ region
- drives lateral root formation
- Prime target for CRISPR editing

Project 1 Abiotic Stress Screening

Beginning this spring!

Bierer, A. M., Tang, L., Viands, K., & Wolcott, C. (2025). Apple Rootstock Response to Threshold Water Management during 6 Weeks of Progressing Drought. *Journal of the American Society for Horticultural Science*, *151*(1), 38–49. https://doi.org/10.21273/JASHS05526-25

Project 2

Development of genotypic resources to identify redundancy and reshape utilization of wild *Malus* accessions.

- 1000+ samples
- 30+ species
- All the unclassified hybrids

ULTIMA GENOMICS

Oxford Nanopore Technologies

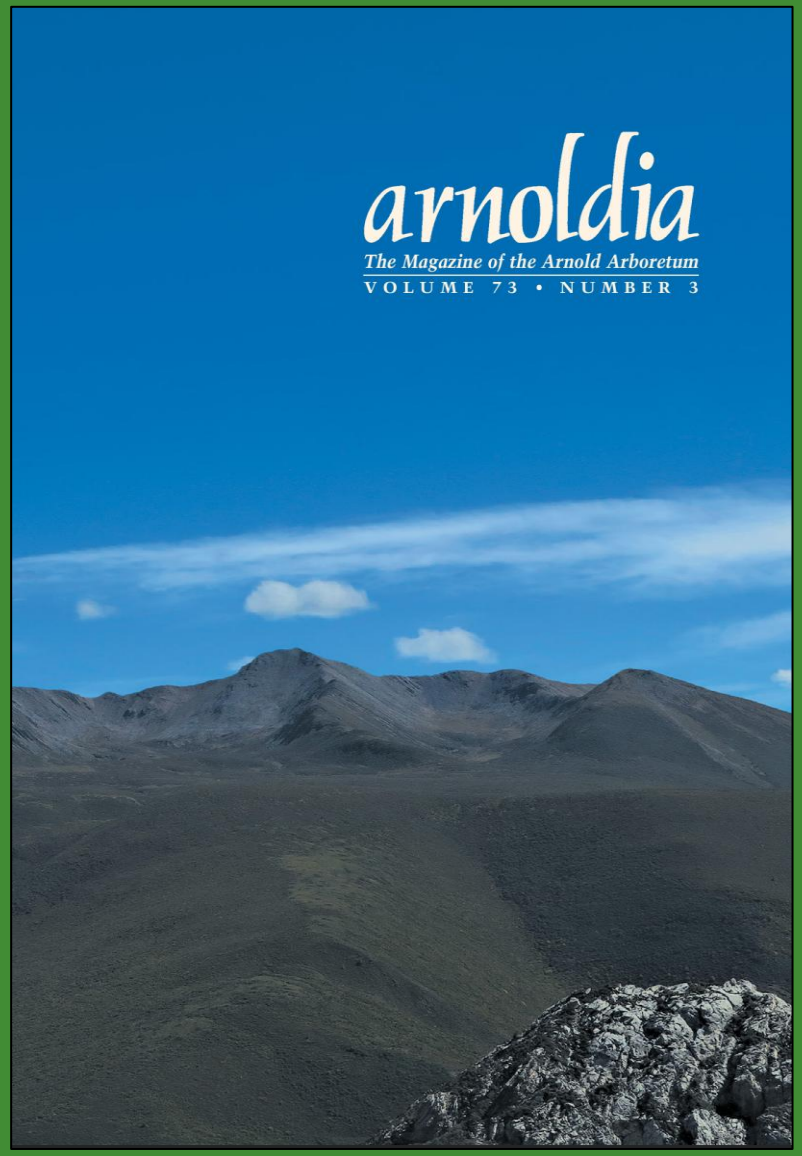
SR: 300+ bp SE reads for 15x coverage/sample

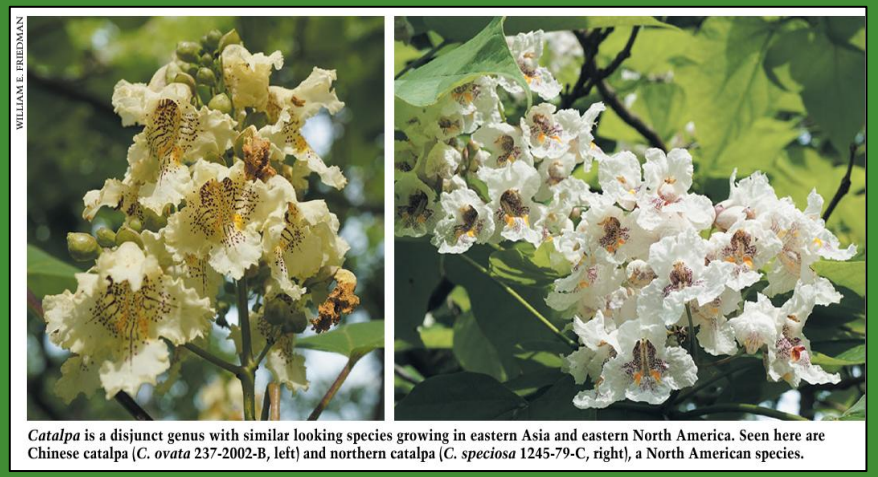
LR: ONT for 3-5x coverage/sample

The Apples of the Arnold Arboretum

Miles Schwartz Sax, Ph.D - Assistant Curator of Living Collections

Campaign for Living Collections





Catalpa **is a disjunct genus with similar looking species growing in eastern Asia and eastern North America. Seen here are Chinese catalpa (*C. ovata* 237-2002-B, left) and northern catalpa (*C. speciosa* 1245-79-C, right), a North American species.**

Croton alabamensis**, a rare semi-evergreen shrub, is one of the species the Arboretum plans to acquire.**

