

ANNUAL REPORT FOR 2018
National Clonal Germplasm Repository
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National Clonal Germplasm Repository Staff



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Graduate Students & Visiting Scientists

Katie Armes Carter, GRA, OSU, Hort.
Christina Mulch, GRA, OSU, Hort.
Craig Hardner, Australia
Linlin Chang, China

Stakeholder/Service Accomplishments

- 12,669 accessions, 72 genera and 784 taxa of 674 species of temperate fruit, nut, and specialty crops were conserved.
- Managed > 3,600 accessions of fruit tree and nut crops on 22 acres of orchard.
- Obtained a total of 226 new accessions and 670 new inventory items in CY 2018.
- Received 789 order requests and shipped 7001 items.
- Collaborated with NGRPL, Ft. Collins, CO, on cryopreservation protocols of dormant blueberry, hazelnut, pear, currant and gooseberry.
- Collaborated with staff of NCGR-Davis to backup genetic resources of hazelnuts in Parlier, and butternuts and kiwifruit in Corvallis, Oregon.
- Trained/Collaborated with visiting scientists from China, Australia, and the US.
- Participated on Governing Board for USDA National Clean Plant Network.
- Participated as Science Editor of the ISHS Proceedings and Journals.
- Implemented dormant bud cryopreservation as one of several backup strategies for woody clonal germplasm accessions.
- Expanded potted greenhouse backup collections of *Pyrus* and *Cydonia* for accessions represented by a single tree and at risk of loss due to disease susceptibility, lack of hardiness or small tree size.

Research Accomplishments

- Determined that a *Rubus* phylogeny using target capture sequencing
- Determined that the most recent common ancestor for *Rubus* is from North America and that it dispersed over land bridges to Asia, Europe, and South America during the early Miocene.
- Determined that *Rubus* diversified greatly on many continents (particularly China) during the middle of the Miocene.
- Detected Black currant reversion virus infection in black currant (*Ribes nigrum*) collection; worked with APHIS to develop a national response plan for this disease.
- Used chloroplast DNA sequence data to differentiate pear species groups, and to identify genetic relationships between pears and other related crops in collaboration with NCGRP, Fort Collins.
- Used interstem grafts to evaluate pear germplasm for dwarfing potential. Correlated pear mother tree architecture traits with dwarfing potential.
- Developed a high-density SNP array for large-scale genotyping of pear germplasm for marker assisted breeding and germplasm collection diversity analysis in collaboration with UC Davis.
- Analyzed genetic diversity and population structure of American wild southeastern blueberry germplasm in the NCGR collection- Identified true-to-type Florida-4B using parentage analysis and provided evidence of its hybrid status (*V. darrowii* and *V. fuscatum*).
- Demonstrated the diagnostic potential of a current marker for *Phytophthora* crown rot in the University of Florida breeding program but not in other diverse germplasm preserved at the NCGR.
- Demonstrated the usefulness of a bioinformatics pipeline in identifying subgenomes of the octoploid strawberry.
- Discovered a potentially novel gene for black spot resistance in rose.
- Identified *Vaccinium* germplasm that is slow to become infected with, and potentially resistant to Blueberry shock virus.

