

USDA Plant Collecting Expedition for Berry Crops

Virginia-West Virginia

21 to 31 August 2018



Fig. 1 (L-R) Jim Ballington, Paul Lyrene, Kim Hummer, and Jill Bushakra at Spruce Knob, 1,482 m (4863'), highest point in West Virginia. This location had a diversity of berry germplasm including two *Fragaria* species, 6 *Rubus* species, *Ribes rotundifolium* and 1 *Vaccinium* species. *Gaylussacia baccata*, the huckleberry species of the east, was also present.

Executive Summary

From to 21 to 31 August 2018, Dr. Jim Ballington (Emeritus Professor), North Carolina State University, Dr. Paul Lyrene (Emeritus Professor), University of Florida, Dr. Jill Bushakra, USDA, Corvallis, Oregon, and Dr. Kim Hummer, USDA, Corvallis, Oregon, collaborated on an expedition to collect berry genetic resources throughout the Appalachian Mountain regions of National Forests in Virginia and West Virginia. Permission for collection was obtained from US National Forest Service. The target genera for this expedition included crop wild relatives of blueberry, raspberry, blackberry, and gooseberry. During the course of the 10 days, 1250 miles were driven. The expedition obtained 64 accessions with 85 seed and plant samples from Monongahela, Washington, and Jefferson National Forests. A total of 7 genera and 21 species were collected. In addition, 30 voucher specimens were collected to be deposited in the US National Arboretum, Washington, D.C. The specialty crop genera collected included: *Fragaria*, *Gaultheria*, *Gaylussacia*, *Ribes*, *Rubus*, *Sambucus*, and *Vaccinium*. Some of the significant accessions collected included the both the diploid *F. vesca* subsp. *americana* and octoploid *F. virginiana* subsp. *virginiana* strawberries; blackberry relatives *R. hispidus* and *R. canadensis*; blueberry relatives *Vaccinium corymbosum* f. *constablaei*, *V. erythrocarpum*, *V. oxycoccus*, *V. macrocarpon*, and *V. simulatum*. After establishment, plant and seed accessions will be preserved at, and distributed for research from, the USDA ARS National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon. Morphological, molecular and taxonomic evaluation of this germplasm will be conducted following plant establishment in their respective institutions.

Primary Participants (Fig 1):

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19 November 2018

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540.626.7196 (arrangements for lodging at the station).

Introduction

The Appalachian Mountains of Virginia and West Virginia are rich ecosystems for berry crop wild relatives. Located in the middle of the eastern region of the United States, many species native to the Northeastern US have their furthest south distributions in these mountain areas, while Southeastern species have their most northern edges located here (Camp, 1945; Gleason, 1974; Uttal, 1987; Vanderkloet, 1988). This suggests that variants of the northern species may have some lower chilling types present, while southern species may have some cold hardy representatives.

Procedure

Dr. Kim Hummer arranged with Dr. Paul Lyrene, Dr. James Ballington and Dr. Jill Bushakra to participate in a plant collecting expedition in Virginia and West Virginia during August 2018. Prior to the expedition, discussions were made with the US Forest Service to collect on National Forest lands.

Hummer and Bushakra flew to Roanoke Airport, rented a car, and dove to Mountain Lake Biological Station. There they met up with Dr. Jim Ballington and Dr. Paul Lyrene on 21 August 2018. The itinerary is presented (Table 1).

Table 1. Itinerary

21 August 2018 Tuesday	Arrival in Virginia	Lodging Mountain Lake Biological Station
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19 November 2018

22 August 2018 Wednesday	Collecting in Dolly Sods Vicinity, West Virginia	Lodging Fort Hill Motel, Petersburg, WVA
23 August 2018 Thursday	Collecting in Dolly Sods Vicinity, West Virginia	Lodging Fort Hill Motel, Petersburg, WVA
24 August 2018 Friday	Collecting in Dolly Sods Vicinity, West Virginia	Lodging Fort Hill Motel, Petersburg, WVA
25 August 2018 Saturday	Collecting in Dolly Sods Vicinity, West Virginia	Lodging Fort Hill Motel, Petersburg, WVA
26 August 2018 Sunday	Collecting near Cranberry Glades, West Virginia	Lodging Mountain Lake Biological Station
27 August 2018 Monday	Drive to Wytheville, WVA	Lodging in Comfort Suites, Wytheville, VA
28 August 2018 Tuesday	Collect from Mt. Rogers Recreational Area, Grayson Highlands	Lodging in Comfort Suites, Wytheville, VA
29 November 2018 Wednesday	Collect from Mt. Rogers Recreational Area, White Top Mountain	Lodging in Comfort Suites, Wytheville, VA
30 August 2018 Thursday	Drive to MLBS	Lodging Mountain Lake Biological Station
31 August 2018 Friday	Return home	Leave from Roanoke Airport

Collection Permission

Email to Kim Hummer 21 August 2018

Hey there Kim, I apologize for the hold up on this. We are still tracking down where it fell through the cracks. Upon review of your proposal, given the nature of the collection request (berries and plant parts, not whole plant collection), and being part of USDA, you do not need a formal research permit from us. As long as you are not selling collected material (which I don't think you are), you do not need a formal collection permit either. We would normally put this information in a signed letter, but it would not get to you in time, because a key person who puts together the forms and letters for signature is currently out on a western fire assignment. So this email will serve as the needed information. Best of luck on your trip! If you need to collect again next year, I will most likely be your first contact (the botanist position is still vacant). After your initial request, if you do not hear from someone after a couple of weeks, please contact me again via email. We process several hundred research and collection requests a year. I am the initial contact for terrestrial wildlife and (right now) plant proposal, but there are several other folks who complete the rest of the process. I am not sure where it got lost and was not aware that it had not been completed.

