

## Mistaken Identity: Correcting the Conflation of *Malus* ‘Virginia Crab’ with *Malus* ‘Hughes Crab’

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**Additional index words:** Hard cider, heirloom, cultivar, vintage fruit

### Abstract

Genetic analysis of *Malus* ‘Virginia Crab’ (PI 589324) has revealed this widely planted crabapple to be a triploid hybrid of *Malus* ‘Manchurian’ (PI 588989) and an unknown second parent. The ‘Virginia’ crabapple (PI 589324) has widely been assumed to be synonymous with ‘Hughes’ a.k.a. ‘Hewes’ crabapple of Virginian origin, historically revered for cidermaking in America since the early eighteenth century. The authors present phenotypic, genetic, and historical evidence that ‘Virginia Crab’ and ‘Hughes Crab’ represent two distinct genotypes. It is unclear at this time if the true-to-type ‘Hughes Crab’ is still extant, and if so, where it is held.

### Introduction

Alcoholic or “hard” cider is a beverage made from the fermented juice of apples and crabapples (*Malus* spp. and hybrids). Certain *Malus* cultivars have for centuries been grown specifically for the positive organoleptic attributes they confer to a cider, such as mouthfeel, aroma, and acidity (Karl et al. 2022; Lea and Drilleau 2003). Many cider apples are also valued for their high juice extraction volume, or alternatively, the richness of their juices in sugars and mucilage. Seedlings which combine these attributes to the satisfaction of cidermakers have been given names by farmers and pomologists, and propagated by grafting, for many centuries.

One such apple prized by American cidermakers and orchardists, is the ‘Hughes’ (or ‘Hewes’) crabapple of Virginia. We will use the older spelling ‘Hughes’ unless directly quoting a source with an alternate spelling. With the possible exception of the ‘Harrison’ of New Jersey, no cider apple has been so revered by American pomologists and cidermakers for its superior cidermaking qualities. ‘Hughes Crab’ cider has held a special place among American fruit wines since long before the American Revolution. In 1744, a county court in the North Carolina colony set the price of “Hughes Crab Cider” at ten shillings per gallon, twice that of other ciders (Winston 1904).

In 1755, “Hughs’s Crab” trees were advertised for sale in Surry Co., Virginia (Smith 1755). In 1763, a tract of land containing an orchard of “150 Hughes’s [sic] crabs beginning to bear” was advertised for sale near Charles City, Virginia (Brooks 1763).

The revolutionary generation likewise revered this crabapple. Congressman Henry Wynkoop of Pennsylvania wrote that, “The Virginia [i.e., the Hughes] crab is the best apple for making cyder, within my knowledge” (Wynkoop 1812). President Thomas Jefferson recalled the “Hughes’s crab apple” being “a common apple on [the] James River” before 1754 (Jefferson 1814), and devoted part of his North Orchard to it at Monticello (Hatch 1998). According to former Secretary of State Timothy Pickering (1814), a Mr. West of Virginia recalled “an orchard, consisting wholly of Hughes’s crab, which was planted when he (Mr. West) was a boy” in the 1710s.

Based on the aforementioned historical evidence, it is likely that the ‘Hughes Crab’ of Virginia originated in early 18th century or perhaps even the late 17th century. One Kentucky newspaper attributed the discovery to “a gentleman named Hughes” who found it “growing in a thicket in Virginia” (N.A. 1870) but that is the extent of current knowledge about the origins of this revered American cider cultivar. The reputation and stature of ‘Hughes Crab’ was

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resurrected during the American hard cider revival. A 2021 survey of the North American cider industry found it to be one of the top dozen most widely reported cider cultivars used by commercial cidemakers (Zakalik & Peck 2023). How many cidemakers have the true ‘Hughes’, as opposed to a confusingly named imposter, is less clear.