Administrative Overview

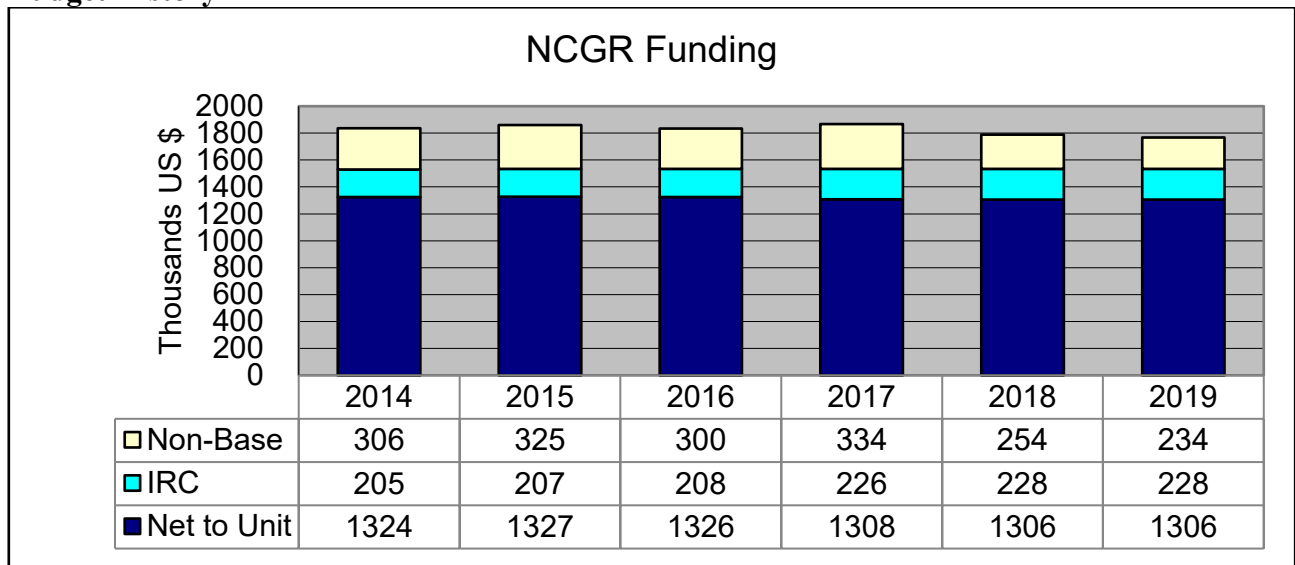
Staffing Changes

Cory Paterson is our temporary Ag-Science Research Technician for the field. Ashley Winters graduated from her Office Automation Trainee position and was selected as our permanent Program Support Assistant. Due to funding issues, we shut down the tissue culture program, though some virus cleanup/micropropagation projects continue. Jeanine DeNoma, Bio-Science Research Technician, now manages screenhouse hop and mint collections.

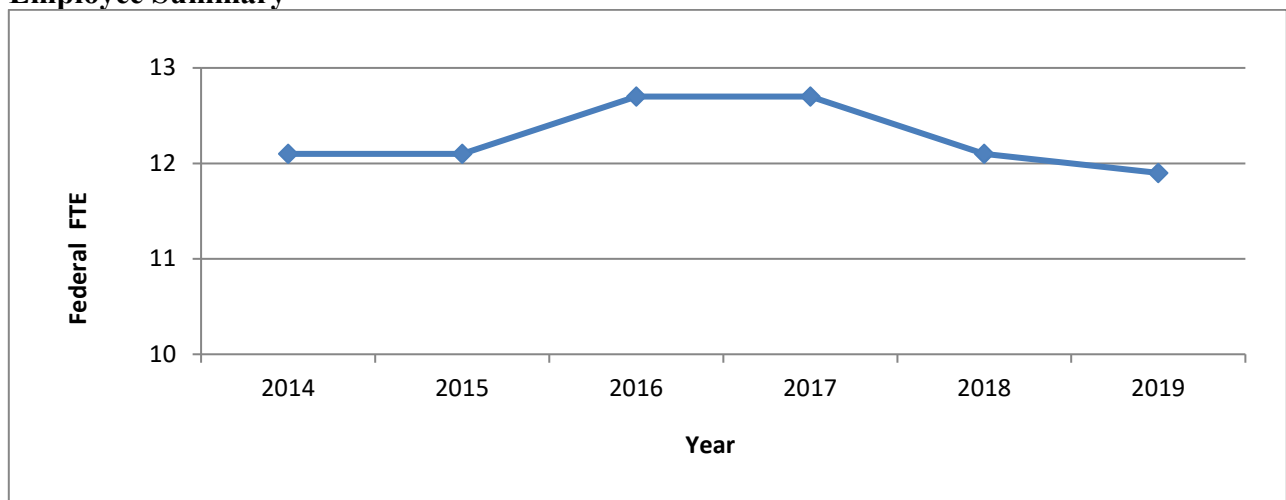
Budget

Our FY 2018 remained level because of continuing resolution most of the year with total federal budget of \$1.54 million. Soft dollars, or “non-base” funds from a variety of research grants supplemented our base federal funds.

