

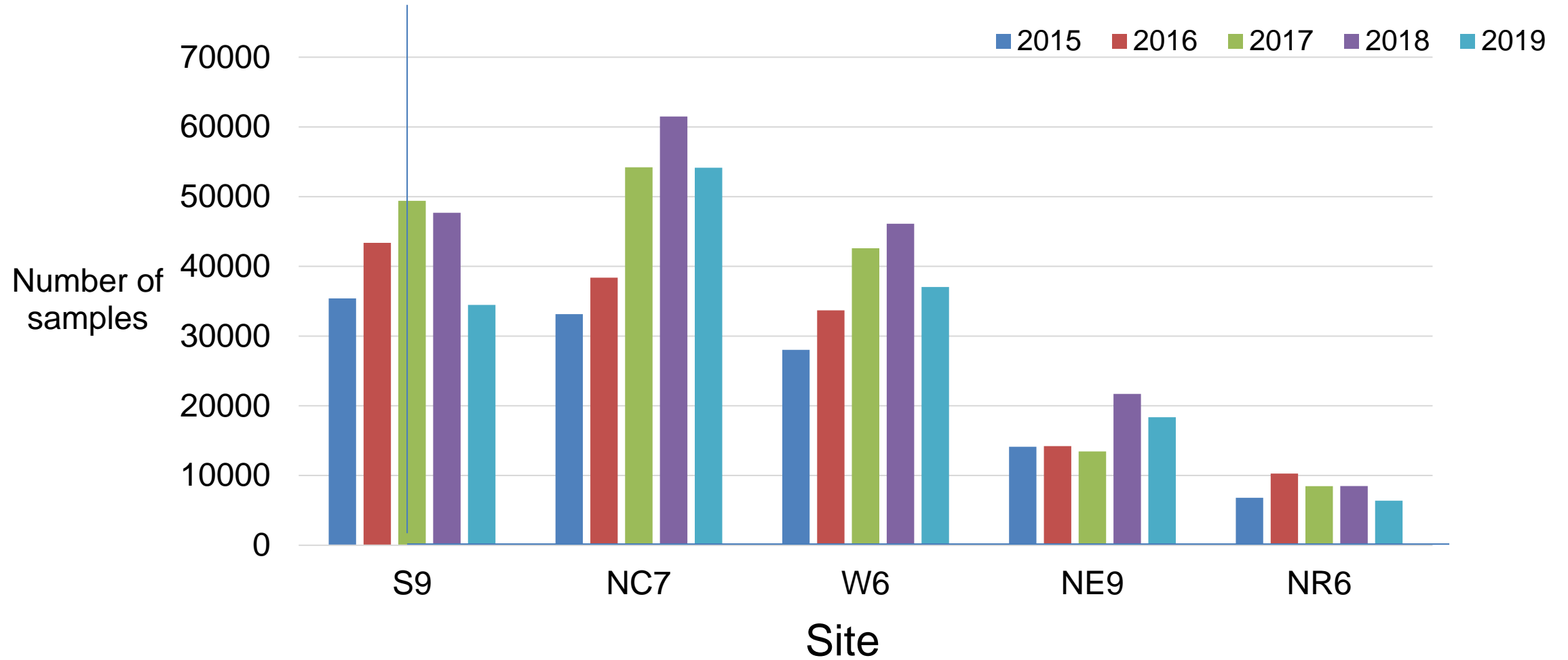
NRSP-6 and Regional Plant Introduction Stations Update

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NRSP-6 and Regional Plant Introduction Stations Functions

- **Acquire, conserve and distribute plant genetic diversity and associated information**
- **Encourage use of germplasm (User-focused)**
- **Conduct research to improve genetic resource management programs**
- **Evaluate and characterize germplasm to facilitate targeted research objectives**
- **Prebreeding activities to facilitate utilization**

Distributions



1,271,783 total samples shipped by NPGS between 2015-2019 (23 sites)

Update on PGOOC meetings

- 2019 Plant Germplasm Operations Committee (PGOC) meeting was virtually held on August 1st, 2019; the 2020 PGOOC will also be virtually held later this month.
- Major topics discussed at the meeting: NPGS updates by P. Bretting, update on GRIN-Global and plant exchange activities by G. Kinard et al., overview of the Canadian germplasm system by D. Kessler, update on NLGRP by C. Walters, update on CWR by C. Khoury, and other businesses.
- Special topic: NPGS management of germplasm with genetically-engineered traits
- Meeting minutes available upon request

Potato Genebank (NRSP-6)

-- *Service basics*--

Preservation, evaluation and distribution of ~5,000 botanical seed accessions of about 100 species and ~1,000 cultivated *in vitro* clones

Collected 15 new populations from southwest USA in collaboration with Univ. Utah. Also received 18 new cultivars and breeding clones from cooperators

Increased 195 accessions as botanical seed populations and did 19,522 *in vitro* clonal stocks transfers

Performed virus tests of nearly 1,000 accessions, germination tests of 1,579 accessions, and ploidy determination of 31 accessions

Distributed 6,659 accessions in USA and 3,383 abroad



Potato Genebank (NRSP-6)

-- *Research and Development* --

Thousands of field plots, and screenhouse and greenhouse plantings supported cooperative research with a broad array of state, federal, industry and foreign collaborators on a full spectrum of topics.



Potato Genebank (NRSP-6)

-- *Impact highlights* --

Continued collaborative research and breeding in Peru

Initiated drought screening team and discovered potential of gibberellin deficient dwarfs

Produced novel custom interspecific hybrids for cooperators

Discovered benefit of freeze-priming seeds

All cultivar and breeding stocks published in 2019 had NRSP6 species in their pedigrees



Potato Genebank (NRSP-6)

-- Administration --

NRSP Review Committee continued to ask for a plan to eliminate the project and transition to other sources of funding.

Since we could not find any viable alternative supporter to take the place of NRSP6, we submitted a *status quo* plan for FY21-25.