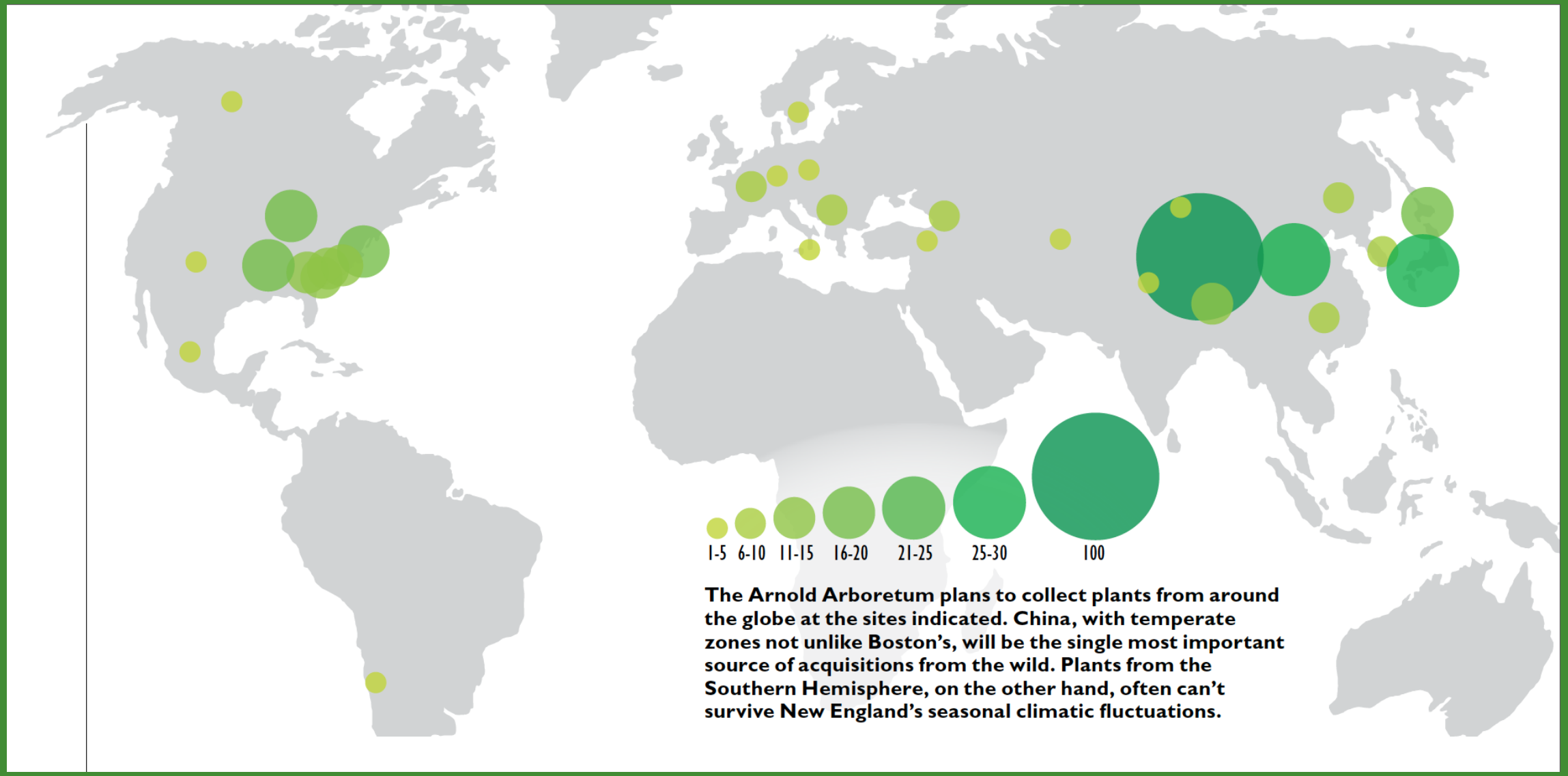
List of Desiderata

Family	Taxon
Actinidiaceae	*Actinidia chinensis*
Adoxaceae	*Viburnum atrocyaneum* *Viburnum bracteatum* *Viburnum buddleifolium* *Viburnum carlesii* *Viburnum cylindricum* *Viburnum davidii* *Viburnum ellipticum* *Viburnum farreri* *Viburnum foetidum* *Viburnum ichangense* *Viburnum kansuense* *Viburnum lantanoides* *Viburnum microcarpum* *Viburnum mongolicum* *Viburnum obovatum* *Viburnum plicatum* ssp. *tomentosum* *Viburnum sieboldii* *Viburnum tinus* *Viburnum urceolatum* *Viburnum wilsonii*
Altingiaceae	*Liquidambar styraciflua*
Anacardiaceae	*Cotinus szechuanensis*
Apocynaceae	*Asclepias incarnata* *Trachelospermum difforme*
Araliaceae	*Aralia nudicaulis*
Araucariaceae	*Araucaria araucana*
Aristolochiaceae	*Aristolochia tomentosa*
Berberidaceae	*Nandina domestica*
Betulaceae	*Alnus glutinosa* *Alnus maritima* *Betula alleghaniensis* *Betula alnoides* *Betula chichibuensis* *Betula humilis* *Betula lenta* *Betula luminifera* *Betula maximowicziana* *Betula murrayana* *Betula pumila* *Betula schugnanica* *Betula uber* *Carpinus caroliniana* *Carpinus cordata* *Carpinus coreana* *Carpinus henryana* *Carpinus polyneura* *Ostrya japonica* *Ostryopsis davidiana*
Bignoniaceae	*Campsis grandiflora*
Buxaceae	*Pachysandra procumbens* *Pachysandra terminalis* *Sarcococca hookeriana* var. *digyna*
Cactaceae	*Opuntia humifusa*
Cannabaceae	*Aphananthe aspera* *Celtis tenuifolia*
Caprifoliaceae	*Kolkwitzia amabilis* *Leycesteria formosa* *Weigela coraeensis* *Weigela maximowiczii* *Weigela middendorffiana*
Celastraceae	*Euonymus fortunei* *Euonymus obovatus*
Cercidiphyllaceae	*Cercidiphyllum magnificum*
Cloranthaceae	*Sarcandra glabra*
Cornaceae	*Alangium platanifolium* *Aucuba japonica* *Cornus alternifolia* *Cornus canadensis* *Cornus florida* *Cornus foemina* *Cornus nuttallii* *Cornus quinquinervis* *Cornus rugosa*
Cupressaceae	*Cupressus nootkatensis*
Cyrillaceae	*Cliftonia monophylla*
Daphniphyllaceae	*Daphniphyllum macropodum*
Elaeagnaceae	*Elaeagnus multiflora*
Ephedraceae	*Ephedra distachya* *Ephedra equisetina* *Ephedra gerardiana* *Ephedra intermedia* *Ephedra likiangensis* *Ephedra major* *Ephedra minuta* *Ephedra monosperma* *Ephedra przewalskii* *Ephedra rituensis* *Ephedra sinica* *Ephedra viridis*
Ericaceae	*Agarista populifolia* *Eubotryoides grayana* *Gaultheria miqueliana* *Gaultheria procumbens* *Kalmia cuneata*

Desiderata = 395 target taxa over 13 years

Friedman, W. E. et al. 2016. Developing an exemplary collection. *Arnoldia* 73(3):2-18.

Where are *Campaign* species found?



The Arnold Arboretum plans to collect plants from around the globe at the sites indicated. China, with temperate zones not unlike Boston's, will be the single most important source of acquisitions from the wild. Plants from the Southern Hemisphere, on the other hand, often can't survive New England's seasonal climatic fluctuations.

Harvard Magazine

Arn. Arb. *Malus* collection at a glance

- Total number of accessions = 492
- Living *Malus* Accessions of wild provenance = 213 (43%)
  - Species = 26
  - Varieties & forma = 11
  - Hybrids = 18
  - Cultivars = 93
- Total Dead *Malus* Accessions = 3509

Malus toringoides

Malus x magdeburgensis

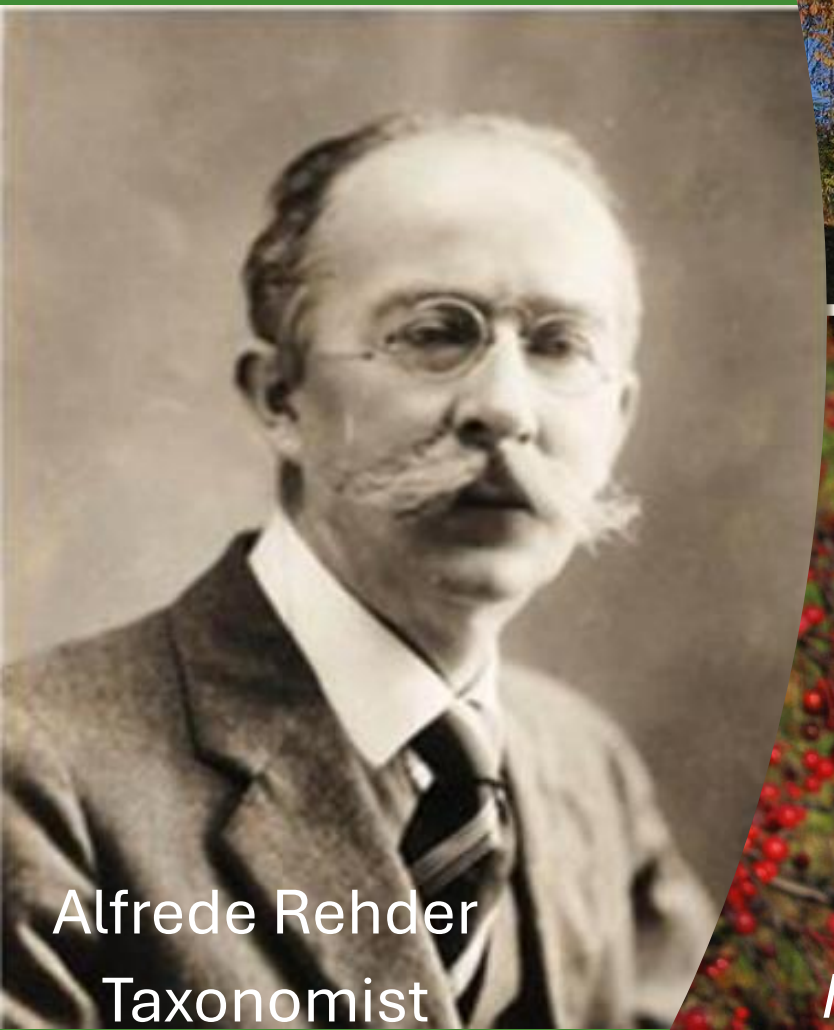
Malus orientalis

Living *Malus* Accessions of wild provenance = 213 (43%)