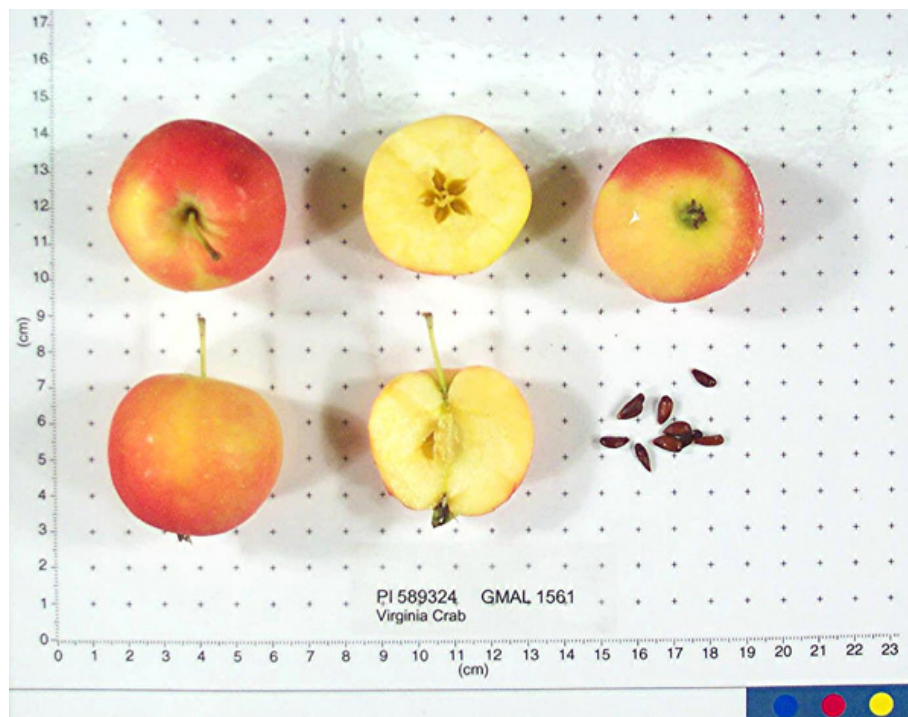
Due to the tendency of many American cider producers to refer to ‘Hughes’ as “Virginia Crab” colloquially, a distinct cultivar called ‘Virginia Crab’ or simply ‘Virginia’— currently held by the USDA as PI 589324 (NPGS 2025a)— has been conflated with the true ‘Hughes Crab’ in the decades since the hard cider industry’s revival in the United States. However, recent genetic analysis of the USDA’s ‘Virginia Crab’ (PI 589324) revealed this accession to be a triploid hybrid of *M. baccata* (Howard et al. 2023). Given historical descriptions of ‘Hughes Crab’ as originating sometime in the 1710s or earlier (see above), the true-to-type ‘Hughes’ is highly unlikely to be a hybrid of *M. baccata*, which is endemic to Eurasia, and is not attested as being cultivated in the United States until much later. The aforementioned primary sources from the 18th and 19th centuries likewise make no mention of either the tree or fruit of ‘Hughes Crab’ resembling the Siberian Crab. Fur-

thermore, the Passport Narrative for ‘Virginia Crab’ (PI 589324, Figure 1) in the USDA’s GRIN-Global database entry makes no mention of the name “Hewes”, “Hughes”, or any variation thereon, and further, makes no mention of ‘Virginia Crab’ being used for cider, historically or otherwise (NPGS 2025a). PI 589324 ‘Virginia Crab’ is described simply as “An indicator for Apple Stem Grooving Virus [...] Of interest only as a horticultural oddity.”

In this paper, we will describe and compare these two cultivars and provide evidence that ‘Virginia Crab’ (USDA accession PI 589324) is *not* the ‘Hughes Crab’ of Virginia, but a confusingly named triploid hybrid of *M. baccata* which likely originated more than a century after the true ‘Hughes’.

### Materials and Methods

**Genomic Analysis.** In 2019, leaf samples of a putative ‘Hughes Crab’ were collected from the Cornell University research orchard at Ithaca, NY, along with ‘Virginia Crab’ (PI 589324, Figure 1) from the USDA *Malus* collection at McCarthy Farm, Geneva, NY (NPGS 2025a). In 2024, leaf samples were also collected from several putative “Hewe’s [sic] Crab” trees at Monticello, which has



**Figure 1.** USDA-ARS photo of PI 589324 ‘Virginia Crab’. Source: <https://npgsweb.ars-grin.gov/gringlobal/ImgDisplay?id=1014684>.

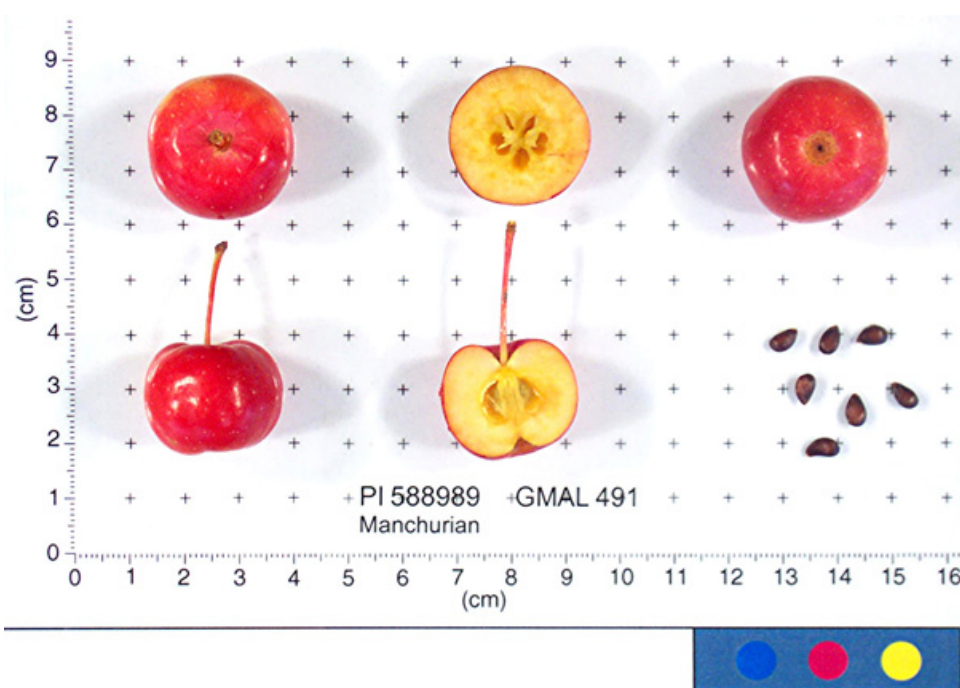
been a budwood source for many nurseries and orchards in the American South. These samples were all genotyped and assessed for ploidy through the My Fruit Tree genetic testing service (<https://my-fruittree.org/>) using methods described by Howard et al. (2023) and Vanderzande et al. (2019). *Harvest.* Pre-harvest fruit maturity was assessed by starch pattern index (SPI) for each cultivar to determine appropriate harvest dates (Blanpied and Silsby 1992); fruit were harvested at an SPI of 7–8, indicating full starch hydrolysis and peak ripeness for cidermaking purposes.