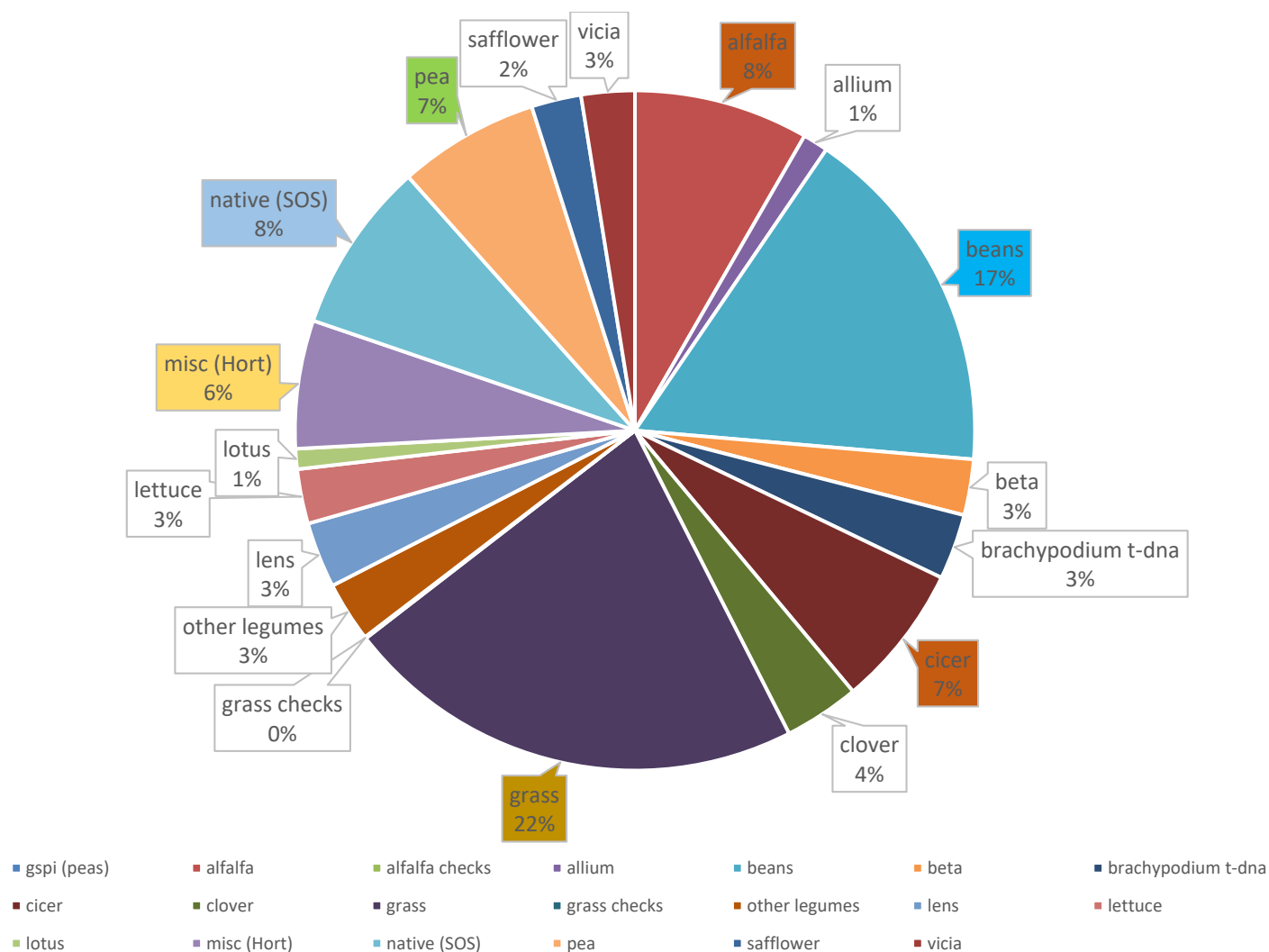
Project staff made our case for continued funding at the 2020 regional spring meetings at the end of March but there has been no feedback from the RC or Admin Advisors about the outlook as of May 18th.

Staff changes: The Project research tech left, and associated taxonomist and enhancement specialist are both retiring in 2020.

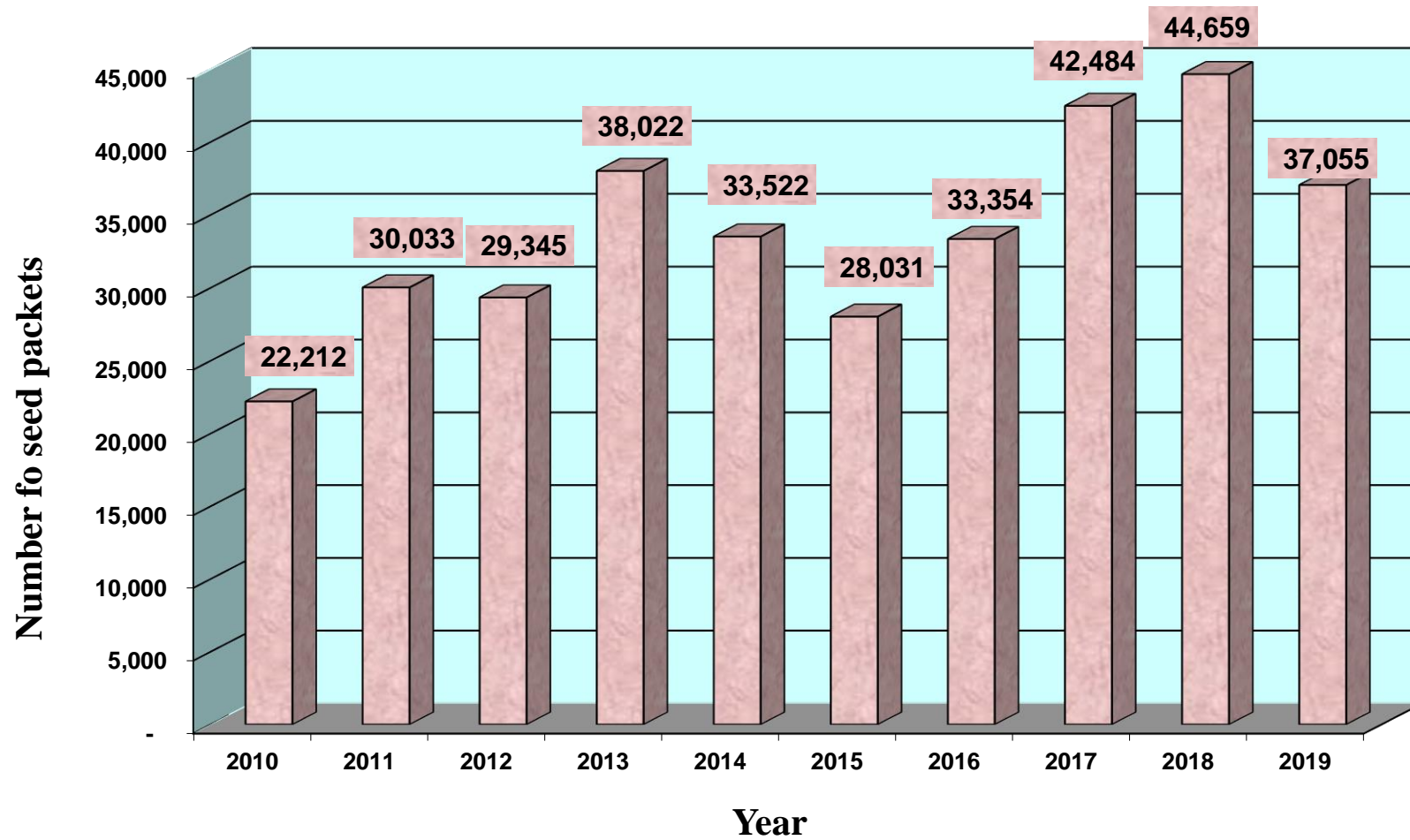


Western Regional Plant Introduction (W6)

103,757 accessions from 169 countries as of February 18, 2020



Number of seed packets distributed by WRPIS each year since 2010. Last year's distribution was slightly less than prior two years



Curatorial and Research Programs in W6

1) Managing the genetic resources of diverse crops/crop groups

Five curatorial programs:

1. Agronomy and grasses (**Vice-Bradley**)
(Clare Coyne is acting)



forage and turf grasses



Safflower

2. Beans (**Vice-Kisha**)
(Barbara Hellier is acting)



various *phaseolus* species

3. Cool season food legumes (**Clare Coyne**)



pea, lentil, chickpea, faba bean, lupine,
fenugreek, grasspea, etc.