Budget History

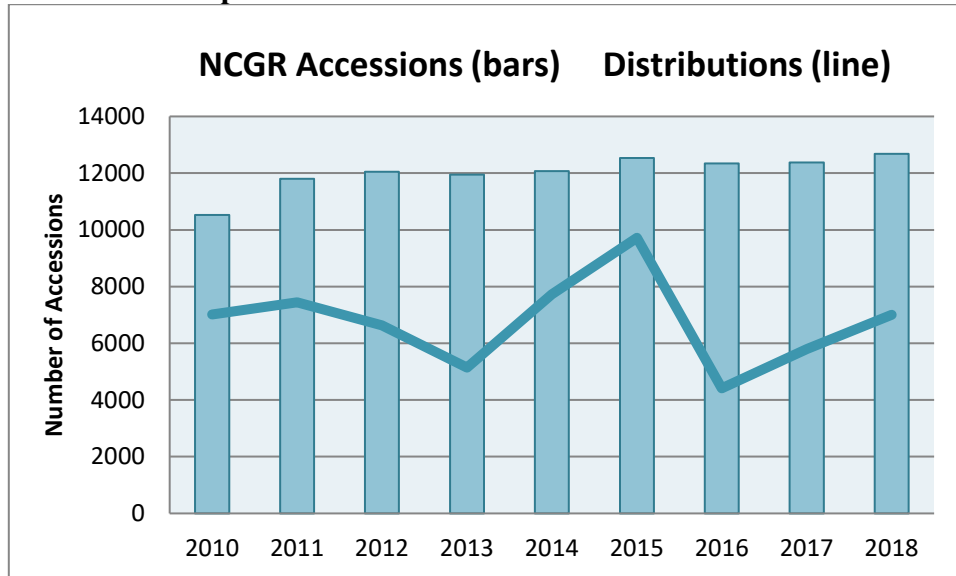


Employee Summary

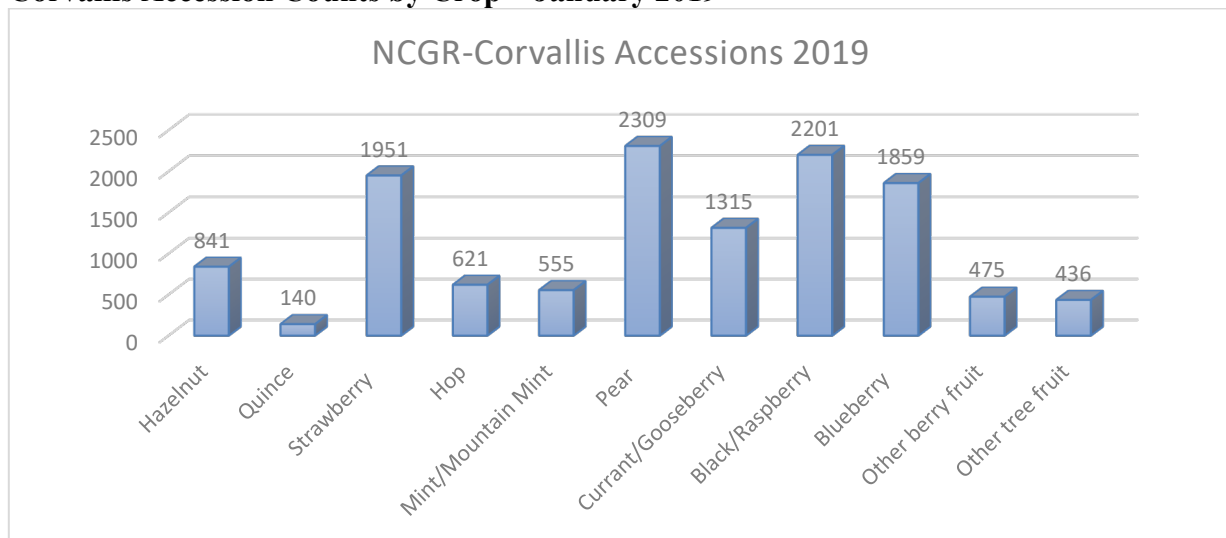


Germplasm Collections

Corvallis Germplasm Collections 2010 -2018



Corvallis Accession Counts by Crop – January 2019

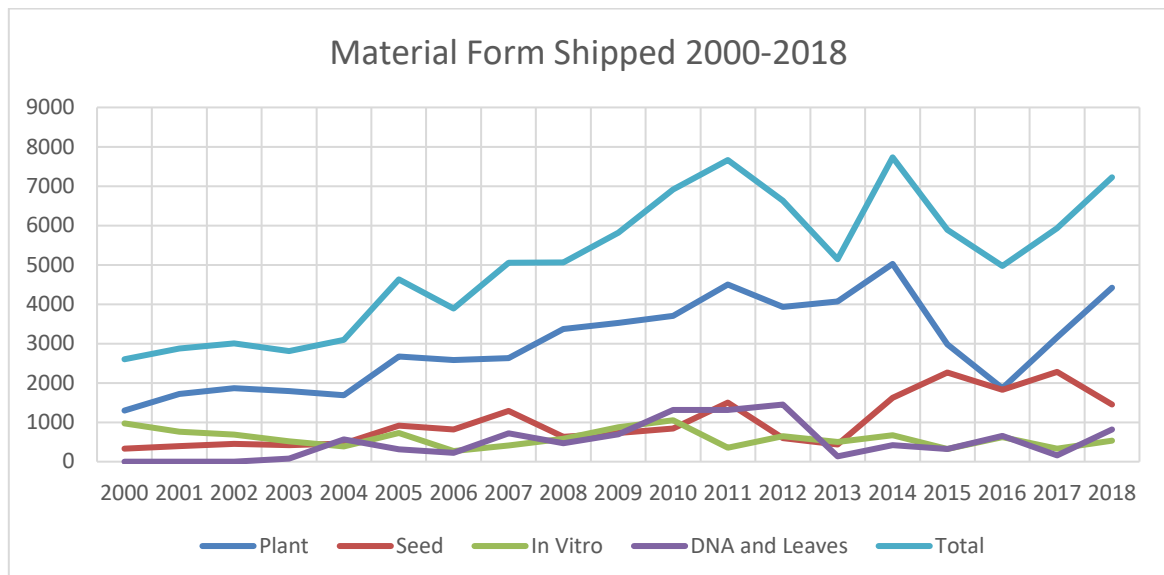


Corvallis Germplasm Collections – Total accessions (12,443) by genus, June 2019

Genus	Common Name	Accessions	Genus	Common Name	Accessions
<i>Actinidia</i>	Hardy Kiwifruit	4	<i>Kalmia</i>	Mountain Laurel	2
<i>Agapetes</i>	Blueberry relative	21	<i>Lonicera</i>	Blue honeysuckle	82
<i>Amelanchier</i>	Serviceberry	48	<i>Lycium</i>	Wolfberry	14
<i>Amelasorbus</i>	Inter-generic hybrid	1	<i>Macleania</i>	Blueberry relative	5
<i>Arbutus</i>	Strawberry Tree	3	<i>Malus</i>	Apple	10
<i>Aronia</i>	Aroniberry	9	<i>Mentha</i>	Mint	460
<i>Asimina</i>	Pawpaw	8	<i>Mespilus</i>	Medlar	61
<i>Buxus</i>	Boxwood	1	<i>Micromeria</i>	Blueberry relative	1
<i>Camellia</i>	Tea Camelia	1	<i>Peraphyllum</i>	Crab apple	7
<i>Castanea</i>	Chestnut	3	<i>Pernettya</i>	Blueberry relative	1
<i>Cavendishia</i>	Blueberry relative	5	<i>Physocarpus</i>	Ninebark	1
<i>Ceanothus</i>	Ceanothus	38	<i>Potentilla</i>	Quinquefoil	8
<i>Celtis</i>	Hackberry	1	<i>Psammisia</i>	Blueberry relative	1
<i>Chaenomeles</i>	Asian quince	48	<i>Pseudocydonia</i>	Asian quince	4