*Juice Extraction and Chemical Analysis.* Fruit was diced and then milled in a Norwalk 290 (Bentonville, AR, USA) hydraulic tabletop juicer into Good Nature (Buffalo, NY, USA) filter bags, which were then pressed on the Norwalk 290 until the stream of juice discontinued. This method closely mimics a typical “rack and cloth” cider press. Juice samples were then aliquoted into sample tubes and frozen at  $-20^{\circ}\text{C}$  or  $-80^{\circ}\text{C}$ . In 2018, pulp was weighed prior to pressing, and total juice yield was weighed subsequent to pressing.

Soluble solids concentration was measured on a PAL-1 BLT digital refractometer (Omaeda, Saitama, Japan). Titratable acidity was measured on a Metrohm 809 Titrando autotitrator (Herisau,

Switzerland) by titrating 5 mL juice aliquot in 40 mL ultrapure Milli-Q water (Darmstadt, Germany) against a standardized 0.1 M NaOH solution to an endpoint of pH 8.1. Acidity was reported as  $\text{g}\cdot\text{L}^{-1}$  malic acid equivalent (MAE) and initial pH. Samples for these analyses, stored at  $-20^{\circ}\text{C}$ , were thawed to room temperature and homogenized via VWR Analog Vortex Mixer (Radnor, PA, USA).

Total polyphenol concentration was measured using the Folin-Ciocalteu method (Singleton et al. 1999) on a Spectramax 384 Plus microplate spectrophotometer and SoftMax Pro 7 Microplate Data Acquisition & Analysis Software (Molecular Devices, San Jose, CA). Frozen ( $-80^{\circ}\text{C}$ ) samples were thawed, vortexed, and then centrifuged at 500 g for 8 minutes. Reaction mixtures consisted of 1.5  $\mu\text{L}$  of sample or standard, 34.9  $\mu\text{L}$  of water and 90.9  $\mu\text{L}$  of 0.2 N Folin-Ciocalteu reagent (Sigma Aldrich, Darmstadt, Germany); 72.7  $\mu\text{L}$  of 70  $\text{g}\cdot\text{L}^{-1}$  sodium carbonate buffer was added six minutes after the Folin-Ciocalteu reagent. Reaction mixtures were then incubated at room temperature in the dark. Reactions were carried out in Cellistar 96-well microplates (Greiner Bio-One, Monroe, NC, USA). Standards were generated using an eight-point standard curve with gallic acid from 0–3  $\text{g}\cdot\text{L}^{-1}$ . Samples were measured at 765 nm and total



**Figure 2.** USDA-ARS photo of PI 588787 ‘Manchurian’. Source: <https://npgsweb.ars-grin.gov/gringlobal/ImgDisplay?id=1006696>.