4. Temperate forage legumes (**Brian Irish**)
located in Prosser, WA



Alfalfa,



Clover and



lotus,

and Native plants

5. Horticultural and miscellaneous
crops (**Barbara Hellier**)



lettuce,



sugar beets,



garlic and onion
relatives,



selected ornamentals,
and



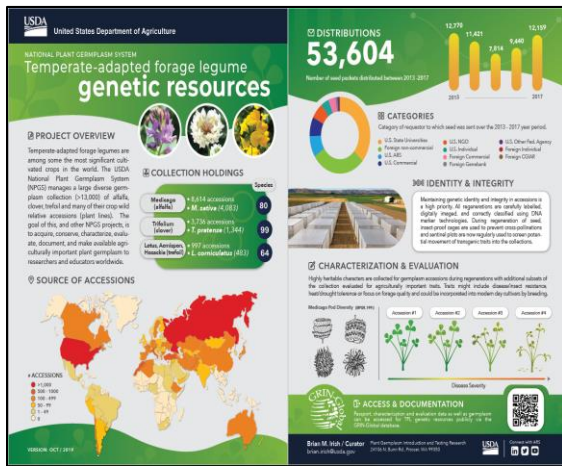
medicinal
plant species

2. Conducting mission-related research:

Three research programs:

1. Plant pathology (**Vice-Dugan**, recruitment initiated in April 2020)
2. Genetics (**Jinguo Hu** to April, 2020)
3. Genetics (**Long-Xi Yu**), located in Prosser, WA

Germplasm Research Activities in W6



Characterization of ornamental crop germplasm



First crop of common bean being regenerated in the new greenhouse on Central Ferry Farm

Research and service activities for temperate-adapted Forage Legume project

A photograph of a large data table showing correlations between alfalfa plot biomass and actual measurements. The table contains numerous rows of data, with columns for plot number, biomass, and correlation. The data is presented in a clear, organized manner, with rows and columns clearly defined.

Significant correlation of alfalfa plot biomass between drone imaging and actual measurement

Personnel changes in W6

Federal:

New Hire:

Mrs. **Jennifer Morris** started in February, 2020 as a two-year term Farmer supporting Mr. Kurt Tetrick at our Central Ferry Farm.

Dr. **Lyle Wallace** will start in July as a Postdoctoral Associate under the supervision of Barbara Hellier to work on the Phaseolus collection management.

Retired:

Dr. **Theodore Kisha**, Geneticist and Common Bean Germplasm Curator, retired on August 31, 2019 after 19 years of working with USDA joined ARS-Pullman, Washington. Ted joined ARS in 2000 as a Plant Geneticist and in 2014, he was reassigned to his current position with responsibility for managing the over 17,000 bean accessions of 47 species collected worldwide.

Dr. **Jinguo Hu** retired on April 24, 2020 after 18 years working with ARS with 12 years at the W6 station as the RL.

State:

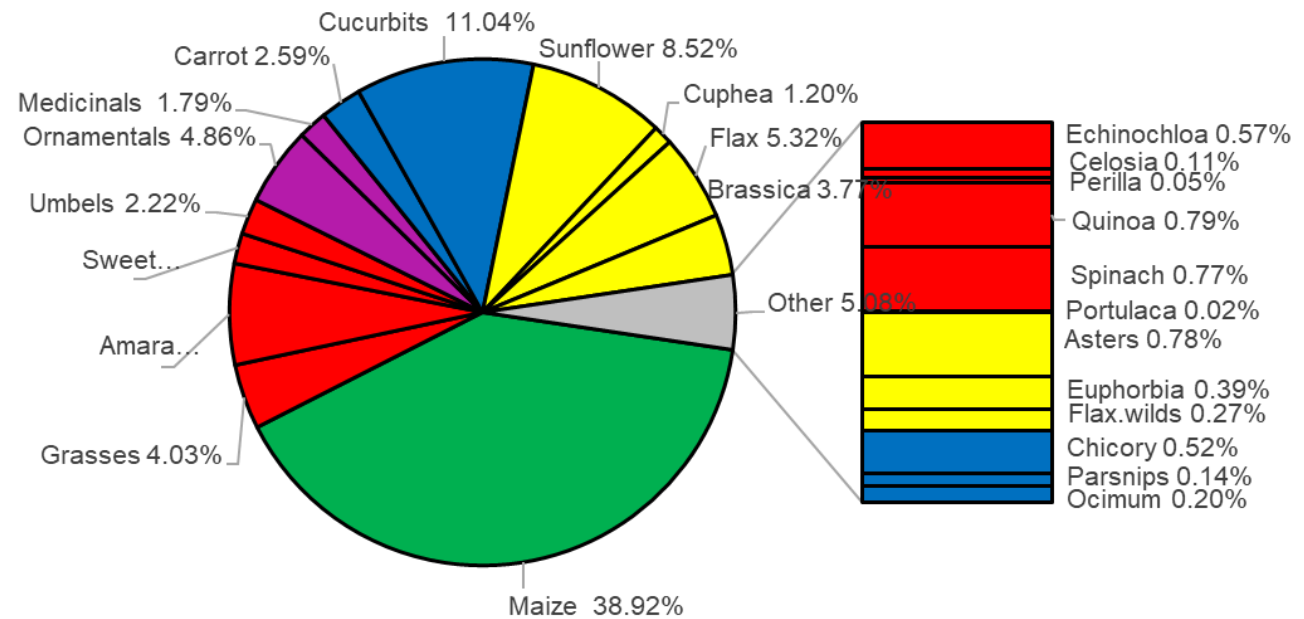
New Hire:

Mrs. **Saber Glass** was promoted to be the Pullman farm manager in June, 2019, after Mr. **Charles Golob** resigned. Mr. **Alec McCall** was hired as a Farm Technician in December 2019 and Ms. **Deah McGaughey** was hired as the Seed Cleaning Technician in January 2020.

North Central Regional PI Station (NC-007)

Curation of nearly 54,800 Accessions

- Strategic collection development resulted in acquisition of about 300 new accessions in 2019. Herbaceous and woody ornamentals, medicinal, sunflower, maize, Cucumis, an expired PVP of *Cichorium endivia* from Netherlands, and other Crop Wild Relatives originated from the Republic of Georgia, California, Missouri, Oklahoma, West Virginia, the Seeds of Success program, the US Forest Service, the NLGRP, and others. Eighty two *Daucus* accessions received via the Crop Trust's Crop Wild Relative Initiative from multiple countries were integrated into the collection.
- Crop Vulnerability Statements (CVS) were updated for maize and sunflower by the curators and Crop Germplasm Committees; others are under review.