Sincerely, Carol



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Inspection and Disposition of Samples

Oregon State Department of Agriculture will be notified of the shipment. Plant material will be available to ODA inspectors. The plant material was propagated and placed in the domestic quarantine greenhouse (GH04, Room 01) at NCGR-Corvallis according to on-site guidelines. The seedlots were cleaned of fruit flesh or debris and air dried at NCGR-Corvallis. The seeds were weighed and placed in NCGR-Corvallis collection. The cuttings were propagated in GH 1 at NCGR-Corvallis. The herbarium voucher specimens will be shipped to US National Arboretum, Washington, D.C.

Funding Arrangements

Funding was supplied by USDA ARS Plant Exploration funding for FY 2018.

Table 2. Costs of the trip

Item	Cost	Comments
Kim Hummer travel costs		Including car rental, gasoline, extra baggage costs, shipping costs
Jill Bushakra travel costs		
Jim Ballington travel costs		
Paul Lyrene travel costs		Including gasoline for driving expenses
Total		

Table 3. Number of species and accessions collected for the USDA ARS National Plant Germplasm System during Virginia-West Virginia plant expedition, August 2018.

Genus	No. species	No. accessions
<i>Fragaria</i>	2	6
<i>Gaultheria</i>	1	2
<i>Gaylussacia</i>	1	2
<i>Ribes</i>	1	1
<i>Rubus</i>	6	14
<i>Sambucus</i>	1	1
<i>Vaccinium</i>	9	38

Total	21	64
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Table 4. Number of samples collected for the Virginia-West Virginia expedition, August 2018.

genus	Seedlots	CT or PL samples	Herbarium samples total	
<i>Fragaria</i>	0	6	3	
<i>Gaultheria</i>	2	2	2	
<i>Gaylussacia</i>	2	0	1	
<i>Ribes</i>	0	1	1	
<i>Rubus</i>	12	5	4	
<i>Sambucus</i>	1	0	0	
<i>Vaccinium</i>	29	23	24	
Total	46	37	35	118

Genera Collected***Fragaria***

Two species of *Fragaria*, *F. vesca* subsp. *americana* and *F. virginiana* subsp. *virginiana* occur in the regions collected on this trip. The alpine strawberry, *F. vesca* subsp. *americana* was collected only at the top of Spruce Knob, West Virginia. *F. virginiana* was more prevalent throughout Western Virginia and West Virginia. Neither of the species were observed in flower or fruit during August 2018.

Gaultheria

Gaultheria procumbens L., commonly called wintergreen, is a low growing stoloniferous groundcover. This species was also seen in woodlands in Virginia. The crushed leaves, stems, and fruit had aroma of wintergreen (methyl-salicylate). Several ripe fruits were collected but not many fruits were observed. The middle of the ripening season was likely past. This species was observed at > 1000 m in the Dolly Sods Wilderness and the Mount Rogers Recreational Areas.

Gaylussacia

We observed *Gaylussacia baccata*, one of the species known as “true huckleberry” in the eastern US, throughout areas where Ericaceous or acid loving plants occurred. This plant had the size of a medium size *Vaccinium* and “similar” leaf shape, but could be distinguished from *Vaccinium* because of interveinal yellow punctate glands on the abaxial side of leaf and spherical fruit which started red and ripened to blue or black. This plant’s fruit tends to ripen later than the blueberry fruits and was quite plentiful on the plants that we observed.

Ribes

While the Pacific Northwest is noted as a center of species diversity for this genus (Sinnott, 1985). Gleason (1974) only described 15 from the eastern US. We observed only *Ribes rotundifolia* frequently throughout the areas that we traveled. This gooseberry was collected from higher elevations in the Dolly Sods

area and from Spruce Knob, West Virginia. The plants were scattered throughout the boggy regions near granite outcroppings.

Rubus

This genus was common in both uplands and valleys of Virginia and West Virginia where Gleason (1974) described 24 species. We obtained 14 samples from 6 species including: *Rubus canadensis*, *R. cuneifolius*, *R. hispidus*, *Rubus idaeus* subsp. *strigosus*, *R. occidentalis*, and *R. odoratus*. The most frequent *Rubus* was the blackberry *Rubus canadensis*. This species has erect habit with good fruit quality but has small fruit size. The fruit taste was sweet, not bitter. The plant is cold hardy. We didn't see *R. allegheniensis*. We observed large colonies of *R. odoratus* on shaded locations on slopes above the road with good drainage. This trailing blackberry species has ornamental qualities. *Rubus hispidus* was common in boggy locations such as on Dolly Sods and on Spruce Knob. This shiny leaved trifoliolate occurred on open balds in bogs where cranberries were growing or in moist seeps. This species had some "full" fruit –ranged from 1-2 to 10-15 drupelets per fruit - and the fruits were small. Black raspberries, *R. occidentalis*, were scattered under dense deciduous forests. Fruit was mostly past though a few fruit were collected. The red raspberry was less frequent, only collected in high elevation(s), such as Spruce Knob, in open sunny areas. The cultivated escape, 'Nanticoke' (*R. cuneifolius*) was collected from hedge rows at low elevation(s). This blackberry has spreading branches on floricanes with remarkable upright folded leaflets with white pubescence below. The fruit were past but some persistent partially-dried fruits were collected for seed extraction.

Sambucus

We only observed and collected fruit of *Sambucus nigra* var. *canadensis* in the area that we collected. We expected to see this species more frequently than we did but it was hard to find. Most of the fruit of this species had ripened previous to our arrival although we did manage to obtain some few fruits from several umbels at combined localities under forest canopies along road sides.