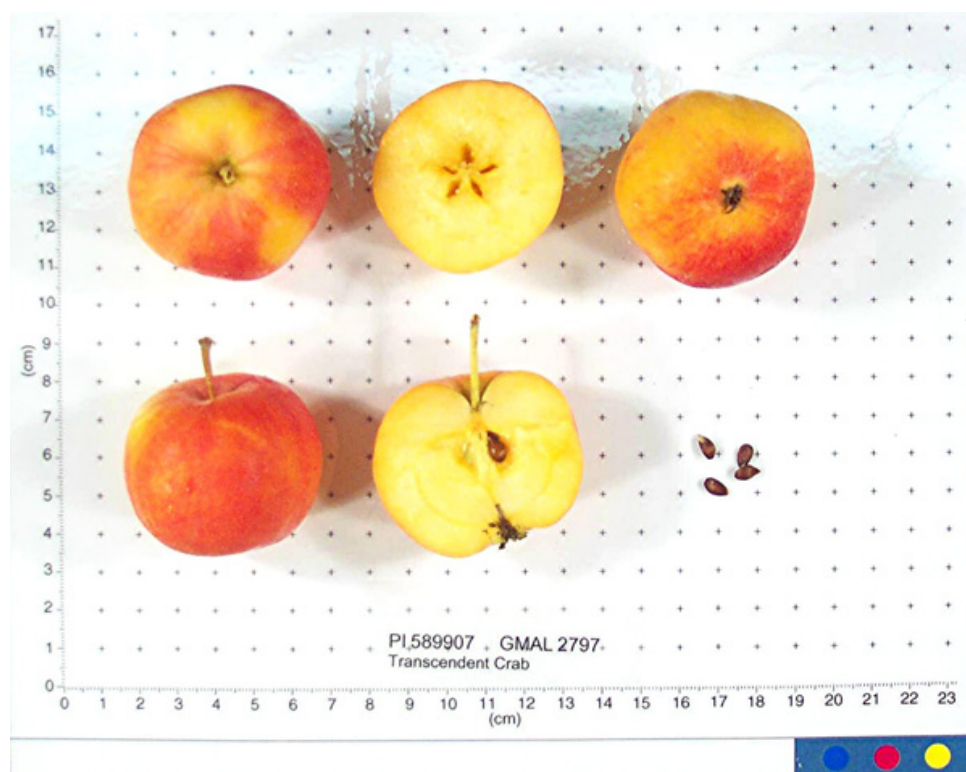
polyphenol concentration was determined by using the linear equations from the standard curve plot. *Historical Research.* In response to initial genetic findings for PI 589324 ‘Virginia Crab’, a literature search of biodiversitylibrary.org and hathitrust.org was performed, using the terms “Hughes Virginia Crab”, “Hewes Crab”, “Virginia Crab”, “Triploid”, and “Manchurian”. Several pomological texts were found containing relevant information about both ‘Hughes Crab’ and a separate crabapple cultivar, the ‘Virginia’. Relevant sources comprised plant breeding reports, nursery catalogues, unpublished USDA research notes, and horticultural society proceedings. An Optical Character Recognition (OCR) search of historical news articles on Newspapers.com was also performed for terms “Hughes Crab”, “Hewes Crab”, “Virginia Crab”, and “Cider.” From these sources, provenance and chain of custody were reconstructed for ‘Virginia Crab’ (PI 589324) and the true-to-type ‘Hughes’ a.k.a. ‘Hewes’ crab.

### Results and Discussion

*Genetic Testing.* The putative ‘Hughes Crab’ at the Cornell Orchard, and the USDA’s ‘Virginia Crab’

(PI 589324) were both found to be genetically identical, and further, triploid ( $3n = 51$ ). One parent was identified as the small-fruited ornamental crabapple cultivar ‘Manchurian’ (PI 588989; Figure 2), which is the parent of several other crabapples, and which is itself a hybrid of *M. baccata* (Borkh.) with an unknown second parent (NPGS 2025b). The putative “Hewe’s [sic] Crab” trees at Monticello were likewise all found to be a match for the triploid *M. baccata* hybrid PI 589324.

*Comparison of Harvest Dates for PI 589324 with Historic Data on Hughes/Hewes Crab.* Historical harvest dates from the USDA’s Variety Apple Orchard, at the Arlington Experimental Farm in Rosslyn, VA (found in the literature search), were compared with the dates on which we harvested the same cultivars from the USDA’s *Malus* collection at Geneva, NY. Harvest dates at Geneva, part of a larger multi-year cider-focused germplasm study (Krishna Kumar et al. 2021; Wojtyna 2018) were chosen based on weekly ripeness testing as described above. We selected two other cultivars as controls, reported by Caldwell (1928) and Gould



**Figure 3.** USDA-ARS photo of PI 589324 ‘Transcendent Crab’. Source: <https://npgsweb.ars-grin.gov/gringlobal/Img-Display?id=1021943>

**Table 1.** Harvest dates of fruits grown at the USDA Apple Variety Orchard at Arlington Experimental Farm, Rosslyn, VA.

| Cultivar       | Reported Harvest Dates |                      |
|----------------|------------------------|----------------------|
|                | Caldwell (1928)        | Gould (1943a, 1943b) |
| 'Hewes'        | 3 Sep 1923             | 10 Oct 1925          |
|                |                        | 4 Oct 1927           |
|                |                        | 6 Oct 1931           |
| 'Transcendent' | 1 Aug 1922             | 15 Aug 1926          |
|                | 20 Aug 1923            | 14 Aug 1928          |
|                | 18 Aug 1924            | 13 Aug 1931          |
|                |                        | 18 Aug 1924          |
| 'Whitney'      | 26 Jul 1922            | 29 Jul 1925          |
|                | 2 Aug 1923             | 4 Aug 1927           |
|                |                        | 4 Aug 1928           |

**Table 2.** Juice composition data from a 2017–2021 study of the USDA's *Malus* collection at McCarthy Farm, Geneva, NY.