<i>Cornus</i>	Cornelian Cherry	2	<i>Pycnanthemum</i>	Mountain mint	95
<i>Corylus</i>	Hazelnut	841	<i>Pyracomeles</i>	Inter-generic hybrid	1
<i>Crataegomespilus</i>	Inter-generic hybrid	2	<i>Pyrionia</i>	Pear-Quince hybrid	7
<i>Crataegosorbus</i>	Inter-generic hybrid	1	<i>Pyrus</i>	Pear	2338
<i>Crataegus</i>	Hawthorn	28	<i>Rhododendron</i>	Rhododendron	6
<i>Crataemespilus</i>	Inter-generic hybrid	2	<i>Rhodomyrtus</i>	Rose Myrtle	1
<i>Cydonia</i>	Quince	143	<i>Ribes</i>	Currant/Gooseberry	1286
<i>Dimorphophanthera</i>	Blueberry relative	2	<i>Rubus</i>	Black/Raspberry	2202
<i>Docynia</i>	Asian quince	2	<i>Sambucus</i>	Elderberry	203
<i>Empetrum</i>	Crow berry	17	<i>Schisandra</i>	Magnoliavine	10
<i>Epigaea</i>	Blueberry relative	1	<i>Sibbaldia</i>	Strawberry relative	2
<i>Fagus</i>	Beech	2	<i>Sorbaria</i>	False spiraea	1
<i>Fragaria</i>	Strawberry	1951	<i>Sorbaronia</i>	Inter-generic hybrid	7
<i>Gaultheria</i>	Blueberry relative	43	<i>Sorbocotoneaster</i>	Inter-generic hybrid	3
<i>Gaylussacia</i>	Huckleberry	17	<i>Sorbopyrus</i>	Sorbus-Pyrus hybrid	9
<i>Hippophae</i>	Sea buckthorn	1	<i>Sorbus</i>	Mountain ash	102
<i>Holodiscus</i>	Beauty Bush	3	<i>Symphysia</i>	Blueberry relative	2
<i>Humulus</i>	Hop	621	<i>Vaccinium</i>	Blueberry	1865
<i>Juglans</i>	Butternut	28	<i>Zelkova</i>	Zelkova	1