Country	# of Plants
China	80
Japan	66
United States	40
Kazakhstan	14
South Korea	13
Armenia	4
Denmark	3
Russian Federation	3
Tajikistan	2
Uzbekistan	2
Canada	2
Lebanon	1

Malus hupehensis
AccNum: 324-55*B

Evaluation & Promotion



Alfrede Rehder
Taxonomist

Malus ‘Donald Wyman’

Donald Wyman
Arboretum Horticulturist

Plant Breeding & Cytology

William (Ned) Friedman; Malus 'Blanche Ames' 166-52*A at the Arnold Arboretum

Malus 'Blanch Ames'

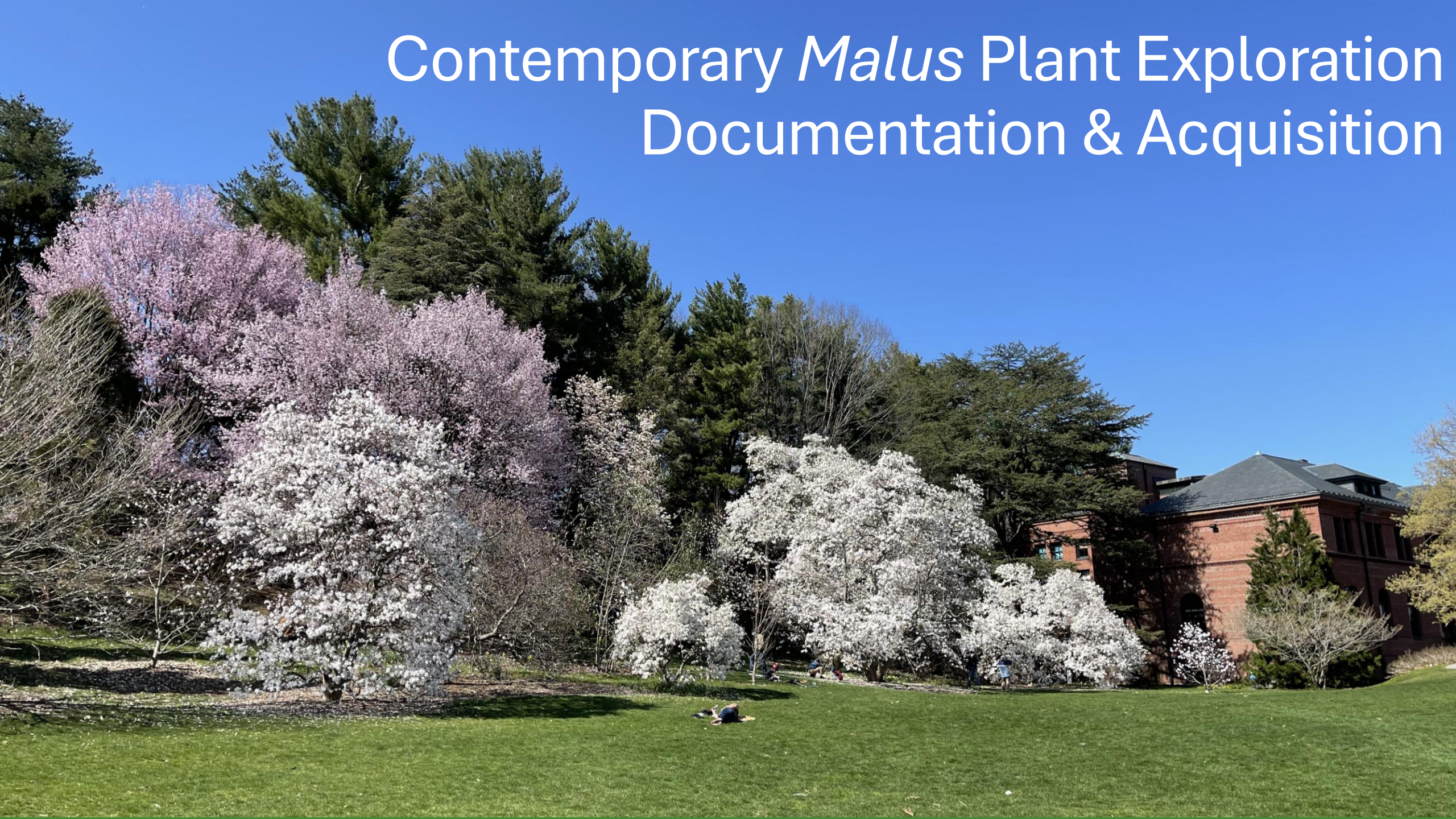
Karl Sax – Arnold Arboretum 3rd Director
Plant Breeder & Cytologist

Malus CV Introductions = 17

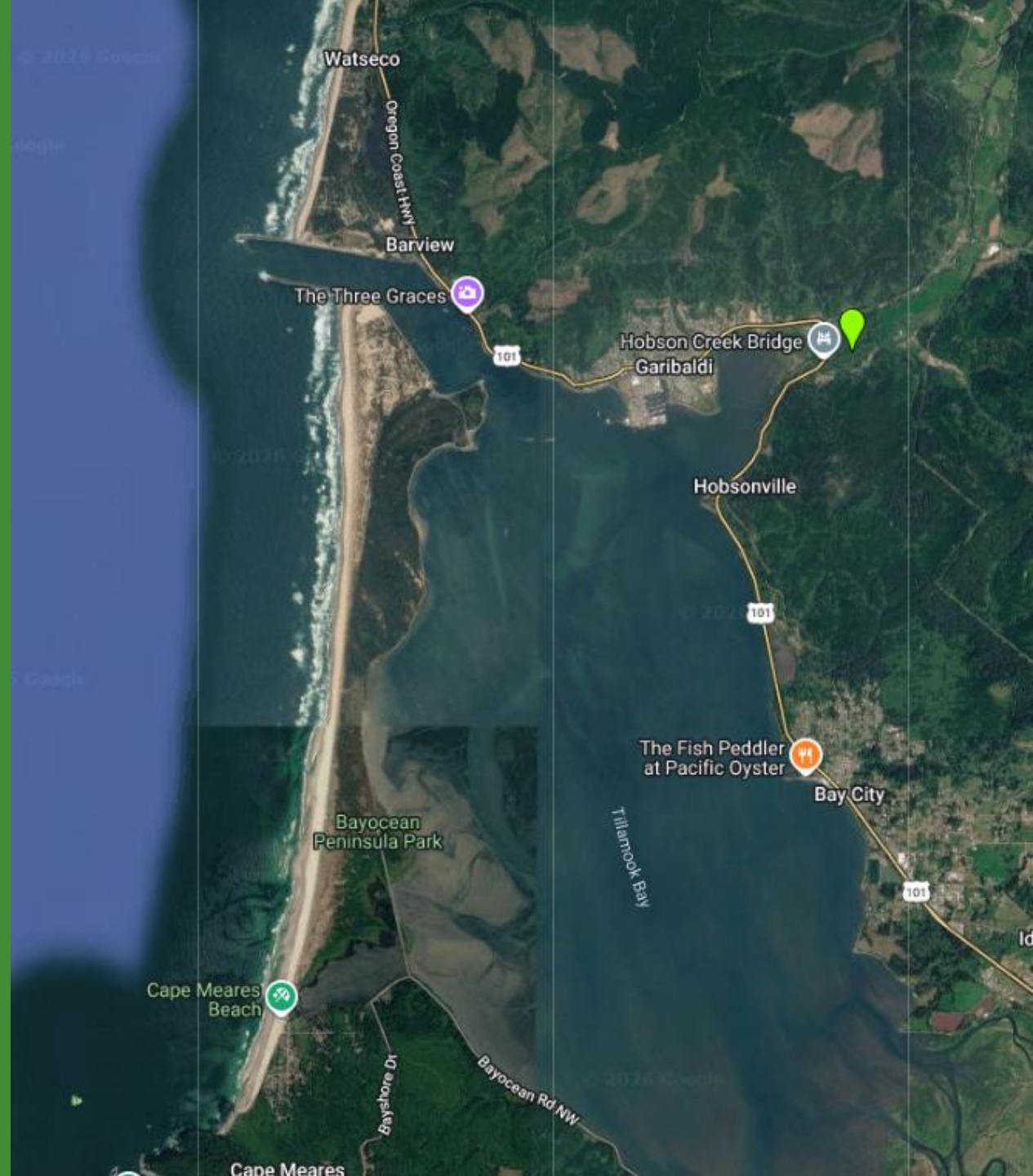
- M. ‘Barbara Ann’
- M. ‘Dorothea’
- M. ‘Henrietta Crosby’
- M. Henry F. DuPont’
- M. ‘Katherine’
- M. ‘Pink Pearl’
- M. ‘Blanche Ames’
- M. ‘Bob White’
- M. ‘Donald Wyman’
- M. ‘Mary Potter’
- M. ‘Prince Georges’
- M. baccata ‘Columnaris’
- M. baccata ‘Jackii’
- M. ioensis ‘Palmeri’
- M. x robusta ‘Erecta’
- M. sargentii ‘Rosea’
- M. x zumi ‘Calocarpa’