Vaccinium

Gleason (1974) described 29 *Vaccinium* species from eastern North America while Uttal (1987) described 15 from Virginia. This counters his colleague Vanderkloet (1988) who merged many taxa (e.g. *V. constablaei*, *V. formosum*) under *V. corymbosum* that Uttal recognized separately. We observed and collected 9 species with a total of 38 accessions. We were surprised to find the red-mahogany fruited *V. erythrocarpum*, to be frequent at elevations above 300 m in Virginia and west Virginia. The plants at the tops of mountains were short. The pigment was present in the skin and flesh of the berries. The berries were juicy with a beautiful red-mahogany color. These plants tended to have low yields; not many berries on any of them.

Dr. Gene Galletta had collected *Vaccinium* species from this area in 1966 and his notes were available to us through Dr. Ballington. From Dr. Galletta's notes, we expected to see 1 or more plants *V. corymbosum* (*V. constablaei*) in the Mountain Lake Biological Station area. We also hoped to see extensive *V. corymbosum* f. *constablaei* (the hexaploid) at higher elevations throughout Virginia and West Virginia. We collected a few representatives of what we think are this taxon, but these will need to be confirmed by cytology (flow cytometry). The Mountain Lake Station and its local trails seemed to represent an old hybridization site where *Vaccinium corymbosum* may have evolved (Lyrene, personal comment). These plants were established then forest grew up around them.

In the higher elevations on wooded slopes *V. simulatum* was present.

Vaccinium simulatum had small berry size and the flavor was very acid, though not unpleasant. The seeds were many in the small fruit. The size of the bush was larger in the protected high valleys. Some would reach

19 November 2018

5-6 m. These plants had large number of uprights with a narrow upright stature above crown. Deer browsing may have affected this.

Wide ranging *Vaccinium pallidum* was present in both states, while *V. simulatum* was only found in Virginia. We observed *V. pallidum* on shady edges of road ways and open slopes where acid soils were present at medium elevations as we were driving up to the taller mountains. Most of the fruit was past ripe but there were a few colonies of these plants that had a few remaining ripe fruit that we collected.

Vaccinium stamineum had variable morphologies among the plants that we observed on this trip. There were tall and short ones. This species is rhizomatous which is colony forming. We observed under-ripe fruits on most plants. These fruits were green in color during our expedition. Most of these fruits will ripen up green or white not purple. We found only one berry that had purple fruit. This species had the biggest fruits of the blueberry (*Vaccinium*) group - except for cranberries. These fruits were maybe 3 times the size of most *Vaccinium* fruit collected. We estimated that the date of 50% ripe berries would be 2 to 3 weeks later or mid-September for this species.

Vaccinium erythrocarpum had the softest fruit and was “hard” to remove from the bush. Like *V. stamineum* and *Vaccinium* section *Myrtillus* species, *V. erythrocarpum* does not develop a picking scar at the base of the berry, but instead separation occurs at the base of the berry pedicel. Also like section *Myrtillus* each berry is borne singly— not in a cluster.

We observed the lowbush blueberries, both *Vaccinium myrtilloides* (diploid) and *V. angustifolium* (tetraploid.) We were able to collect some fruits from each. *V. angustifolium* would have been 3 weeks past mid-season ripening, —so fully ripe fruit would occur in early August for WVA plants. On *Vaccinium. angustifolium* we found polymorphic fruit color blue to dull black and blue leaved plants often with really dark fruit.

We observed both types of cranberries, the small leaf (*V. oxycoccos*) and the large leaf *V. macrocarpon*. We observed that *V. oxycoccos* can have as large fruit as the large leaf cranberry. The distinguishing character is that the septum on the small leaf cranberry is in the lower third of the pedicel while the septum is on the upper third of the pedicel on the large leaf. The *V. macrocarpon* fruit that we observed were not yet quite ripe; they were mostly yellow with some red on the sunny side of the fruit. Their size was as large as commercial fruit. The little leaf was the most abundant species in the cranberry glades. The big leaf was more erect with very long upright stems.

Conclusions

The berry crop genetic resources that we observed in the Blue Ridge Region of Virginia and West Virginia were diverse and plentiful. The area we collected ranged in elevation from about 767 m (2,516') in both states to (1673 m or 5,489') at White Top Mountain, Virginia We increased the diversity of *V. simulatum* for the collection. Now the repository has representatives of the Virginia strawberry from Virginia, and from West Virginia and documented numerous locations for this species in the Blue Ridge Region in both states. Some of the blueberry wild relatives may provide germplasm that could increase cold hardiness and extend fruiting season and avoid frost through late bloom.

Acknowledgements

The cooperation of the US Forest Service for permission to collect in the National Forests is appreciated. The botanical identification assistance of Dr. Henry Wilbur and Dr. Becky Wilbur of the University of Virginia.

19 November 2018

The cooperation of the USDA team at the Plant Exploration office, including Dr. Karen Williams and Dr. Gary Kinard, to prepare the arrangements and agreements for the expedition was greatly appreciated.

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Appendix 1. Collection list by sequential number.