| Cultivar            | PI Number | Date Picked  | Soluble Solids Concentration (°Brix) | Titrateable Acidity (g/L MAE) | Folin-Ciocalteu Total Phenolics (g/L GAE) |
|---------------------|-----------|--------------|--------------------------------------|-------------------------------|-------------------------------------------|
| 'Virginia Crab'     | 589324    | 17 Sept 2019 | 18.0                                 | 7.95                          | 1.98                                      |
| 'Transcendent Crab' | 589907    | 22 Aug 2019  | 13.6                                 | 12.26                         | 1.79                                      |
|                     |           | 2 Sept 2020  | 13.6                                 | 7.91                          | 1.06                                      |
| 'Whitney Crab'      | 589908    | 4 Sept 2019  | 15.4                                 | 4.78                          | 0.64                                      |

(1943b), that are also currently held by the USDA at Geneva, NY, and compared harvest dates from the 1920s (Table 1) with our own from 2019 and 2020 (Table 2). These were 'Hewes' [sic] (Rosslyn only); 'Transcendent Crab' (Figure 3) and 'Whitney Crab' (both sites); and 'Virginia Crab' (Geneva only). Because juice chemistry data for 'Hughes' were only reported by Caldwell for the year 1923, when it was picked at Rosslyn a month earlier (3 September) than in subsequent years (early October), we determined that these data would not be dispositive or representative of 'Hughes' at optimal maturity for cidemaking. Presumably, the early harvest date in that first year of data collection was due to un-

familiarity with the cultivar's harvest phenology.

The harvest phenology of 'Hewes' [sic] at Rosslyn and of 'Virginia Crab' at Geneva differ markedly (Table 1). At Rosslyn, VA—where fruit would presumably ripen much earlier than in the cooler climate of Geneva, NY—'Hewes' [sic] was harvested in early October for the years 1925, 1927, and 1931 (Gould 1943a), while 'Virginia Crab' at Geneva was fully ripe (SPI 7–8) by the second week of September in 2019. If these two accessions were one and the same, the opposite would be expected.

The relative differences in harvest phenology compared to 'Whitney Crab' and 'Transcendent Crab' (both sites) also differed markedly between

‘Hewes’ [sic] (Rosslyn) and ‘Virginia Crab’ (Geneva). At Rosslyn, ‘Hewes’ [sic] was ripe almost two months after ‘Transcendent’ and ‘Whitney’ crabs (Table 1), while at Geneva, ‘Virginia Crab’ was ripe only thirteen days after ‘Whitney Crab’ and only twenty-six days after ‘Transcendent Crab’ (Table 2).

Other historic descriptions of the ripening period for ‘Hughes Crab’ in various regions of the U.S. differ markedly from the mid-September ripening time for ‘Virginia Crab’ (PI 589324) at Geneva, NY. Richard Platt (1803) of Flushing, NY wrote in a letter to former president John Adams, then president of the American Academy of Arts and Sciences, that “All late kinds of apples are best [for cider], for instance, Hughes’s [sic] Crab of Virginia, Redstreak, and other sound, hard fruit.” Platt’s description of ‘Hughes’ as a late-ripening, sound and hard variety, is quite different from our own observations of soft, easily bruised, and rather poorly storing ‘Virginia Crab’ harvested at Geneva and at the Cornell University Research Orchard at Ithaca, NY.

William Prince, proprietor of the famous Linnaean Botanic Garden in Flushing, NY listed the ripening season of “Hughes’ Virginia crab” as October and November (Prince 1822). James P. Henry (1873) of Arkansas listed “Hughes’ crab” among “good varieties for winter” in that southern state. Nurseryman and pomologist Joseph L. Budd (1870) of Shellsburg, Iowa wrote that Hewes’s season in that upper midwestern state was “November to January.” A nursery catalogue from Emporia, VA reports “Hughes’ [sic] Virginia Crab” being “used mainly for winter cider” (Lindley 1904). The catalogue for Franklin Davis Nursery Company in Baltimore, MD describes “Hewes’ [sic] Virginia Crab” as small and striped, with a season of “Oct. to Dec.” (n.a. 1914). The Missouri State Horticultural Society listed November as the ripening time for “Hughes’ Crab” (Tracy 1881). Even in Henry Country, TN, William H. Raiford (1834) noted that among cider apples suited to the south, the “Hugh’s [sic] crab [...] continues on the tree till frost, and is the best to keep in the winter of any.” Regardless of when it ripened in different climates, the true-to-type ‘Hughes’ or ‘Hewes’ crab was widely agreed to be a late-ripening, long-hanging, and well-storing cultivar.

Harvest dates for ‘Hewes’ at the USDA’s Rosslyn, VA orchard, recorded by division head Harris P.

Gould (1943a) were generally, as previously mentioned, in the first or second week of October. Gould’s crew also made a small study of the storing qualities of ‘Hewes’; they found that fruit harvested on 4 Oct 1927 and stored on 11 Oct were shriveled but “otherwise in good condition” when taken out of storage on 8 Feb 1928. Cox (n.d.) noted that the fruit “should be housed at least a fortnight before [being] ground.” This contradicts our observations of PI 589324 ‘Virginia Crab’ picked on 11 Sept 2021: it showed substantial splitting, softening, and rot by the end of October in cold storage. The same issues recurred in subsequent years. One highly experienced Virginia grower, when asked about when a putative ‘Hughes’ grown in their orchard, reported to us that, when harvested ripe, “this apple does not store well and tends to split in cold storage” (Private Comm. 2023).