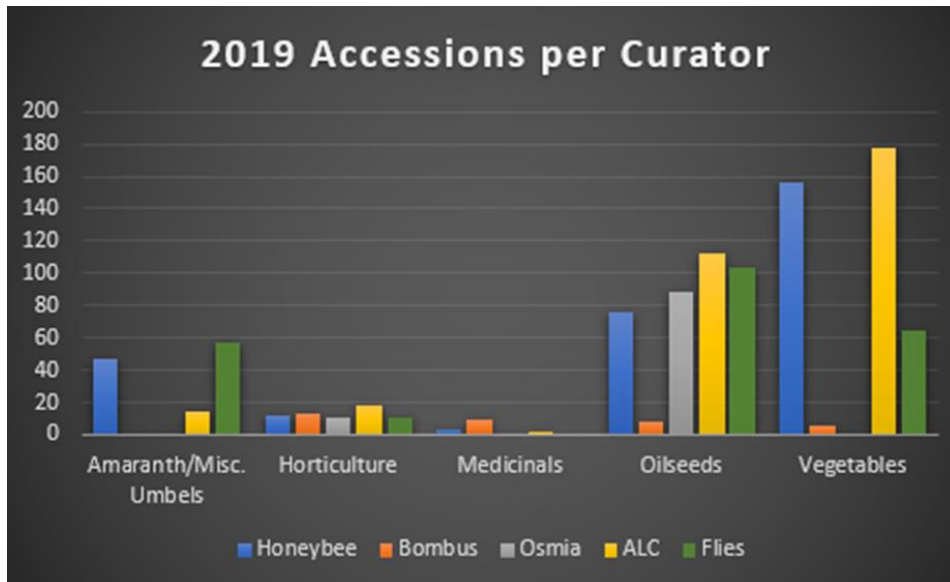


NCRPIS Genebank Objectives

- *Maintain and provide* high quality, well-documented germplasm for research and educational objectives for primarily heterogeneous, heterozygous, outcrossing crops.
 - 1,245 accessions were regenerated
 - 4,210 accessions were tested for viability; 45% of collection holdings have been tested in the past 10 years. Many of our 1700+ taxa lack viability testing protocols.
 - A commercially relevant, easily transformable maize inbred line, LH244 was cleared from PVP protection by its owner in order to make it available to the scientific community earlier and transferred to Ames from the NLGRP.
 - 1200 tropical maize accessions were transferred from the NLGRP to Ames and made newly available.
 - Curators increased our first genetically engineered, expired maize PVP accession off-site.
 - New maize curator Vivian Bernau analyzed various success metrics for 10 years of nursery plantings.
 - Laura Marek utilized the ARS NPGS site at Parlier, CA for increasing wild *Helianthus* taxa requiring a longer growing season and a more arid environment.
 - Newly constructed vernalization rooms were utilized for Brassica sp. for plant conditioning.

Provide for pollination and seed/plant health testing services to ensure production of high quality, true-to type seed:

- Entomology team provided honeybees, bumble bees, Osmia (Mason) bees, Alfalfa Leafcutter bees, and two species of flies for pollination services to nearly 1,000 accessions grown by our curators.
- Queen production and grafting of honeybees was successful, 19 queen cells /week.
- Entomologists Steve Hanlin and Kallie Webber successfully emerged Pipevine Swallowtail butterflies for pollination of Monarda in cages.



Queen cell selections



Pipevine
swallowtail
chrysalis

Pathology, continued:

- Various protocols were tested to determine if incidence of seedborne *Acidovorax citrulli*, causal agent of bacterial fruit blotch in *Cucumis melo* can potentially be reduced by exposing seeds to chlorine gas treatment, in conjunction with confirmation of infection by ELISA; results are promising.
- Group-specific PCR was used to characterize the isolates of *A. citrulli*, an aid in determining their pathogenicity.
- Fungicide seed treatments on *Cucurbita* and *Cucumis* seedlings were compared to select best control option for damping off, and did not decrease seed germination rates.
- Two new diseases were observed in Ames and first reports submitted, 1) a phytoplasmal disease affecting flax and Euphorbia, and 2) anthracnose of quinoa caused by *Colletotrichum coccodes* and *Colletotrichum truncatum*.
- Phytosanitary inspections were made of more than 900 accessions, and lab testing of more than 3,000.
- New disease management plans were established for multiple crops.

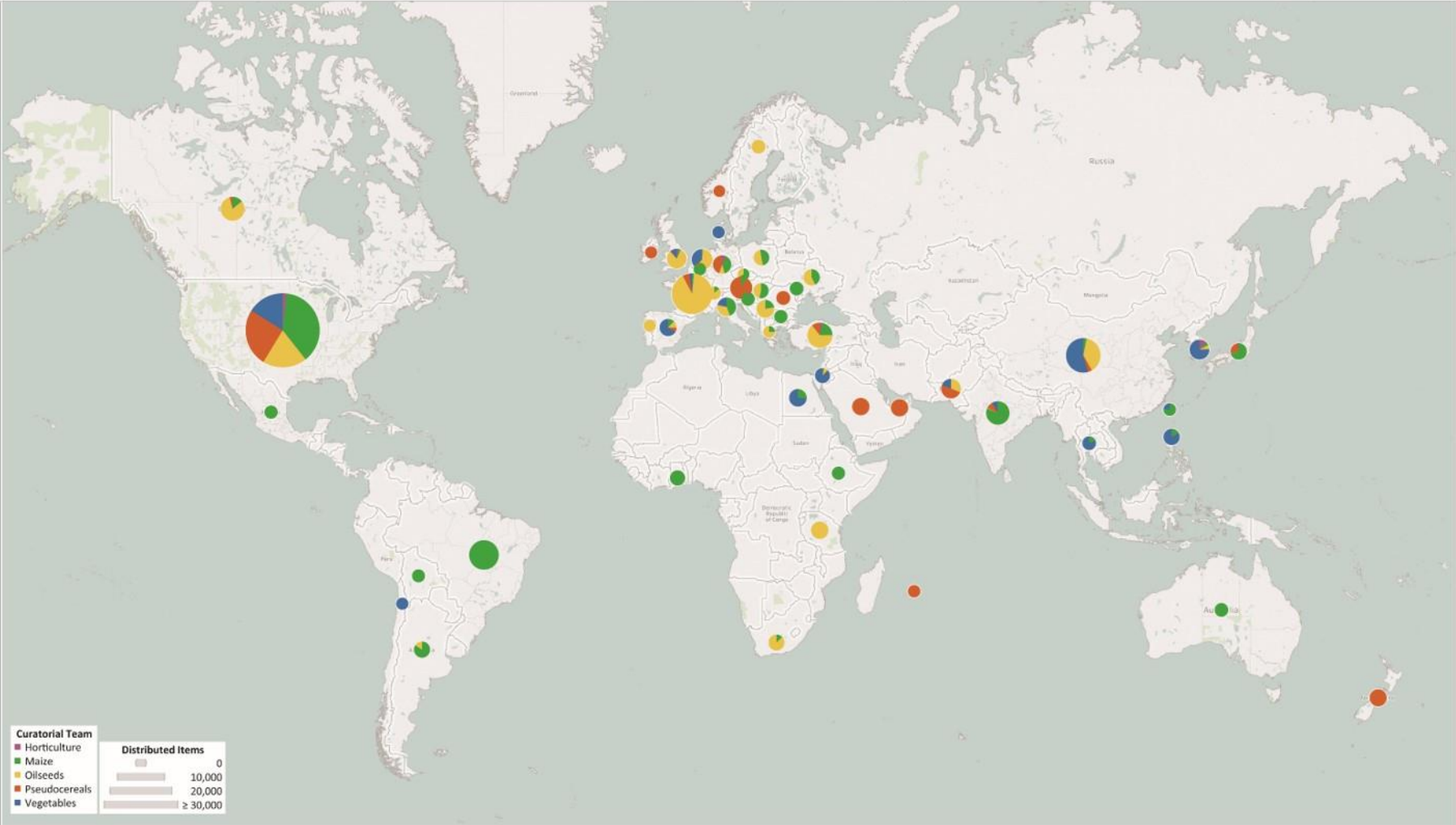
➤ *Characterization and evaluation to increase collection utility – user community examples*