Germplasm Distribution

- In CY 2018, NCGR staff shipped 7221 items as seeds, cuttings, runners, scionwood, rooted plants, tissue cultures, DNA or leaf samples.
- In CY 2018, 855 new orders were received. 744 orders were completed.
 - 713 of these were domestic orders and 31 international.
- *Pyrus*, *Vaccinium* and *Fragaria* were the most distributed genera – *Pyrus* with 2078 items, *Fragaria* with 979 items and *Vaccinium* with 986 items.
- Domestic individuals, state agencies and universities, and ARS researchers received the most germplasm from Corvallis in 2018.



Molecular Genetics & Plant Pathology Accomplishments

- Identified likely original ‘Boysen’ genotype among four genotypes in the industry (nurseries and private collections) using the blackberry fingerprinting set; and determined its parentage as resulting from the cross between ‘Logan’ x ‘Austin Mayes’.
- Surveyed genetic diversity of mint crop ancestors, *Mentha aquatica* and *Mentha suaveolens*, and determined their ploidy, essential oil composition, and relative Verticillium wilt resistance. This study provided updates of accession descriptions in the GRIN database, and is expected to increase the utility of the *Mentha* collection to the research community.
- Developed a reliable *Corylus* sp. reference database of 195 accessions through the implementation of a DNA fingerprinting set. Implementation of this test together with the addition of more unique accessions to the reference database will help verification of trueness-to-type of economically important cultivars for the hazelnut industry.
- Established a reference chromosome-scale genome sequence for black raspberry using new techniques. This updated, high-quality black raspberry reference genome will be useful for comparative genomics across the horticulturally important Rose family and enable the development of marker assisted breeding in these berry fruit crops.
- The presence of Black currant reversion virus (BRV) in black currant germplasm accessions was confirmed through a collaboration with the USDA-ARS genetic resources lab in Beltsville, Md. reporting the presence of BRV in the U.S (Zurn et al. 2019. Plant Disease). A revised RNA extraction protocol resulted in many false positives due to primer-dimers. New PCR primers will be designed using virus sequence information so that the distribution of BRV in *Ribes nigrum* germplasm can be assessed.
- A highly efficient Axiom® 70K SNP array was developed for genetic analysis, high-density mapping and characterization of pear germplasm using sequence data from more than 2000 accessions from the USDA *Pyrus* germplasm collection in collaboration with the University of California, Davis.

Publications

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