Collection number	Date collected	PI	LOC	Species	Seed lots	Plants/cuttings	Herbarium
VA-2018-001	8/22/2018	688309	CRUB 2878	Rubus odoratus	1	0	1
VA-2018-002	8/22/2018	688310	CRUB 2879	Rubus occidentalis	0	1	0
VA-2018-003	8/22/2018	688311	CSAM	Sambucus nigra subsp. canadensis	1	0	0
VA-2018-004	8/23/2018	688312	CRUB 2880	Rubus hispida var. hispida	1	1	1
VA-2018-005	8/23/2018	688313	CFRA 2319	Fragaria virginiana subsp. virginiana	0	1	1
VA-2018-006	8/23/2018	688316	CGAY 21	Gaylussacia baccata	1	0	1
VA-2018-007	8/23/2018	688318	CVAC 2348	Vaccinium angustifolium	1	1	1
VA-2018-008	8/23/2018	688319	CVAC 2311	Vaccinium oxycoccus	1	1	1
VA-2018-009	8/23/2018	688320	CVAC 2312	Vaccinium oxycoccus	1	1	1
VA-2018-010	8/23/2018	688321	CVAC 2313	Vaccinium pallidum	0	1	1
VA-2018-011	8/23/2018	688322	CVAC 2314	Vaccinium oxycoccus	1	1	1
VA-2018-012	8/23/2018	688323	CVAC 2315	Vaccinium myrtilloides	1	0	1
VA-2018-013	8/23/2018	688324	CGAY 22	Gaylussacia baccata	1	0	0
VA-2018-014	8/23/2018	688325	CVAC 2316	Vaccinium oxycoccus	1	1	1
VA-2018-015	8/23/2018	688326	CGAU 55	Gaultheria procumbens	1	1	1
VA-2018-016	8/24/2018	688327	CVAC 2317	Vaccinium erythrocarpum subsp. erythrocarpum	1	1	1
VA-2018-017	8/24/2018	688328	CRUB 2881	Rubus idaeus subsp. strigosus	1	1	1
VA-2018-018	8/24/2018	688329	CRIB 1701	Ribes rotundifolium	0	1	1

VA-2018-019	8/24/2018	688314	CFRA 2320	<i>Fragaria vesca</i> subsp. <i>americana</i>	0	1	1
VA-2018-020	8/24/2018	688315	CFRA 2321	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	0	1	1
VA-2018-021	8/24/2018	688330	CRUB 2882	<i>Rubus canadensis</i>	0	1	1
VA-2018-022	8/24/2018	688331	CRUB 2883	<i>Rubus odoratus</i>	1	0	1
VA-2018-023	8/24/2018	688332	CRUB 2884	<i>Rubus canadensis</i>	1	0	1
VA-2018-024	8/24/2018	688333	CRUB 2885	<i>Rubus canadensis</i>	1	0	0
VA-2018-025	8/24/2018	688334	CRUB 2886	<i>Rubus idaeus</i> subsp. <i>strigosus</i>	1	0	0
VA-2018-026	8/24/2018	688368	CVAC 2318	<i>Vaccinium pallidum</i>	0	1	0
VA-2018-027	8/24/2018	688369	CVAC 2319	<i>Vaccinium angustifolium</i>	1	0	1
VA-2018-028	8/24/2018	688370	CVAC 2320	<i>Vaccinium myrtilloides</i>	0	1	1
VA-2018-029	8/25/2018	688371	CVAC 2321	<i>Vaccinium stamineum</i>	1	0	1
VA-2018-030	8/25/2018	688372	CVAC 2322	<i>Vaccinium pallidum</i>	1	0	1
VA-2018-031	8/25/2018	688373	CVAC 2323	<i>Vaccinium stamineum</i>	1	0	0
VA-2018-032	8/25/2018	688374	CRIB 1702	<i>Ribes rotundifolium</i>		1	0
VA-2018-033	8/25/2018	688375	CRUB 2887	<i>Rubus canadensis</i>	1	0	0
VA-2018-034	8/25/2018	688376	CVAC 2324	<i>Vaccinium pallidum</i>	0	1	0
VA-2018-035	8/25/2018	688377	CVAC 2325	<i>Vaccinium oxycoccos</i>	0	1	0
VA-2018-036	8/26/2018	688378	CGAU 56	<i>Gaultheria procumbens</i>	1	1	1
VA-2018-037	8/26/2018	688379	CVAC 2326	<i>Vaccinium stamineum</i>	1	0	1
VA-2018-038	8/26/2018	688380	CVAC 2327	<i>Vaccinium pallidum</i>	1	0	0
VA-2018-039	8/26/2018	688381	CVAC 2328	<i>Vaccinium oxycoccos</i>	1	1	1

VA-2018-040	8/26/2018	688382	CRUB 2888	Rubus hispidus var. hispidus	1	0	0
VA-2018-041	8/26/2018	PI 688383	CVAC 2329	Vaccinium macrocarpon	1	1	1
VA-2018-042	8/26/2018	PI 688384	CVAC 2330	Vaccinium macrocarpon	1	1	1
VA-2018-043	8/26/2018	PI 688385	Duplicate accession CSAM	Sambucus nigra subsp. canadensis	0	0	0
VA-2018-044	8/26/2018	PI 688386	CVAC 2331	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	1
VA-2018-045	8/27/2018	PI 688387	CVAC 2332	Vaccinium corymbosum	0	1	1
VA-2018-046	8/27/2018	PI 688388	CVAC 2333	Vaccinium erythrocarpum subsp. erythrocarpum	0	1	0
VA-2018-047	8/27/2018	PI 688389	CVAC 2334	Vaccinium corymbosum	1	1	0
VA-2018-048	8/27/2018	PI 688390	CVAC 2335	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-049	8/28/2018	PI 688391	CVAC 2336	Vaccinium simulatum	1	0	0
VA-2018-050	8/28/2018	PI 688392	CFRA 2322	Fragaria virginiana subsp. virginiana	0	1	0
VA-2018-051	8/28/2018	PI 688393	CVAC 2337	Vaccinium simulatum	0	1	0
VA-2018-052	8/28/2018	PI 688394	CVAC 2338	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	1
VA-2018-053	8/28/2018	PI 688395	CRUB 2889	Rubus canadensis	1	0	0
		PI 688396		Rubus canadensis duplicate entry			
VA-2018-054	8/28/2018	PI 688397	CVAC 2339	Vaccinium simulatum	1	0	0
VA-2018-055	8/28/2018	PI 688398	CVAC 2340	Vaccinium simulatum	1	1	1