- Observations of *Gymnocladus dioicus* and *Betula nigra* continue for evaluation of superior accessions for the Midwest. Cooperation with NSF and Genome Canada projects involved field and greenhouse evaluations of the UGA-SAM1 *Helianthus* association mapping population and the GB-UBC pre-breeding lines developed in collaboration with the University of British Columbia and the Global Crop Diversity Trust.
- Evaluated 544 accessions of *Brassica rapa* for flowering type and vernalization requirement.



➤ *Distributed* more than 61,100 packets of 23,330 accessions in 2019; ~52% in U.S., 48% to internationals; of U.S. recipients, ~½ of distributions were to Landgrant Institutions.

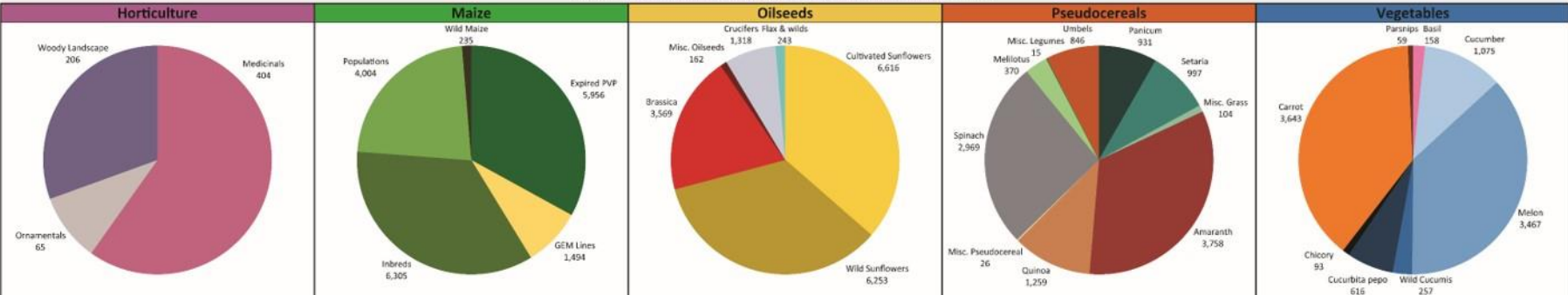
2019 Worldwide NCRPIS Germplasm Distributions



2019 - NCRPIS Germplasm Distribution Summary				
Curatorial Team	Orders		Order Items	
	United States	International	United States	International
Horticulture	116	9	516	164
Maize	575	147	12,169	5,941
Oilseeds	175	84	6,228	11,933
Pseudocereals	141	54	8,125	3,150
Vegetables	99	57	5,169	4,199
Grand Total	1,008	331	32,207	25,387

2019 - NCRPIS Germplasm Distribution Detail		
Country	Orders	Items
Argentina	8	193
Australia	2	52
Austria	6	913
Belgium	3	15
Bolivia	1	27
Brazil	7	2,611
Bulgaria	1	37
Canada	24	1,235
Chile	1	8
China	13	4,145
Croatia	5	46
Czech Republic	3	3
Denmark	2	11
Egypt	5	310
Ethiopia	2	32
France	31	6,541
Germany	23	390
Ghana	1	127
Greece	2	4
Hungary	5	121
India	20	1,141
Ireland	1	7
Israel	5	117
Italy	18	439
Japan	13	216
Korea, South	17	567
Mauritius	1	15
Mexico	2	34
Moldova	2	50
Netherlands	10	688
New Zealand	1	272
Norway	1	4
Pakistan	5	545
Philippines	3	206
Poland	8	155
Portugal	2	7
Romania	1	58
Saudi Arabia	3	291
Serbia	7	340
South Africa	4	181
Spain	14	273
Sweden	2	55
Switzerland	4	30
Taiwan	3	17
Tanzania	1	300
Thailand	6	50
Turkey	12	1,495
Ukraine	4	204
United Arab Emirates	1	290
United Kingdom	15	551
United States	1,021	32,251
Grand Total	1,352	57,670

2019 - Crop Distributed Order Items by NCRPIS Curatorial Group



GRIN-Global Development

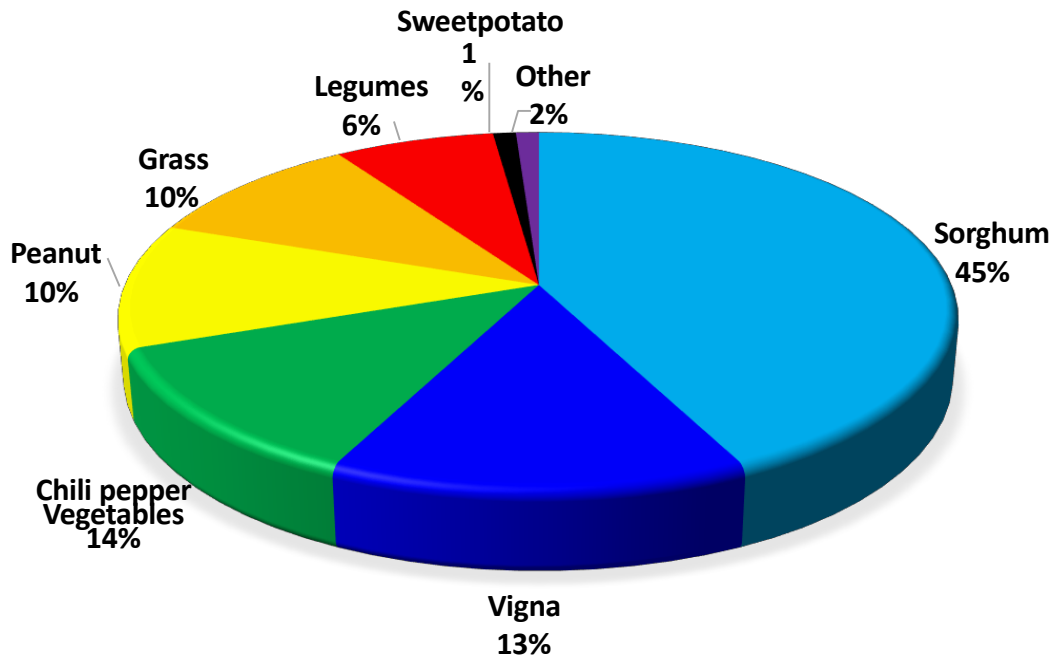
- Multiple new Curator Tool versions were developed, and CT 1.9.9.6 was released to the National Plant Germplasm System curatorial community by developer Pete Cyr.
- Multiple new versions of the Order, Cooperator, and Viability Wizards were tested and released for curatorial use by Pete Cyr
- The GRIN-Global Advisory Committee, chaired by Lisa Burke, met bi-weekly to discuss user challenges, prioritize development needs, vet software products developed by Ames and Beltsville development team members, and recommend versions for production.