chael Dosmann; Malus 'Mary Potter' 181-52*B at the Arnold Arboretum

Contemporary *Malus* Plant Exploration Documentation & Acquisition



Malus fusca
Oregon, 2023



Dr. Hiroyuki Iketani

- Okayama University of Science
- NARO (National Agriculture & Food Research Organization
- Wild Apple and Pear geneticist

Studies wild apple genetic resources in Japan:

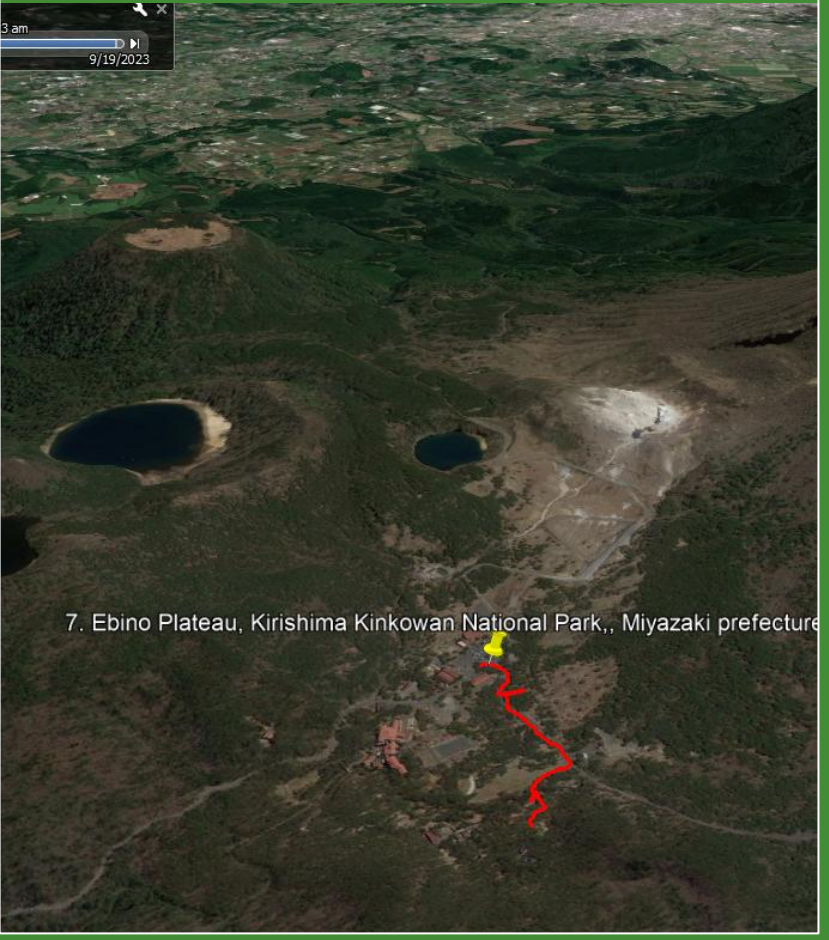
- *Malus toringo*
- *Malus hupehensis*
- *Malus roseotakanabensis*
- *Malus spontanea*
- *Malus tschnoskii*

Malus spontanea

Endangered Apple Species

2012 = 296 individuals in population

Entire population thought to be apomictic clones (Iketani et al. 2026)



Japan 2023
Kirishima Kinkowan National Park

Last eruption = June 22, 2025

Malus spontanea

22 unique lineages grown from seed in the living collection at Arnold Arboretum

spontanea 10796-1*A at the Arnold Arboretum
vs of Harvard College

Susan Hardy Brown; Malus spontanea 49-98*A at the Arnold Arboretum
© 2008 President and Fellows of Harvard College

Malus hupehensis

China Mainland species

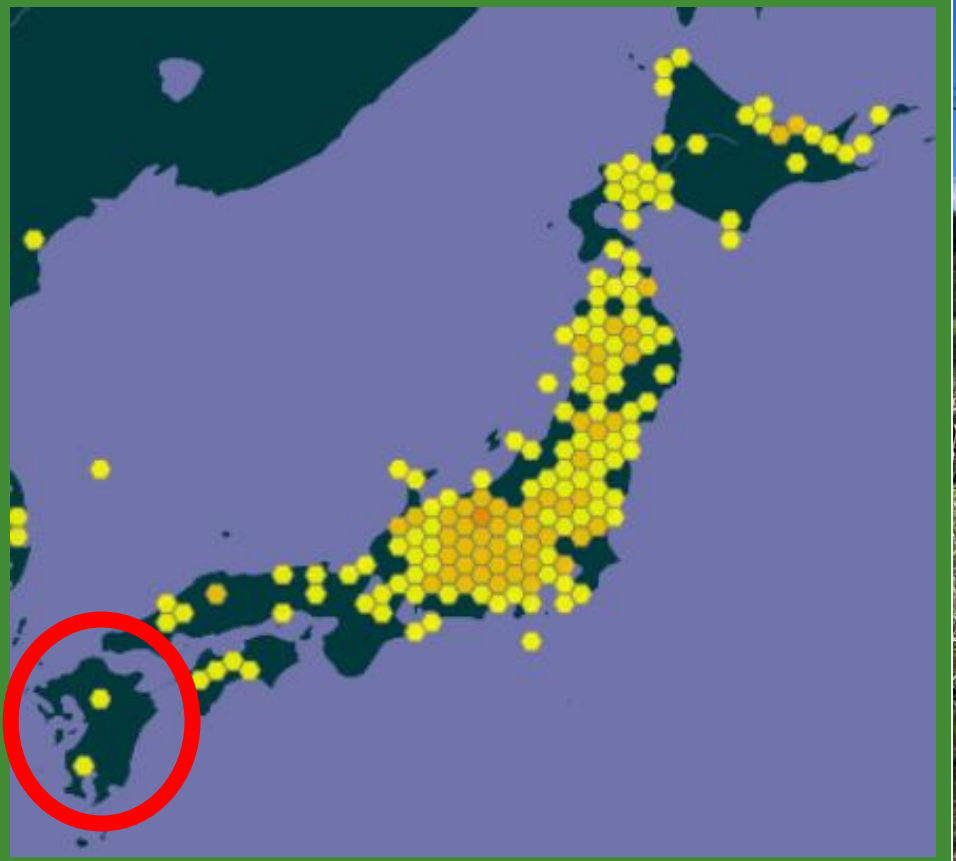
Only known wild population in Japan

Iketani, H., & Mase, N. (2016). Collection of wild and cultivated rare Malus genetic resources in Northern Kyūshū, Japan. *Annu. Rep. Explor. Introd. Plant Genet. Res*, *31*.