VA-2018-056	8/28/2018	PI 688399	CVAC 2341	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-057	8/28/2018	PI 688400	CFRA 2323	Fragaria virginiana subsp. virginiana	0	1	0
VA-2018-058	8/28/2018	PI 688401	CVAC 2342	Vaccinium simulatum	1	1	0
VA-2018-059	8/28/2018	PI 688402	CRUB 2390	Rubus cuneifolius	1	1	0
VA-2018-060	8/29/2018	PI 688403	CFRA 2324	Fragaria virginiana subsp. virginiana	0	1	0
VA-2018-061	8/29/2018	PI 688404	CVAC 2343	Vaccinium simulatum	1	0	0
VA-2018-062	8/29/2018	PI 688405	CVAC 2344	Vaccinium erythrocarpum subsp. erythrocarpum	1	1	1
VA-2018-063	8/29/2018	PI 688406	CVAC 2345	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-064	8/29/2018	PI 688407	CVAC 2346	Vaccinium simulatum	1	1	1
VA-2018-065	8/29/2018	PI 688408	CVAC 2347	Vaccinium simulatum		1	1
VA-2018-066	8/29/2018	PI 688409	CRUB 2391	Rubus odoratus	1	0	0

Appendix 2. Collection list by taxon.

Collection number	Date collected	PI	LOC	Species	Seed	plants/cuttings	Herbarium
VA-2018-019	8/24/2018	688314	CFRA 2320	<i>Fragaria vesca</i> subsp. <i>americana</i>	0	1	1
VA-2018-005	8/23/2018	688313	CFRA 2319	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>		1	1
VA-2018-020	8/24/2018	688315	CFRA 2321	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	0	1	1
VA-2018-050	8/28/2018	PI 688392	CFRA 2322	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	0	1	0
VA-2018-057	8/28/2018	PI 688400	CFRA 2323	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	0	1	0
VA-2018-060	8/29/2018	PI 688403	CFRA 2324	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	0	1	0
VA-2018-015	8/23/2018	688326	CGAU 55	<i>Gaultheria procumbens</i>	1	1	1
VA-2018-036	8/26/2018	688378	CGAU 56	<i>Gaultheria procumbens</i>	1	1	1
VA-2018-006	8/23/2018	688316	CGAY 21	<i>Gaylussacia baccata</i>	1	0	1
VA-2018-013	8/23/2018	688324	CGAY 22	<i>Gaylussacia baccata</i>	1	0	0
VA-2018-018	8/24/2018	688329	CRIB 1701	<i>Ribes rotundifolium</i>	0	1	1
VA-2018-032	8/25/2018	688374	CRIB 1702	<i>Ribes rotundifolium</i>	0	1	0
VA-2018-021	8/24/2018	688330	CRUB 2882	<i>Rubus canadensis</i>	0	1	1
VA-2018-023	8/24/2018	688332	CRUB 2884	<i>Rubus canadensis</i>	1	0	1
VA-2018-024	8/24/2018	688333	CRUB 2885	<i>Rubus canadensis</i>	1	0	0
VA-2018-033	8/25/2018	688375	CRUB 2887	<i>Rubus canadensis</i>	1	0	0

VA-2018-053	8/28/2018	PI 688395	CRUB 2889	Rubus canadensis	1	0	0
		PI 688396		Rubus canadensis duplicate entry	0	0	0
VA-2018-059	8/28/2018	PI 688402	CRUB 2390	Rubus cuneifolius	1	1	0
VA-2018-004	8/23/2018	688312	CRUB 2880	Rubus hispidus var. hispidus	1	1	1
VA-2018-040	8/26/2018	688382	CRUB 2888	Rubus hispidus var. hispidus	1	0	0
VA-2018-017	8/24/2018	688328	CRUB 2881	Rubus idaeus subsp. strigosus	1	1	1
VA-2018-025	8/24/2018	688334	CRUB 2886	Rubus idaeus subsp. strigosus	1	0	0
VA-2018-002	8/22/2018	688310	CRUB 2879	Rubus occidentalis	0	1	0
VA-2018-001	8/22/2018	688309	CRUB 2878	Rubus odoratus	1	0	1
VA-2018-022	8/24/2018	688331	CRUB 2883	Rubus odoratus	1	0	1
VA-2018-066	8/29/2018	PI 688409	CRUB 2391	Rubus odoratus	1	0	0
VA-2018-003	8/22/2018	688311	CSAM	Sambucus nigra subsp. canadensis	1	0	0
VA-2018-043	8/26/2018	PI 688385	Duplicate accession of above	Sambucus nigra subsp. canadensis	1	0	0
VA-2018-007	8/23/2018	688318	CVAC 2310	Vaccinium angustifolium	1	1	1
VA-2018-027	8/24/2018	688369	CVAC 2319	Vaccinium angustifolium	1	0	1
VA-2018-045	8/27/2018	PI 688387	CVAC 2332	Vaccinium corymbosum	0	1	1
VA-2018-047	8/27/2018	PI 688389	CVAC 2334	Vaccinium corymbosum	1	1	0
VA-2018-051	8/28/2018	PI 688393	CVAC 2337	Vaccinium corymbosum	0	1	0
VA-2018-055	8/28/2018	PI 688398	CVAC 2340	Vaccinium corymbosum	1	1	1
VA-2018-016	8/24/2018	688327	CVAC 2317	Vaccinium erythrocarpum	1	1	1