Personnel News

- New Category 4 SY, Plant Pathologist Dr. Anna Testen joined the NCRPIS in February 2019, position formerly held by Dr. Charlie Block.
- New Category 4 SY, Maize Geneticist (Curator) Dr. Vivian Bernau joined the NCRPIS in March 2019, a new position.
- New Biological Science Technician, Seed Storage, Ashley Sonner.
- New Cat 3 SY, Dr. Adam Vanous, Germplasm Enhancement of Maize Project.
- Maize Curator Mark Millard will celebrate 40 years as a Curator in July, 2020!

Southern Regional (S-009)

Crops managed

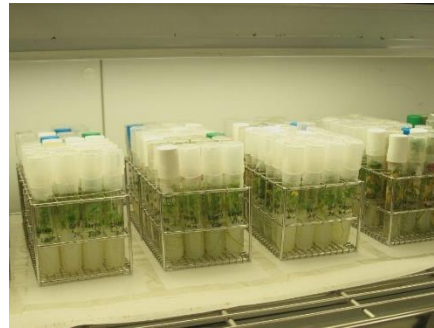


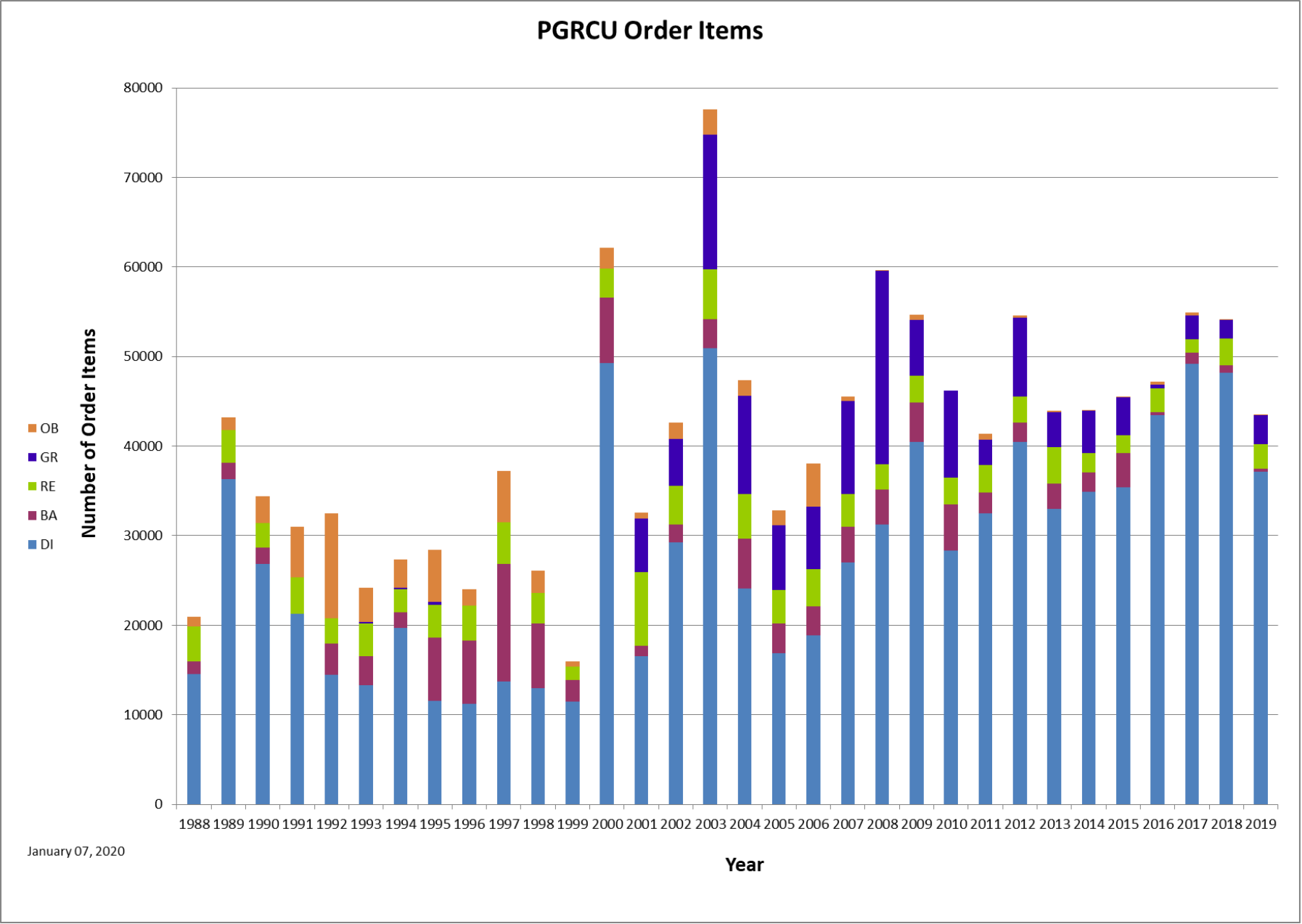
Curators and Scientists

- Sorghum & S-009 Millets (Melanie Harrison)
- Peanut & Vigna (Shyam Tallury)
- Pepper, Melons, Vegetables (Bob Jarret)
- Legumes, Warm-season Grasses, Clover (Brad Morris)
- Sweet Potatoes (Ming Li Wang)

Southern Regional (S-009) Stats

- The PGRCU collection totals 100,249 accessions of 1605 species and 286 genera with 86.4% available for distribution and 98.5% backed up at Ft. Collins, CO. A total of 2,290 additional accessions were made available for distribution in 2019.
- A total of 37,391 accessions (9016 in the S-009 region) were distributed in 1193 orders to users worldwide in 2019.
- Currently, 88,201 accessions or 89.2% of the seeded accessions in the collection are stored at -18°C. This reflects an additional 503 accessions moved to -18 °C in 2019. Seed longevity is improved by storage in -18°C rather than 4°C.
- A total of 251 images and 6312 observations were uploaded to GRIN-Global.





OB = Observation; GR = Germination; RE = Regeneration; BA = Back Up; DI = Distribution

Southern Regional (S-009) Activities

SNP analysis using a low density genome sequencing in *Capsicum frutescens* and *Luffa*;

Evaluation of insect resistance in a wild *Citrullus* species (whiteflies and spider mites)

Screening of the watermelon (*Citrullus* spp.) collection for the presence of *Acidovorax citrulli* (Bacterial Fruit Blotch)

Identification of biochemical compounds in several *Desmodium* and *Lespedeza* species with anti-intestinal parasite control potential

Evaluation of roselle and butterfly pea genotypes with high calyx, flower, and seed production for use in chutney, jelly, and teas

Analysis of sorghum root traits
Oil and protein content and fatty acid composition in peanut.