Malus sieboldii (syn. = Malus toringo)

Only two known populations in Kyushu

Collections made at both sites in 2024



Malus roseotakanabensis

The newest described apple species to science as of August 2024 – Extinct in the wild

IKETANI, H., & MINAMITANI, T. (2024). Malus roseotakanabensis (Rosaceae), an Extinct-in-the-wild Small Tree Newly Described from Miyazaki Prefecture, Japan. *The Journal of Japanese Botany*, *99*(4), 211-220.


町木
タカナベカイドウ
TAKANABE KAIDOU
知ってる？

Malus hupehensis

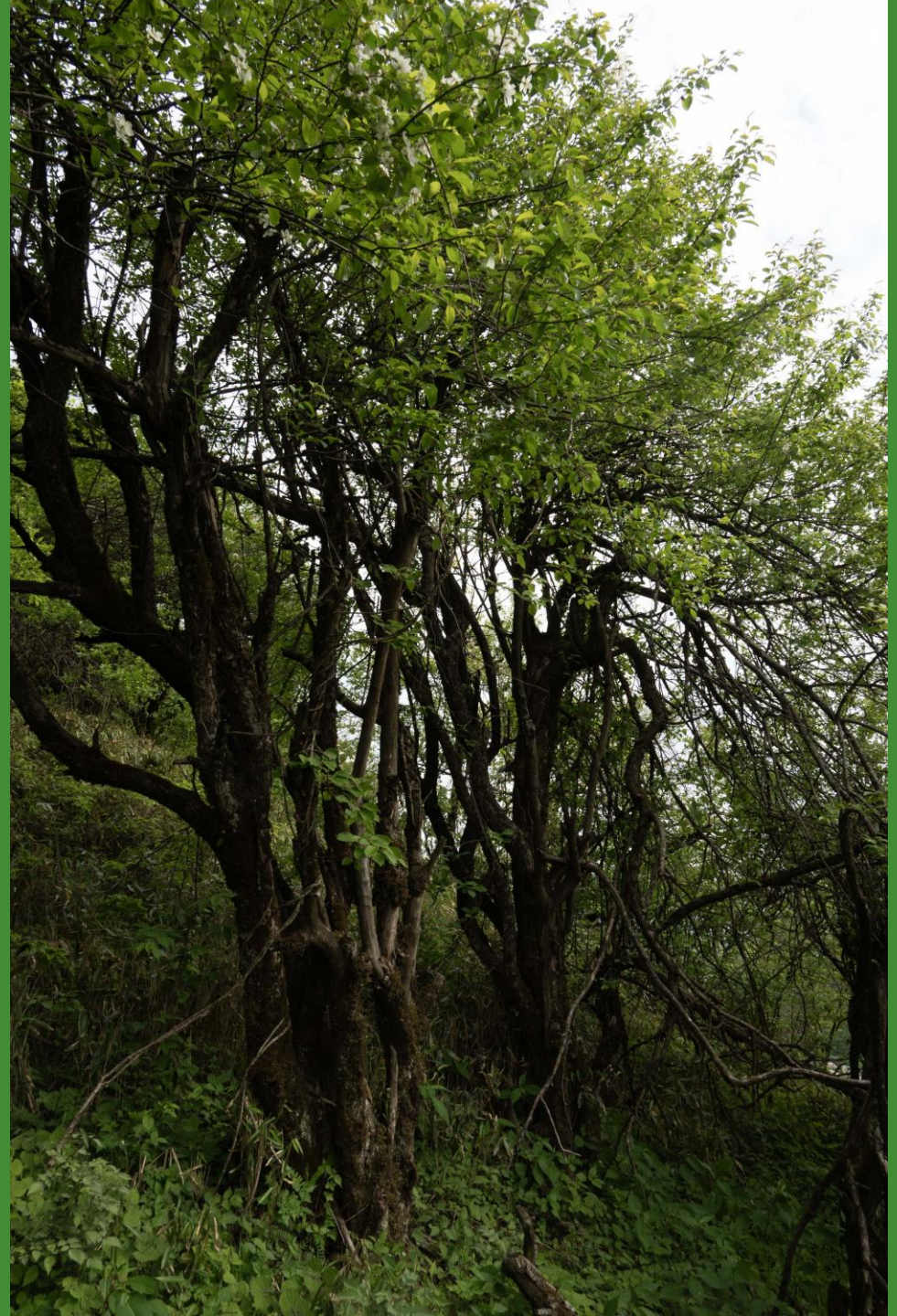
Conserved through cultivation

Wild collected

Planted grove


Malus hupehensis forest
Shennongjia, Hubei China 2025

Malus hupehensis
Shennongjia, Hubei China 2025

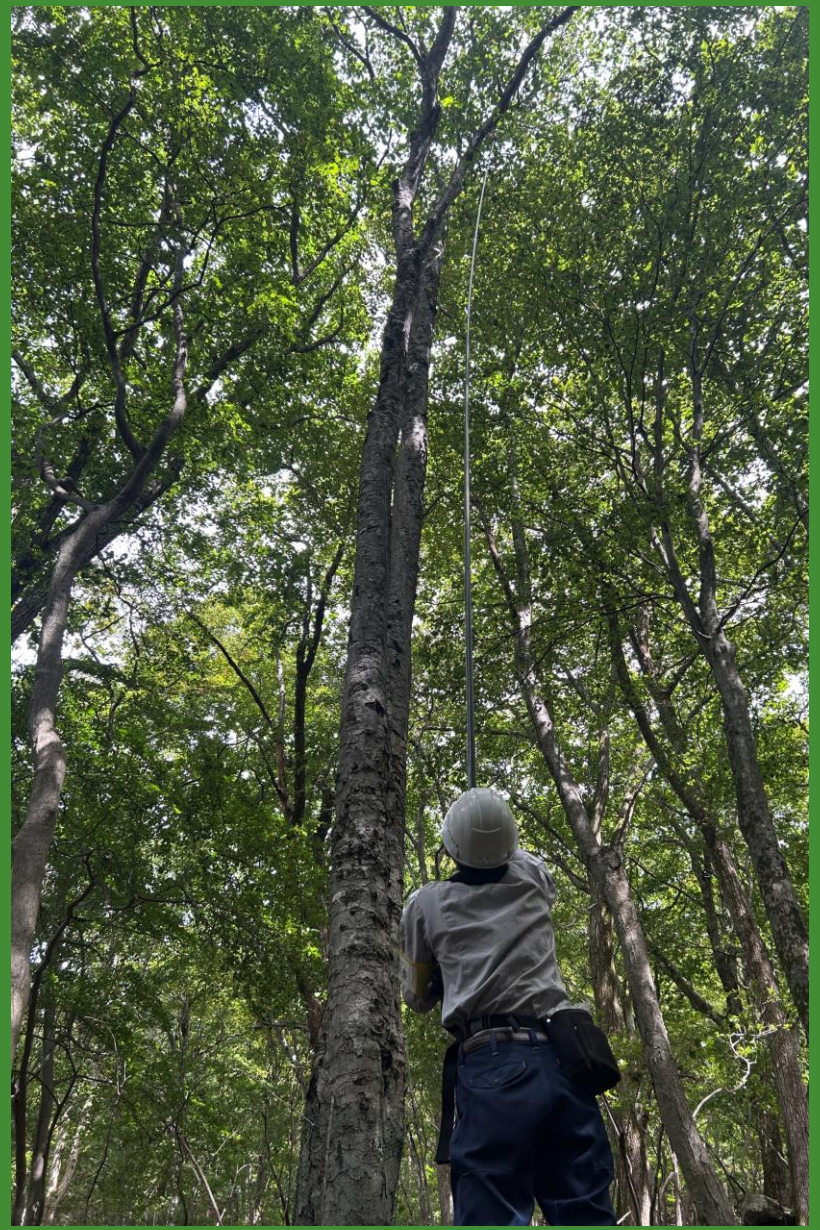


Malus kansuensis
Taibai Shan, Shaanxi, China 2025

Malus sieboldii = *Syn. M. toringo*

Nikko, Japan - 2025

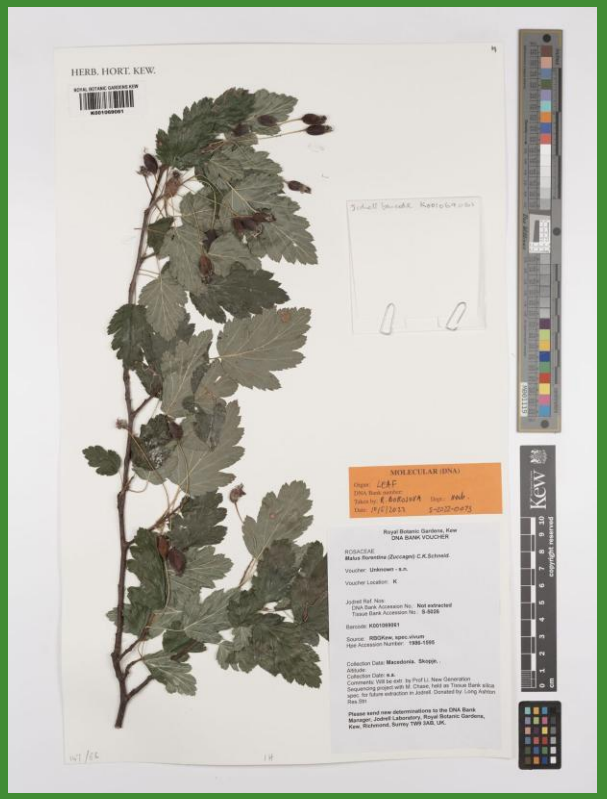
Malus tschonoskii – 2025 Mt. Takahara, Japan



Future Targets

Malus trilobata - Greece

Malus florentina - Italy