				subsp. erythrocarpum			
VA-2018-044	8/26/2018	PI 688386	CVAC 2331	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	1
VA-2018-046	8/27/2018	PI 688388	CVAC 2333	Vaccinium erythrocarpum subsp. erythrocarpum	0	1	0
VA-2018-048	8/27/2018	PI 688390	CVAC 2335	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-052	8/28/2018	PI 688394	CVAC 2338	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	1
VA-2018-056	8/28/2018	PI 688399	CVAC 2341	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-062	8/29/2018	PI 688405	CVAC 2344	Vaccinium erythrocarpum subsp. erythrocarpum	1	1	1
VA-2018-063	8/29/2018	PI 688406	CVAC 2345	Vaccinium erythrocarpum subsp. erythrocarpum	1	0	0
VA-2018-041	8/26/2018	PI 688383	CVAC 2329	Vaccinium macrocarpon	1	1	1
VA-2018-042	8/26/2018	PI 688384	CVAC 2330	Vaccinium macrocarpon	1	1	1
VA-2018-012	8/23/2018	688323	CVAC 2315	Vaccinium myrtilloides	1	0	1
VA-2018-028	8/24/2018	688370	CVAC 2320	Vaccinium myrtilloides	0	1	1
VA-2018-008	8/23/2018	688319	CVAC 2311	Vaccinium oxycoccos	1	1	1
VA-2018-009	8/23/2018	688320	CVAC 2312	Vaccinium oxycoccos	1	1	1

VA-2018-011	8/23/2018	688322	CVAC 2314	Vaccinium oxycoccos	1	1	1
VA-2018-014	8/23/2018	688325	CVAC 2316	Vaccinium oxycoccos	1	1	1
VA-2018-035	8/25/2018	688377	CVAC 2325	Vaccinium oxycoccos	0	1	0
VA-2018-039	8/26/2018	688381	CVAC 2328	Vaccinium oxycoccos	1	1	1
VA-2018-010	8/23/2018	688321	CVAC 2313	Vaccinium pallidum	0	1	1
VA-2018-026	8/24/2018	688368	CVAC 2318	Vaccinium pallidum	0	1	0
VA-2018-030	8/25/2018	688372	CVAC 2322	Vaccinium pallidum	1	0	1
VA-2018-034	8/25/2018	688376	CVAC 2324	Vaccinium pallidum	0	1	0
VA-2018-038	8/26/2018	688380	CVAC 2327	Vaccinium pallidum	1	0	0
VA-2018-049	8/28/2018	PI 688391	CVAC 2336	Vaccinium simulatum	1	0	0
VA-2018-054	8/28/2018	PI 688397	CVAC 2339	Vaccinium simulatum	1	0	0
VA-2018-058	8/28/2018	PI 688401	CVAC 2342	Vaccinium simulatum	1	1	0
VA-2018-061	8/29/2018	PI 688404	CVAC 2343	Vaccinium simulatum	1	0	0
VA-2018-064	8/29/2018	PI 688407	CVAC 2346	Vaccinium simulatum	1	1	1
VA-2018-065	8/29/2018	PI 688408	CVAC 2347	Vaccinium simulatum		1	1
VA-2018-029	8/25/2018	688371	CVAC 2321	Vaccinium stamineum	1	0	1
VA-2018-031	8/25/2018	688373	CVAC 2323	Vaccinium stamineum	1	0	0
VA-2018-037	8/26/2018	688379	CVAC 2326	Vaccinium stamineum	1	0	1

Locality information for the collection.

Collection no.	Date collected	PI	Species	Local No.	Latitude	Longitude	Elevation (m)	Locality
VA-2018-001	8/22/2018	688309	<i>Rubus odoratus</i>	CRUB 2878	37.420983	-80.509850	1027	Mountain Lake Biological Research Station, Jefferson National Forest, Giles Co., VA
VA-2018-002	8/22/2018	688310	<i>Rubus occidentalis</i>	CRUB 2879	37.422833	-80.505883	1017	Mountain Lake Biological Research Station, Jefferson National Forest, Giles Co., VA
VA-2018-003	8/22/2018	688311	<i>Sambucus nigra</i> subsp. <i>canadensis</i>	CSAM				Mountain Lake Biological Research Station, Jefferson National Forest, Giles Co., VA and a small sample from Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-004	8/23/2018	688312	<i>Rubus hispidus</i> var. <i>hispidus</i>	CRUB 2880	39.065983	-79.301517	942	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-005	8/23/2018	688313	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	CFRA 2319	39.065983	-79.301517	942	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-006	8/23/2018	688316	<i>Gaylussacia baccata</i>	CGAY 21	39.065983	-79.301517	942	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-007	8/23/2018	688318	<i>Vaccinium angustifolium</i>	CVAC 2348	39.064167	-79.305117	1197	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-008	8/23/2018	688319	<i>Vaccinium oxycoccos</i>	CVAC 2311	39.064167	-79.305117	1197	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV

VA-2018-009	8/23/2018	688320	Vaccinium oxycoccos	CVAC 2312	39.064167	-79.305117	1197	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-010	8/23/2018	688321	Vaccinium pallidum	CVAC 2313	39.064167	-79.305117	1197	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-011	8/23/2018	688322	Vaccinium oxycoccos	CVAC 2314	39.064167	-79.305117	1197	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-012	8/23/2018	688323	Vaccinium myrtilloides	CVAC 2315	39.032583	-79.319750	1203	Dolly Sods Blackbird Knob trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-013	8/23/2018	688324	Gaylussacia baccata	CGAY 22	39.032583	-79.319750	1203	Dolly Sods Blackbird Knob trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-014	8/23/2018	688325	Vaccinium oxycoccos	CVAC 2316	39.026167	-79.319167	1195	Dolly Sods Blackbird Knob trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-015	8/23/2018	688326	Gaultheria procumbens	CGAU 55	39.026167	-79.319167	1195	Dolly Sods Blackbird Knob trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-016	8/24/2018	688327	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2317	38.026237	-79.531700	1488	Spruce Knob, Public Road 104, Monongahela National Forest, Pendleton, Co. WV
VA-2018-017	8/24/2018	688328	Rubus idaeus subsp. strigosus	CRUB 2881	38.699667	-79.533133	1516	Spruce Knob, Public Road 104, Whispering Spruce trail, Monongahela National Forest, Pendleton, Co. WV
VA-2018-018	8/24/2018	688329	Ribes rotundifolium	CRIB 1701	38.699500	-79.516833	1473	Spruce Knob, Public Road 104, Whispering Spruce trail, Monongahela National Forest, Pendleton, Co. WV
VA-2018-019	8/24/2018	688314	Fragaria vesca subsp. americana	CFRA 2320	38.700533	-79.532283	1478	Spruce Knob, Public Road 104, Whispering Spruce trail, Monongahela National Forest, Pendleton, Co. WV

VA-2018-020	8/24/2018	688315	<i>Fragaria virginiana</i> subsp. <i>virginiana</i>	CFRA 2321	38.699817	-79.531817	1478	Spruce Knob, Public Road 104, Whispering Spruce trail, Monongahela National Forest, Pendleton, Co. WV
VA-2018-021	8/24/2018	688330	<i>Rubus canadensis</i>	CRUB 2882	38.700750	-79.532167	1481	Spruce Knob, Public Road 104, Whispering Spruce trail, Monongahela National Forest, Pendleton, Co. WV
VA-2018-022	8/24/2018	688331	<i>Rubus odoratus</i>	CRUB 2883	38.702667	-79.524767	1309	Spruce Knob, Public Road 112, Monongahela National Forest, Pendleton, Co. WV
VA-2018-023	8/24/2018	688332	<i>Rubus canadensis</i>	CRUB 2884	38.702667	-79.524767	1309	Spruce Knob, Public Road 112, Monongahela National Forest, Pendleton, Co. WV
VA-2018-024	8/24/2018	688333	<i>Rubus canadensis</i>	CRUB 2885	38.957750	-79.363300	1159	Dolly Sods, FR 70, Monongahela National Forest, Randolph Co. WV
VA-2018-025	8/24/2018	688334	<i>Rubus idaeus</i> subsp. <i>strigosus</i>	CRUB 2886	38.957750	-79.363300	1159	Dolly Sods, FR 70, Monongahela National Forest, Randolph Co. WV
VA-2018-026	8/24/2018	688368	<i>Vaccinium pallidum</i>	CVAC 2318	38.965083	-79.358417	1265	Dolly Sods Rohrbaugh Trail, Monongahela National Forest, Tucker Co. WV
VA-2018-027	8/24/2018	688369	<i>Vaccinium angustifolium</i>	CVAC 2319	38.995783	-79.328400	1227	Dolly Sods FR 1116 intersection with FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-028	8/24/2018	688370	<i>Vaccinium myrtilloides</i>	CVAC 2320	38.995783	-79.328400	1227	Dolly Sods FR 1116 intersection with FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-029	8/25/2018	688371	<i>Vaccinium stamineum</i>	CVAC 2321	39.065833	-79.263450	715	Dolly Sods FR 75 approx. 0.6 km from intersection with Jordan Run Road, Monongahela National Forest, Tucker Co. WV
VA-2018-030	8/25/2018	688372	<i>Vaccinium pallidum</i>	CVAC 2322	39.057600	-79.284783	908	Dolly Sods FR 75, Monongahela National Forest, Tucker Co. WV

19 November 2018

VA-2018-031	8/25/2018	688373	<i>Vaccinium stamineum</i>	CVAC 2323	39.057600	-79.284783	908	Dolly Sods FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-032	8/25/2018	688374	<i>Ribes rotundifolium</i>	CRIB 1702	39.062550	-79.303883	1207	Dolly Sods Bear Rocks Trail, FR 75, Monongahela National Forest, Tucker Co. WV
VA-2018-033	8/25/2018	688375	<i>Rubus canadensis</i>	CRUB 2887	38.965083	-79.358417	1265	Dolly Sods Rohrbaugh Trail, Monongahela National Forest, Tucker Co. WV
VA-2018-034	8/25/2018	688376	<i>Vaccinium pallidum</i>	CVAC 2324	39.027317	-79.316100	1179	Dolly Sods FR 75 just N of Northland Loop trailhead, Monongahela National Forest, Tucker Co. WV
VA-2018-035	8/25/2018	688377	<i>Vaccinium oxycoccos</i>	CVAC 2325	39.029383	-79.315517	1177	Dolly Sods FR 75 just S of Red Creek Campground entrance, Monongahela National Forest, Tucker Co. WV
VA-2018-036	8/26/2018	688378	<i>Gaultheria procumbens</i>	CGAU 56	38.264233	-79.981483	767	Hwy 28 to Thorny Mountain Road (Rt 11/2), Pocahontas Co. WV
VA-2018-037	8/26/2018	688379	<i>Vaccinium stamineum</i>	CVAC 2326	38.264233	-79.981483	767	Hwy 28 to Thorny Mountain Road (Rt 11/2), Pocahontas Co. WV
VA-2018-038	8/26/2018	688380	<i>Vaccinium pallidum</i>	CVAC 2327	38.264233	-79.981483	767	Hwy 28 to Thorny Mountain Road (Rt 11/2), Pocahontas Co. WV
VA-2018-039	8/26/2018	688381	<i>Vaccinium oxycoccos</i>	CVAC 2328	38.197967	-80.271450	1019	Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-040	8/26/2018	688382	<i>Rubus hispidus</i> var. <i>hispidus</i>	CRUB 2888	38.197967	-80.271450	1019	Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-041	8/26/2018	PI 688383	<i>Vaccinium macrocarpon</i>	CVAC 2329	38.198150	-80.271167	1013	Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-042	8/26/2018	PI 688384	<i>Vaccinium macrocarpon</i>	CVAC 2330	38.199067	-80.272167	1028	Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-043	8/26/2018	PI 688385	<i>Sambucus nigra</i> subsp. <i>canadensis</i>					Limited seed sample. Pool with VA-2018-003