Southern Regional (S-009) Facilities

In addition to annual appropriations, USDA-ARS provided substantial support through Area Office and Headquarters funded projects and equipment for FY19-FY20 which included:

- Custom built small plot peanut combine
- Roof repair to metal storage building
- Roof and ceiling replacement in seed storage building
- Renovation of field shop including replacement of exterior walls and roof
- HVAC renovation in headhouse and renovation of heating system in attached greenhouses
- Reglazing and asbestos abatement in two greenhouses.

Personnel Changes in Southern Regional (S-009)

➤ New Hires\Appointments:



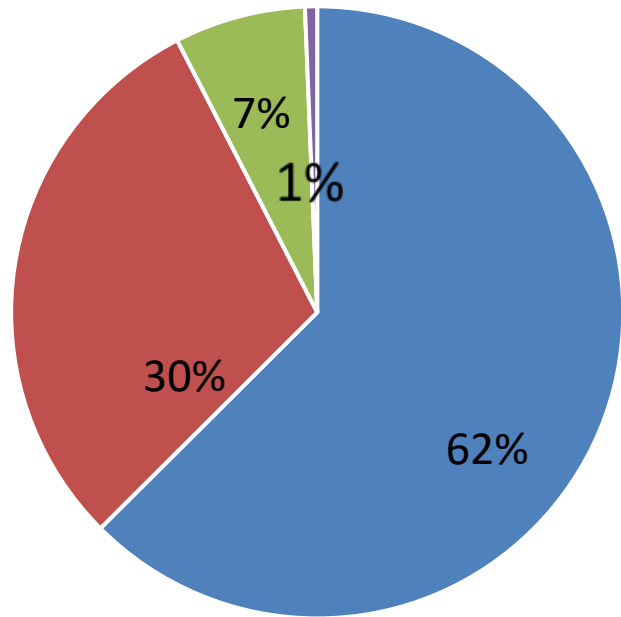
Cassa Munroe was hired in 2019 as a federal Biological Science Technician. Her role is to handle and track incoming germplasm requests and package and ship germplasm. With this hire, the seed storage crew is now complete for the first time in several years after multiple retirements.

➤ Vacancies to be Advertised Soon:

- S-009 Research Technician for Field Operations
- USDA-ARS Agricultural Science Lab Tech for peanut/vigna curation
- USDA-ARS Maintenance Mechanic

Northeast Regional PI Station (NE9)

Crops conserved



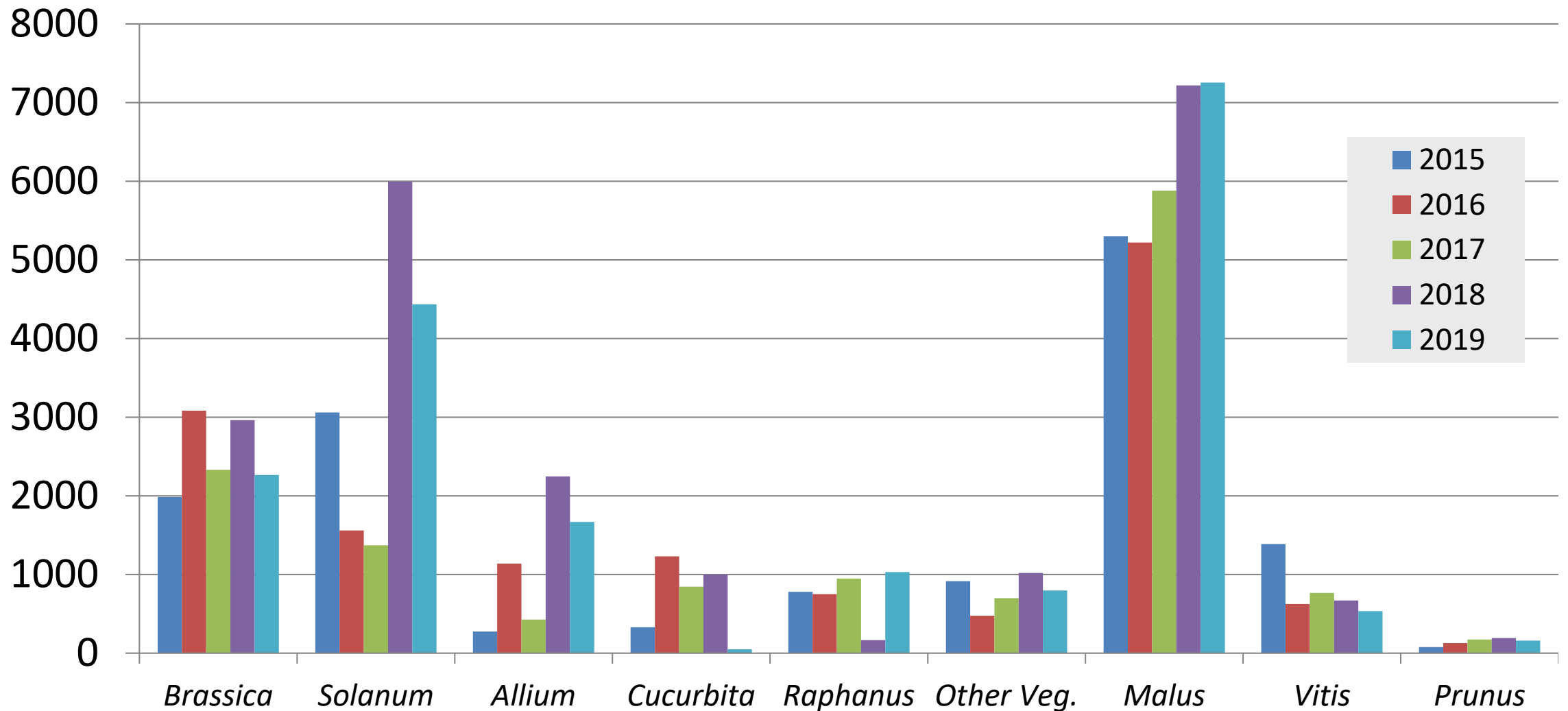
Vegetables	12707 accessions
Apples	6073 accessions
Grapes	1405 accessions
Tart cherries	131 accessions

Two curatorial programs:

- ❖ Industrial Hemp & Vegetable (tomato, onion, radish, winter squash, cabbage, cauliflower, broccoli, other cole crops, celery, tomatillo, asparagus, buckwheat and other vegetables) Crops (Joanne Labate & one vacancy) The major crops managed by this project represent approximately 40% of the combined dollar value of fresh and processing vegetables in the US.
- ❖ Clonal Crops (Ben Gutierrez & one vacancy) apples, grapes and tart cherries
- ❖ Apples, grapes, and tart cherries are among the most valuable fruit crops worldwide, with US production valued at
 - \$ 6.3 billion for grapes
 - \$ 3.5 billion for apples
 - \$ 89.4 million for tart cherry