Priorities

- Documentation of populations
- Collect germplasm
- Rare and endangered species
- Species underrepresented in collections
- Pest and disease resistance
- Researcher access & scholarship

Work Cited

- Iketani, H., & Mase, N. (2016). Collection of wild and cultivated rare Malus genetic resources in Northern Kyūshū, Japan. *Annu. Rep. Explor. Introd. Plant Genet. Res*, *31*.

- Iketani, H., Inoue, N., Kuroiwa, N., & Iwatsubo, Y. (2020). Rediscovery of Malus hupehensis (Rosaceae) from Oita Prefecture, Kyushu, Japan.

- IKETANI, H., & MINAMITANI, T. (2024). Malus roseotakanabensis (Rosaceae), an Extinct-in-the-wild Small Tree Newly Described from Miyazaki Prefecture, Japan. *The Journal of Japanese Botany*, *99*(4), 211-220.

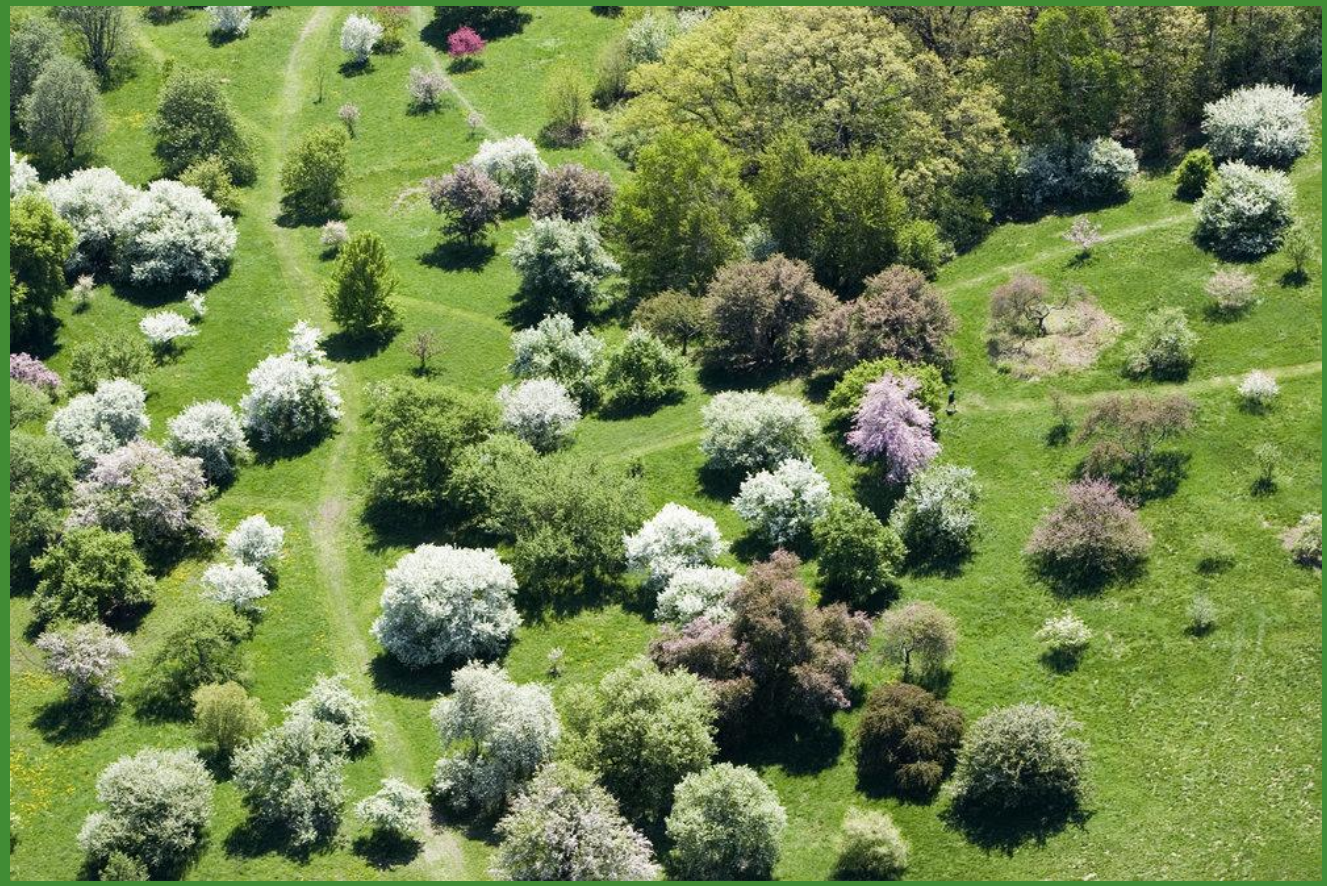
- Iketani, H., Nakao, T., & Mase, N. (2026). Estimated Clonality of Malus spontanea (Rosaceae), an Endangered Tree in Kirishima Mountains, Kyushu, Japan. *The Journal of Japanese Botany*, *101*(1), 43-51.