*Comparison of Juice Quality and Fruit Appearance for ‘PI 589324’ with Historic Descriptions of Hughes/Hewes Crab.* Juice chemistry data for ‘Virginia Crab’ (PI 589324) harvested at Geneva in 2019 (Table 2) show a mildly acidic (~8 g/L MAE) and moderately tannic (~2 g/L GAE) juice. The authors’ own experience of biting into ripe fruit of PI 589324, as well as of drinking both raw juice and fermented cider thereof, indicate a well-balanced, subtly astringent variety of bright but not excessive acidity, hardly comparable to the historical descriptions of ‘Hughes’ as being harsh, highly acidic and astringent, listed below.

A USDA photo of PI 589324 ‘Virginia Crab’, taken in 2000 (Figure 1), was compared with two historical watercolors of ‘Hewes’ [sic] crabapple (Figures 4 and 5). Juice chemistry data for PI 589324 were also compared to historical descriptions of juice vintage qualities for true-to-type ‘Hughes’ found during the literature search.

The fruit of PI 589324 ‘Virginia Crab’ (Figure 1) has a golden-yellow background partially overlaid with a bright pink flush, with numerous white lenticels. The flush doesn’t exhibit much streaking. The calyx protrudes visibly, and the fruit is somewhat oblong-conical or globular in shape. Our own observations of fruit harvested at Ithaca and Geneva comport with the USDA’s photo (NPGS 2025a). A photograph of fruit from the aforementioned Virginia grower’s orchard likewise showed a slightly conical, mostly yellow crabapple



**Figure 4.** Watercolor illustration of “Hewes’ Crab” by Elizabeth Coxe McMurtrie. Source: Coxe McMurtrie, Elizabeth. n.d. *A View of the Cultivation of Fruit Trees: Atlas*. Special Collections, USDA National Agricultural Library. <https://www.nal.usda.gov/exhibits/speccoll/items/show/580>. This volume, intended as a companion volume to *A View of the Cultivation of Fruit Trees*, by William Coxe (father of the artist) was donated to the USDA in 1915 by the artist’s granddaughters, but the colored plates were likely done contemporaneous to the publication of Coxe’s *A View* (1817).

with only faint pink blush (Private Comm. 2023).

By contrast, Pickering (1814) wrote that “The Hughes’s [sic] crab that I have met with, have been nearly covered with dull red stripes”, and that the fruit was “very small, with long stems.” William Coxe (1817) likewise wrote, “This apple is of very small size; the form nearly round, the stem long and thin, the skin a dull red, mixed with faint streaks of greenish yellow, and numerous small white spots.” In an unpublished handwritten manuscript for an intended second edition of the same text, Coxe (n.d.) drafted a more extensive description of the “Hewes’s [sic] or Virginia Crab”, describing it as “very small round [and] flat...of a light green striped with dull red, of an extremely ~~harsh~~ [sic] astringent unpleasant taste.” Coxe’s daughter Elizabeth Coxe McMurtrie painted a color plate of ‘Hewes’ [sic] grown at Coxe’s farm (Figure 4) for an unpublished companion volume to his *A View of the Cultivation of Fruit Trees*. It shows a slightly flattened-round (oblate) apple of a dull red with faint yellow striping, with no visible calyx protrusion. Arnold’s (c. 1927) watercolor of ‘Hewes’ [sic] painted for the USDA (Figure 5) shows a likewise oblate apple with mostly dull red or slightly brownish red skin, with yellow around the numerous

dark lenticels. In cross-section, Arnold’s watercolor shows ‘Hewes’ having a slightly inset eye basin, out of which the calyx does not protrude. Pomologist Joseph L. Budd (1870) of Iowa published a description of the “Hewes’ Crab”, together with an engraving of it in cross section (Figure 6), in *The Western Pomologist*. Budd wrote that it “is striped with a dark dullish red upon a yellow ground,” and the accompanying engraving shows a slightly oblate apple with a depressed calyx basin out of which the calyx does not protrude. Catalogues for the Southern Nursery and Landscape Co. of Winchester, TN describe the



**Figure 5.** Watercolor illustration of ‘Hewes’ by Mary Daisy Arnold (c. 1927). Source: U.S. Department of Agriculture Pomological Watercolor Collection. Rare and Special Collections, National Agricultural Library, Beltsville, MD 20705. <https://handle.nal.usda.gov/10113/POM00003580>. No date given, but a 1927 record of ‘Hewes Crab’ at the USDA’s Variety Apple Collection at Alexandria, VA cross-references #109587, the image code associated with this watercolor.

**Table 3.** Chronological listing of putative ‘Hughes Crab’ and ‘Virginia’ (Foster) trees cited from historical sources.