Distribution of NE9 Geneva Germplasm

18,199 vegetable and clonal germplasm samples in 2019 and 81,453 samples from 2015 – 2019



Northeast Regional PI Station (NE9)

Germplasm regeneration, collection, and outreach highlights:

- Successful regeneration of 704 accessions from 2015 – 2019 (average 141 seed lots produced/yr), 150 regenerations planned in 2020 for seed production of vegetable germplasm to distribute and replenish stocks.
- PGRU continues to support organic farming by providing germplasm and demonstrations for small-scale seed production as part of the Northern Organic Vegetable Improvement Collaborative (NOVIC3).
- Foreign exploration to Viet Nam for tropical apple species, *Malus doumeri*.



seed production outreach NOVICIII



Malus doumeri fruit

Northeast Regional PI Station (NE9)

Germplasm research highlights:

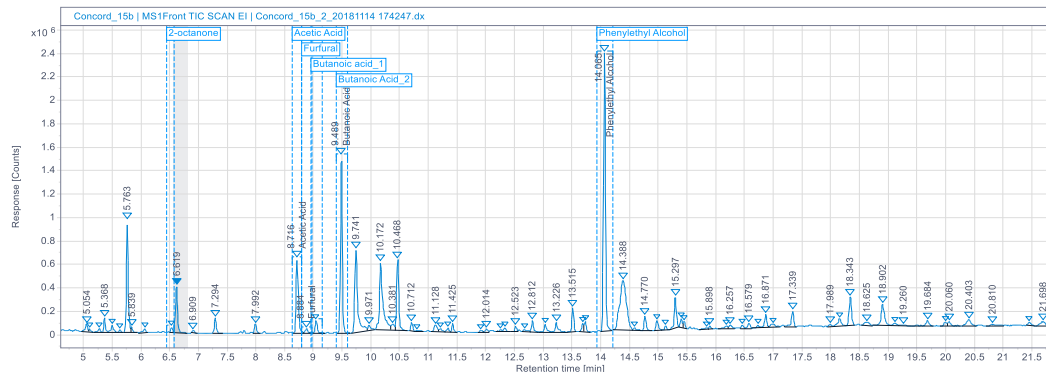
- Onion germplasm from the Indian subcontinent, Iran and central Asia were divergent from onions that dispersed to Europe (and eventually globally). This indicates that Asian germplasm is a potential source of novel alleles.
- A fully genotyped, 175-line *Brassica oleracea* mapping population will be made available through NPGS for analyzing genetics of traits.
- Acquisition of LCMS for chemical profiling of crops



onion population structure



Brassica mapping population



Aroma analysis in grapes

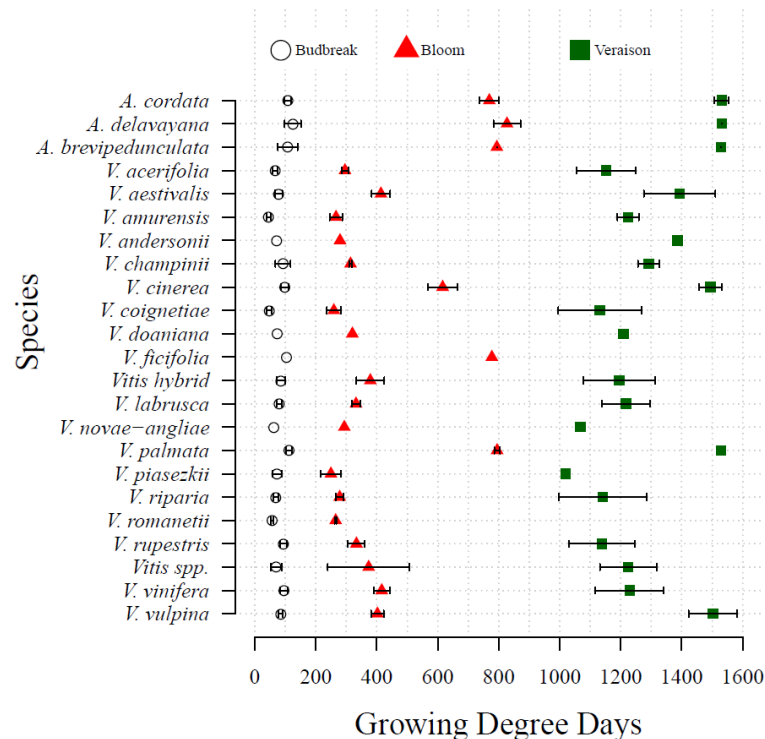


budding in apple

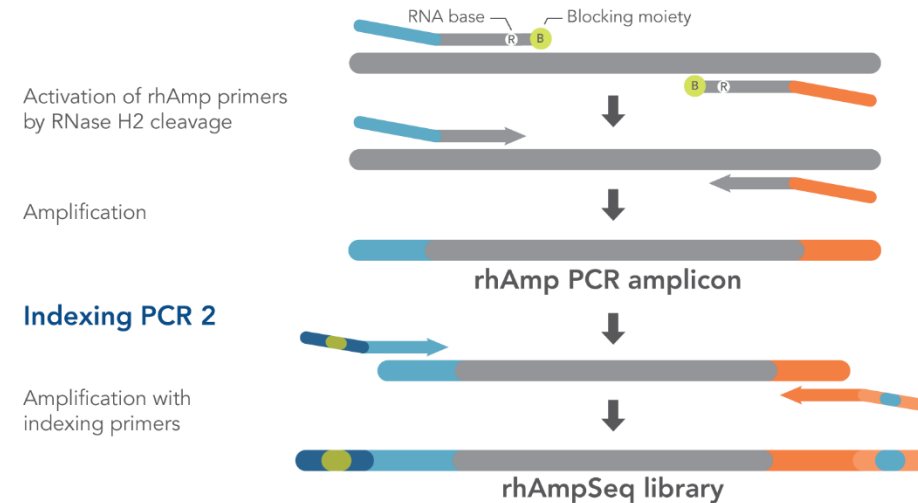
Northeast Regional PI Station (NE9)

Germplasm research highlights:

- Cooperated in screenings of Fusarium Basal Rot resistance in *Allium cepa* and indoor vertical farming potential of *Brassica oleracea*
- The grape collection was characterized for phenological diversity, identifying resources for climate adapted grape breeding.
- rhAmp Seq genotyping of Davis and Geneva *Vitis* collections (2019 and 2020)



Targeted rhAmp PCR 1



Changes in projects, facility and personnel (NE9)

Industrial hemp germplasm

- An industrial hemp germplasm project was added to the ARS Geneva program in 2019.
- Establishment of the project and hiring of a curator for the project are in progress.

PGRU facility

- A fire incident destroyed a range of PGRU greenhouses and damaged the PGRU laboratory and office building.
- Cornell AgriTech provided space for the displaced personnel due to the fire.
- The damaged building will be demolished to make room for the construction of a new building for the ARS Grape Genetics Research Unit, is a sister organization of PGRU in Geneva. The grape germplasm project will move into the new building.

Personnel

- Thomas Chao, apple curator, resigned in 2019. The search for a new curator is in progress.