- M. Schwartz Sax (2025). The Majesty of Malus roseotakanabensis. Arnoldia Vol 82, Issue 1

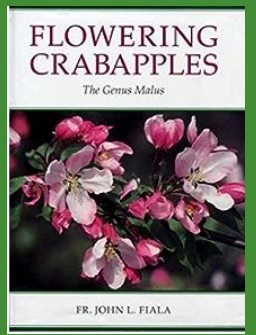
Extra slides

The “Mother Arboretum” of flowering Crabapples

Arnold Arboretum- Meadow circa 1940



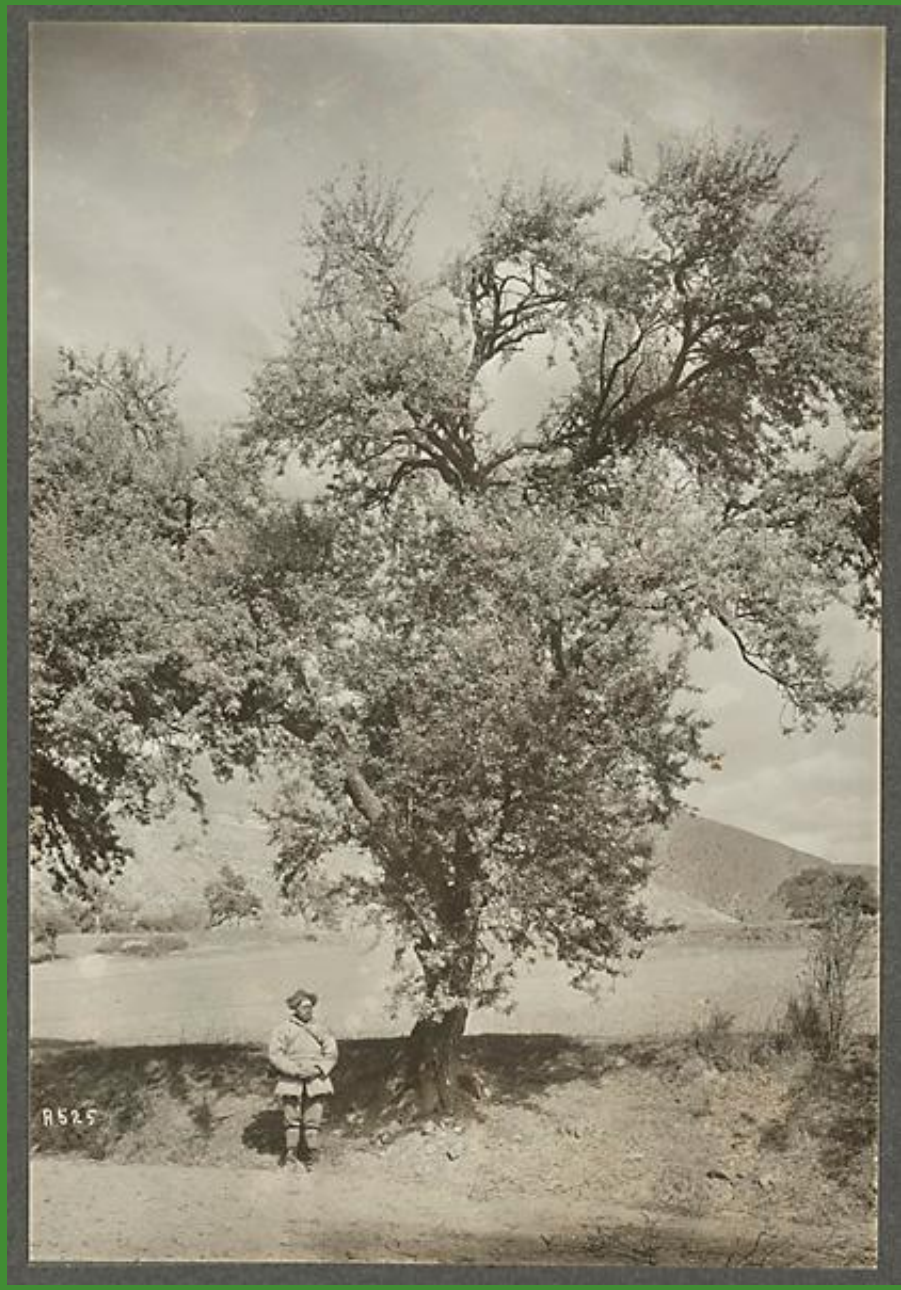
Aerial photo of Crabapple Collection



“No horticultural institution did as much for introducing and discovering new species, varieties, or special clones [of *Malus*] as did the Arnold Arboretum.” From The Flowering Crabapple by John Fiala, 1994

Plant Exploration – *Malus spp.*

- **East Asia = 130 unique lineages**
  - C.S. Sargent (1892-1904) = 33 unique Lineages
  - E.H. Wilson (1907-1919) = 18 unique lineages
  - J.F. Rock (1926-1927) = 4 unique lineages
  - J.G. Jack (1904-1905) = 6 unique lineages
  - Sino-American Botanical Expedition (1980) = 51 unique lin.
- **North America = 73 unique lineages**
  - E.J. Palmer (1923-1958) = 8 unique lineages
  - T.G. Harbison (1910-1921) = 18 unique lineages
- **Central Asia = 38 Unique lineages**
- **Europe = 10 Unique lineages**



***Malus transitoria* - Gansu China 1926 by Joseph Rock**

Sino-American Botanical Expedition (SABE) 1980

- Joint Chinese-American team of 13 botanists from 9 Institutions
- Shennongjia Forest District, Hubei Provence
- 621 Germplasm Collections
- 51 Lineages of *Malus* in Liv. Col.
- Malus collected
  - *M. baccata*
  - *M. halliana*
  - *M. hupehensis*
  - *M. kansuensis var. calva*
  - *M. yunnanensis*
  - *M. yunnanensis var. veitchii*

Malus baccata (1843-80*H)

Malus baccata (1843-80*J)

eng Li; Malus baccata 1843-80*D at the Arnold Arboretum

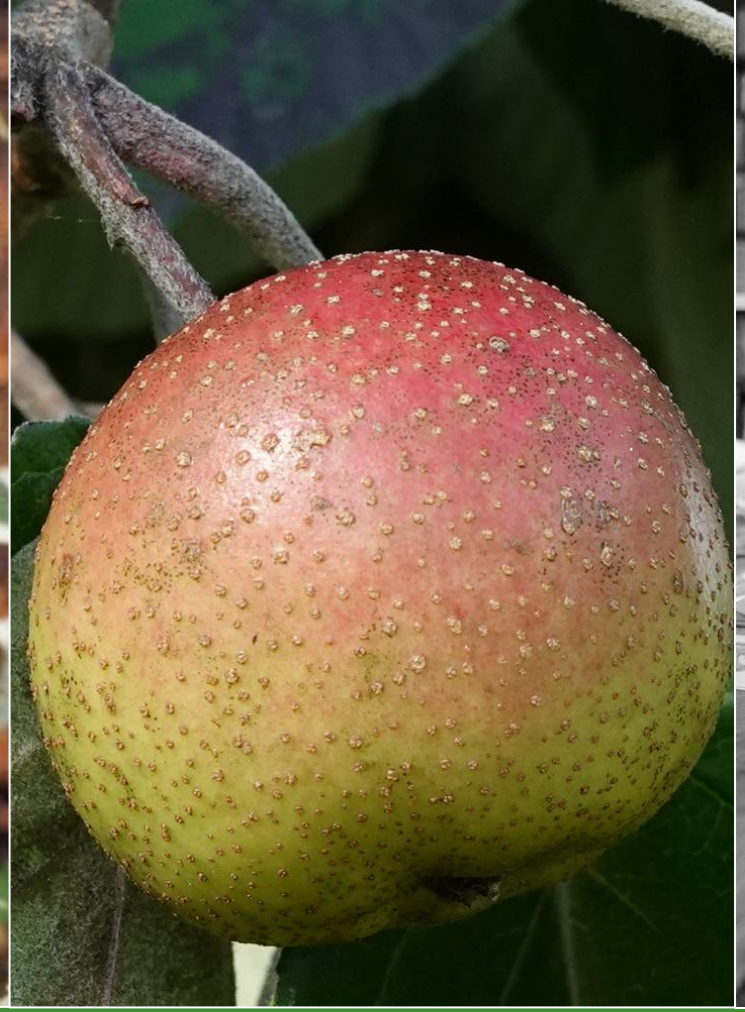
Malus baccata (1843-80*D)