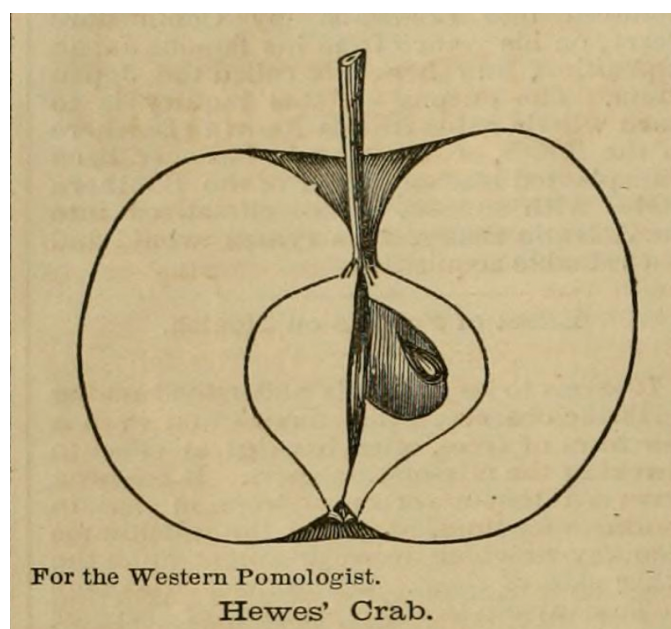
| Genotype          | Labeled As              | Year         | Location                                | Literature Source       |
|-------------------|-------------------------|--------------|-----------------------------------------|-------------------------|
| Virginia (Foster) | “Virginia”              | c. 1852–1868 | Suel Foster Nursery (Muscatine, IA)     | Richardson (1896)       |
| Hughes Crab       | “Hewe’s Virginia”       | c. 1852–1868 | Suel Foster Nursery (Muscatine, IA)     | Richardson (1896)       |
| Hughes Crab       | “Hewes’ Crab”           | 1869         | Charles Clark Farm (Hennepin Co., MN)   | Minn. Hort. Soc. (1873) |
| Virginia (Foster) | “Virginia Crab”         | 1869         | Charles Clark Farm (Hennepin Co., MN)   | Minn. Hort. Soc. (1873) |
| Virginia (Foster) | “Virginia Crab”         | 1946         | USDA Plant Intro. Stn. (Glenn Dale, MD) | Russell (1952)          |
| Virginia (Foster) | “Virginia Crab”         | c. 1963      | WSU Orchard (Prosser, WA)               | Fisher (1963)           |
| Virginia (Foster) | “Virginia Crab”         | 1986         | USDA NPGS (Geneva, NY)                  | Norris (1996)           |
| Virginia (Foster) | “Hewes Crab” (spurious) | 2019         | Cornell University (Ithaca, NY)         | —                       |
| Virginia (Foster) | “Virginia Crab”         | 2019         | McCarthy Farm (Geneva, NY)              | —                       |
| Virginia (Foster) | “Hewe’s Crab”           | 2024         | Monticello (Charlottesville, VA)        | —                       |

“Hughes’ Virginia Crab” as “Small; dull red; with white specks...with an acid, rough and stringent [sic] flavor” (Chattin 1924; Chattin 1929). Gould’s handwritten notes (1943a) describe the ‘Hewes’ fruit harvested from the USDA Variety Orchard at Rosslyn as “Oblate regular, sometimes indistinctly ribbed. Ground color yellow, nearly all over. Spread with red. Dots numerous, yellowish, both submerged and slightly raised, areola; light grayish overspread, some specimens it is heavy. [...] Very acid, very astringent.” In shape and color, PI 589324 does not match either the earliest or latest surviving descriptions or illustrations of the true-to-type ‘Hughes’.

*Further Analysis of Historical Descriptions of Hughes/Hewes Crab.* Several sources from the late nineteenth century explicitly distinguish between the ‘Virginia’ crab and the ‘Hughes’ or ‘Hewes’ crab of Virginia, though sources differ on the

former’s origins. At the second annual meeting of the Minnesota Horticultural Society in 1869, Charles H. Clark reported “that the Virginia Crab succeeded, while Hewes’ [sic] Virginian Crab winter-killed” in Hennepin County, MN (Minn. Hort. Soc. 1873). Clark also noted that the ‘Virginia Crab’ (i.e., not ‘Hughes’) “is the size of the Transcendent, yellow, with a blush,” and—for what’s it’s worth—that it “Makes excellent cider.” At that society’s 1878 meeting, a letter from F.G. Gould of Excelsior, MN was entered into the record, stating that the author “Hope[d] a new and better name may be adopted for the Virginia Crab. I do not believe it originated in Virginia” (Lacy 1878).