19 November 2018

VA-2018-044	8/26/2018	PI 688386	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2331	38.198317	-80.274133	1026	Cranberry Glades, Hwy 39/55, Pocahontas Co. WV
VA-2018-045	8/27/2018	PI 688387	Vaccinium corymbosum	CVAC 2332	37.377267	-80.518167	1154	Mountain Lake Biological Research Station, Hedwig trail, Jefferson National Forest, Giles Co., VA
VA-2018-046	8/27/2018	PI 688388	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2333	37.377533	-80.517250	1154	Mountain Lake Biological Research Station, Hedwig trail between Crazy Rocks and intersection with Spruce Bog trail, Jefferson National Forest, Giles Co., VA
VA-2018-047	8/27/2018	PI 688389	Vaccinium corymbosum	CVAC 2334	37.411133	-80.524667	1220	Mountain Lake Biological Research Station, Hedwig trail between Crazy Rocks and intersection with Spruce Bog trail, Jefferson National Forest, Giles Co., VA
VA-2018-048	8/27/2018	PI 688390	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2335	37.411133	-80.524667	1220	Mountain Lake Biological Research Station, Hedwig trail between Crazy Rocks and intersection with Spruce Bog trail, Jefferson National Forest, Giles Co., VA
VA-2018-049	8/28/2018	PI 688391	Vaccinium simulatum	CVAC 2336	36.624860	-81.500970	1499	Mt. Rogers Grayson Highlands State Park Visitors Center, Twin Pinnacles trail, Grayson Co. VA
VA-2018-050	8/28/2018	PI 688392	Fragaria virginiana subsp. virginiana	CFRA 2322	36.624860	-81.500970	1499	Mt. Rogers Grayson Highlands State Park Visitors Center, Twin Pinnacles trail, Grayson Co. VA
VA-2018-051	8/28/2018	PI 688393	Vaccinium corymbosum	CVAC 2337	36.626740	-81.503730	1556	Mt. Rogers Grayson Highlands State Park, Twin Pinnacles trail, Grayson Co. VA
VA-2018-052	8/28/2018	PI 688394	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2338	36.626740	-81.503730	1556	Mt. Rogers Grayson Highlands State Park, Twin Pinnacles trail, Grayson Co. VA

VA-2018-053	8/28/2018	PI 688395	Rubus canadensis	CRUB 2889	36.627070	-81.504680	1548	Mt. Rogers Grayson Highlands State Park, Twin Pinnacles trail, Grayson Co. VA
		PI 688396	Rubus canadensis duplicate entry					
VA-2018-054	8/28/2018	PI 688397	Vaccinium simulatum	CVAC 2339	36.633430	-81.508920	1426	Mt. Rogers Grayson Highlands State Park, Massie parking area entrance to Rhododendron trail, Grayson Co., VA
VA-2018-055	8/28/2018	PI 688398	Vaccinium corymbosum	CVAC 2340	36.636070	-81.510340	1450	Mt. Rogers Grayson Highlands State Park, Rhododendron trail, Grayson Co., VA
VA-2018-056	8/28/2018	PI 688399	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2341	36.636230	-81.510090	1453	Mt. Rogers Grayson Highlands State Park, Rhododendron trail, Grayson Co., VA
VA-2018-057	8/28/2018	PI 688400	Fragaria virginiana subsp. virginiana	CFRA 2323	36.637370	-81.508190	1468	Mt. Rogers Grayson Highlands State Park, Rhododendron trail, Grayson Co., VA
VA-2018-058	8/28/2018	PI 688401	Vaccinium simulatum	CVAC 2342	36.636330	-81.509480	1450	Mt. Rogers Grayson Highlands State Park, Rhododendron trail, Grayson Co., VA
VA-2018-059	8/28/2018	PI 688402	Rubus cuneifolius	CRUB 2390	36.888690	-81.359660	761	Hwy 11 between Atkins (Smyth Co.) and Rural Retreat (Wythe Co.), VA
VA-2018-060	8/29/2018	PI 688403	Fragaria virginiana subsp. virginiana	CFRA 2324	36.638280	-81.605510	1673	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA
VA-2018-061	8/29/2018	PI 688404	Vaccinium simulatum	CVAC 2343	36.638280	-81.605510	1673	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA
VA-2018-062	8/29/2018	PI 688405	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2344	36.637810	-81.608790	1657	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA

19 November 2018

VA-2018-063	8/29/2018	PI 688406	Vaccinium erythrocarpum subsp. erythrocarpum	CVAC 2345	36.632690	-81.603740	1563	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA
VA-2018-064	8/29/2018	PI 688407	Vaccinium simulatum	CVAC 2346	36.633900	-81.604030	1590	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA
VA-2018-065	8/29/2018	PI 688408	Vaccinium simulatum	CVAC 2347	36.632730	-81.604300	1572	Whitetop Mountain, Mud Creek Lane, Grayson Co. VA
VA-2018-066	8/29/2018	PI 688409	Rubus odoratus	CRUB 2391	36.708290	-81.616630	963	Whitetop Mountain, Hyw 58, Smyth Co. VA