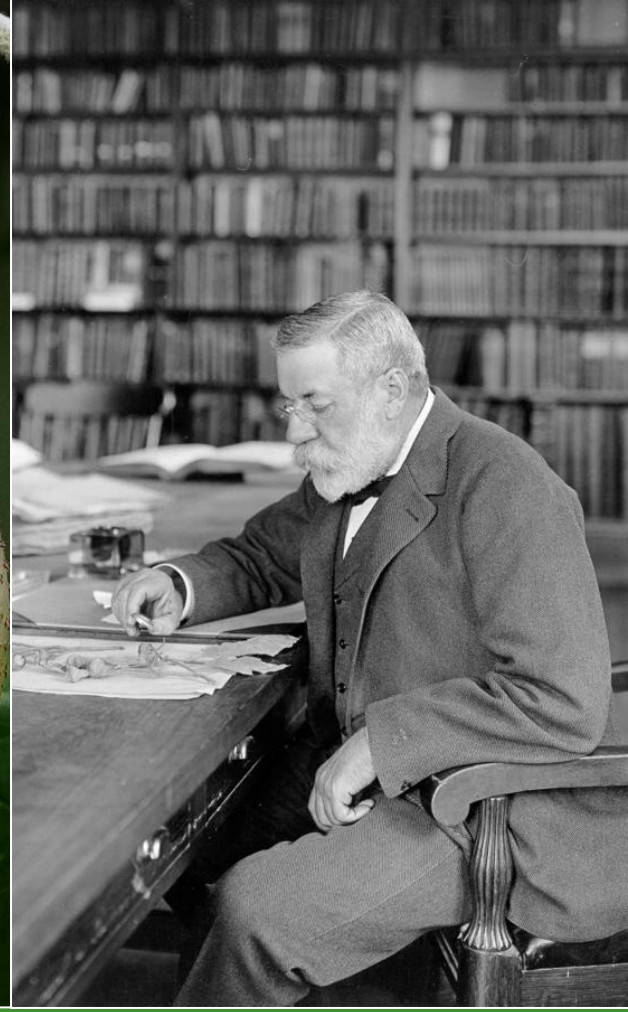
Collecting by
C.S. Sargent

Malus sargentii

Japan 1892

gentii 286-89*A at the Arnold Arboretum
ws of Harvard College

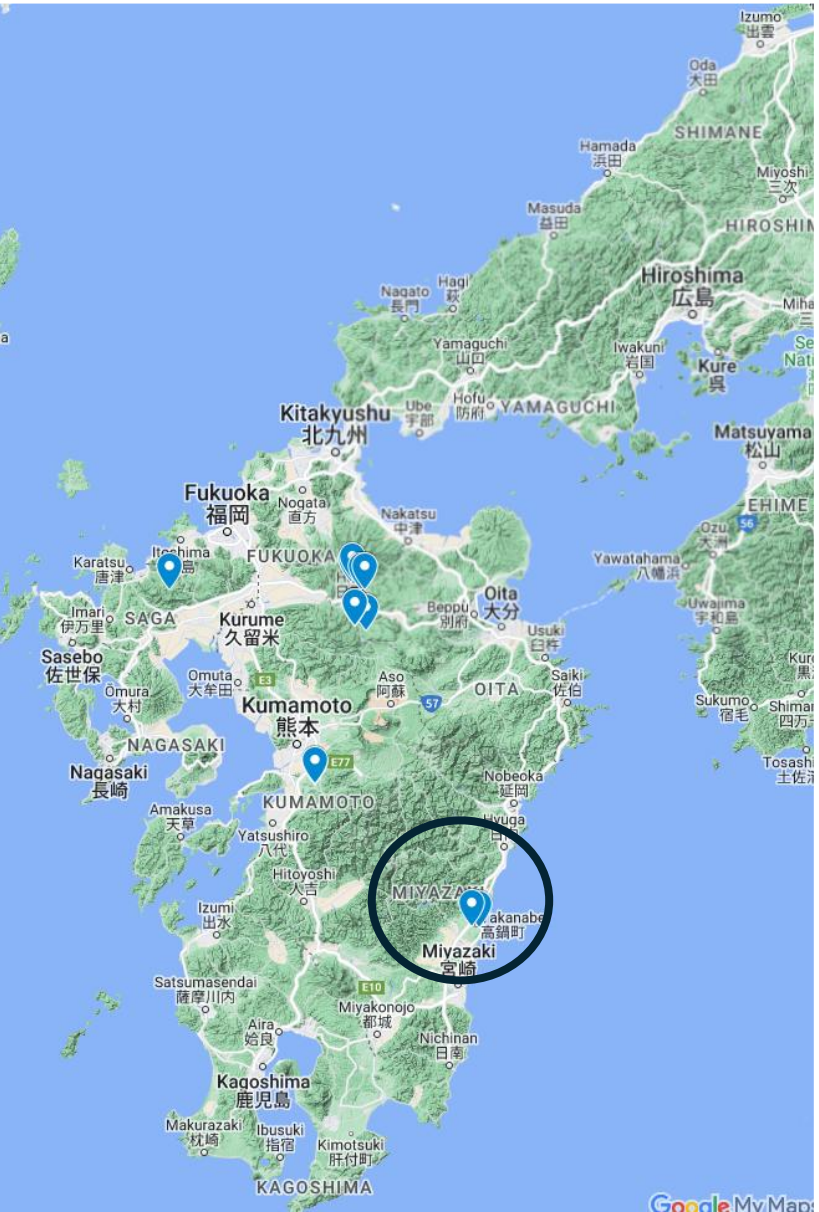




Collecting by
Charles Sprague Sargent

Malus tschonoskii
syn. = Macromeles tschonoskii
Japan 1892

Takaniba


Izumo
出雲
Oda
大田
SHIMANE
Hamada
浜田
Miyoshi
三次
Masuda
益田
HIROSHIMA
Hiroshima
広島
Nagato
長門
Hagi
萩
Yamaguchi
山口
Iwakuni
岩国
Kure
呉
Ube
宇部
Hofu
防府
YAMAGUCHI
Kitakyushu
北九州
Matsuyama
松山
Fukuoka
福岡
Nogata
直方
Nakatsu
中津
EHIME
Ozu
大洲
Itoshima
糸島
FUKUOKA
Karatsu
唐津
Yawatahama
八幡浜
Imari
伊万里
SAGA
Kurume
久留米
Beppu
別府
Oita
大分
Uwajima
宇和島
Usuki
臼杵
Sasebo
佐世保
Omuta
大牟田
Aso
阿蘇
OITA
Saiki
佐伯
Omura
大村
Kumamoto
熊本
Sukumo
宿毛
Shimanto
四万十
NAGASAKI
Nagasaki
長崎
Tosashimizu
土佐清水
Nobeoka
延岡
KUMAMOTO
Amakusa
天草
Yatsushiro
八代
Hyuga
日向
Hitoyoshi
人吉
MIYAZAKI
Izumi
出水
Takanabe
高鍋町
Miyazaki
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Satsumasendai
薩摩川内
Miyakonojo
都城
Aira
姶良
Nichinan
日南
Kagoshima
鹿児島
Makurazaki
枕崎
Ibusuki
指宿
Kimotsuki
肝付町
KAGOSHIMA
Google My Maps

Malus spontanea

Endangered

Kirishima mountain, Kyushu, Japan

Collected in 1918 by E. H. Wilson

Sharing of germplasm

- V_f Gene = Most studied & commonly used scab resistance gene in apple
- Identified from a seed of *Malus floribunda* (#821) sent from Arn. Arb. to Univ. of Illinois in 1908
- Disease resistance identified in 1940.
- Used in PRI (Purdue-Rutgers-Illionis) apple breeding program since

Malus floribunda at Holme Lee, 1st Director C.S. Sargent's Estate

Pyrus calleryana

Approx. 100 years old