The ‘Virginia’ crabapple was, by the late nineteenth century, known to be a hybrid of the Siberian or Manchurian crabapple (*M. baccata*). Nurseryman C.W. Gurney (1894) of Nebraska reported that “of the most promising varieties and hybrids of



**Figure 5.** Cross-section of “Hewes’ Crab” as described by Joseph L. Budd. Source: *The Western Pomologist* 1(6):76. June 1870. Des Moines, Iowa.

the Siberian crabs [...] [t]he only crab we now pronounce valuable is the one known as Virginia crab.” At the 1895 meeting of the Iowa State Horticultural Society, Prof. Joseph L. Budd asserted “that what is known as the Virginia Crab is...the wild apple of Russia...it came from there to Virginia by the way of the botanical gardens at Kew” (Richardson 1896). At a later session that same day, plant breeder Charles G. Patten reported that the ‘Virginia’ crabapple “was found growing with the Hewe’s [sic] Virginia in the nursery of Suel Foster and attracted notice by its superior vigor, and being asked what it should be named, [Foster] called it Virginia”.

Professor Harvey L. Lantz (1938) of Iowa, on the other hand, wrote that “the Virginia Crab originated in eastern Iowa by N.K. Fluke,” while Filinger and Abmeyer (1961) of Kansas State University simply say that it originated in 1862.

Prof. Niels E. Hansen of South Dakota even made a cross between ‘Virginia’ and ‘Macintosh’, noting that the resulting offspring “combine[d] the high quality of the ‘McIntosh’ with Siberian hardiness, the ‘Virginia’ being part Siberian crab” (Hansen 1933). In a later discussion of Siberian and Manchurian crabapples as cold-hardy rootstocks, Hansen (1940) noted, “The large hybrid crabs often are poor seeders. The ‘Virginia’ crab is an example; cytological research shows it to be a triploid with 51 chromosomes”.

The historical record is quite clear: both Charles Clark and Suel Foster had ‘Virginia’ growing at the same site as ‘Hughes’ and drew explicit contrasts between the two. Professor Joseph L. Budd of Iowa also recognized ‘Hughes’ and ‘Virginia’ as distinct cultivars. The conflation of these two cultivars is thus, however frustratingly, explained. Hansen’s (1940) mention of ‘Virginia’ being a triploid hybrid of the ‘Manchurian’ crabapple matches Howard et al.’s (2023) genetic findings.

*Chain of Custody for PI 589324 ‘Virginia Crab’.* In December 1946, the USDA assigned PI 157044 to the Virginia Crabapple, held at the Glenn Dale, MD Plant Introduction Station (Russell 1952). As of 1963, Virginia Crabapple (PI 157044) was also held by Washington State University at Prosser, WA (Fisher 1963). In 1986, ‘Virginia Crab’ was donated from Prosser to the newly formed National Plant Germplasm System (Norris 1996) and assigned PI number 589324, which is the number currently assigned to ‘Virginia Crab’. A chronological list of the ‘Hughes Crab’ and ‘Virginia’ (Foster) trees enumerated above can be found in Table 3.

This same genotype is held under the name “Virginia Crab” in collections in Switzerland, Germany, France, and the United Kingdom (Unpublished Data, 2023). An internet search of the UK’s National Fruit Collection database, as well as those of Germany’s PGRDEU and France’s INRAE, does not return results for any *Malus* accession named either “Hughes” or “Hewes.”

*Status of True-to-Type Hewes.* It is unclear who in the world, if anyone, currently holds the true-to-type ‘Hughes Crab’. Further literature searches have not yet yielded evidence that the ‘Hughes’ held by the USDA from 1911–1940 still survives. We present the sum of our current knowledge below.

According to the records of curator Harris P. Gould (1943), the specimen of ‘Hewes’ [sic] depicted in the USDA watercolor (Figure 5) came from a tree in the Variety Apple Orchard at Arlington Farm, in Rosslyn, VA. Gould’s notes from the 1927 season cross-reference the USDA watercolor, meaning that image dates to 1927 or earlier. The tree was propagated from scions donated by Thaddeus Manning

Whitney of Fairfax Co., Virginia, who operated a cider mill in Washington, D.C. as early as 1880 and as late as 1919 (Haskin 1919). Arlington Farm closed in 1940; the site is now a parking lot at the Pentagon. The latest surviving nursery catalogue we could locate mentioning ‘Hughes Crab’ for sale, dates to 1929.

### Conclusion

Though no genetic profile currently exists for true-to-type ‘Hughes Crab’, genetic and phenotypic data nonetheless demonstrate that PI 589324 ‘Virginia Crab’ cannot be the historic ‘Hughes’ or ‘Hewes’ crabapple of Virginian origin. The question remains whether the true ‘Hughes’ is still extant, and if anyone claiming to have it in their orchard does indeed have it. Though far from the only cider apple whose status is uncertain, ‘Hughes Crab’ occupies a unique place as a cultivar of national cultural significance in the United States (Zakalik and Peck 2023). Given its cultural and historical importance, it is vital to ascertain who, if anyone, possesses the true ‘Hughes Crab’ rather than the triploid ‘Virginia Crab’. We strongly encourage growers and commercial nurseries to submit leaf samples for genotyping. If it cannot be conclusively proven that anyone currently possesses the true ‘Hughes’, it is a matter of national cultural import to try and locate any remaining specimens of this most beloved American cider cultivar. The threats posed by climate change, property development, and time in general, make the task all the more urgent.

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