Pear CGC Meeting Minutes
February 18, 2022; 12:00-2:00pm PST
Held over Zoom

Attendees: Jessica Waite (chair), Nahla Bassil, Jen Baugher, Kevin Brandt, Peter Bretting, Tami Collum, Rodney Cooper, Rachel Elkins, Kate Evans, Dale Goldy, Chris Gottschalk, Ines Hanrahan, Oscar Hurtado, Awais Khan, Gary Kinard, Ryan King, Blanca Leon, Louis Nottingham, Sarah Paris, Joseph Postman, Lauri Reinhold, Soon Li Teh, Gayle Volk, Dave Weil, Gene Woodin

Minutes provided by: Jessica Waite

National Program Report (Peter Bretting)
Powerpoint presented and attached here. Below are a few added notes for slides that came up during the presentation:

- Effects of Covid-19 slide: student labor has been tough due to varying restrictions at multiple levels, ARS going back to the office soon
- Budget and purchasing power slides: some decreases attributed to cost of labor and inputs going up
- Key challenges slide: highlighted cryopreservation for Pyrus
- Overview of priorities slide: Red high priority, orange medium, green is ongoing and dependent on high priorities, black signifies value

National Germplasm Resources Report (Gary Kinard and Blanca Leon)
PDF report sent around before meeting and attached here.
Highlights from Gary: Anne Frances is new botanist; Plant explorations on hold, proposals usually go out Feb/March, but not sure this year due to travel restrictions; GRIN has been functioning and had extra attention during pandemic.
Blanca:

- Focus on crop wild relatives
- Compilation of traits for several crops, including Pyrus
    - Most of the work on traits for the past 10 years is clarifying genotyping and duplicates in collections
    - Has been a challenge combining recent info with old data – need to work closer with the curators and folks doing the genotyping work
    - Following the traits, labeling, and trying to sort out whether these are from true types or hybrid for example
    - Trying to link all these efforts and have a clean presentation of this data
    - Crop wild relative website – needs to be underlined for NPGS efforts

Plant Germplasm Quarantine Program Report (Oscar Hurtado)
Powerpoint presented and attached summarizing activities of the PGQP, with highlights of new molecular pipeline work and what this means for Pyrus and other pome fruit. Highlights below:

- PGQP serves as means for importation of any germplasm
    - Located at old BARC airport site
    - 20 different genera
    - Cydonids, Pyrus, Malus (Oscar esp. works with pomes)

- Greenhouse testing and molecular testing to look for viruses and eliminate them, can include tissue culture therapy
- For Pyrus – regulations have been updated, was 3 years, now closer to 2
    - Grafts for pomes for virus indexing – they screen for a lot of indicators
    - ~20 viruses and viroids for Pyrus
    - Diagnostics in house using metagenomics
    - Have developed pipeline for viral detection with bioinformatics
    - Timeline of how processing samples if germplasm comes in from outside US
    - Field indexing part of the past, which is good
- Pipeline updates and improvement:
    - Have been able to remove field indexing
    - Because the new pipeline is molecular based, they can move through much quicker – closer to 2 years
    - Lots of releases from new pipelines for pome fruit
- Note: a lot of things out there are not virus free – even when certified, some still have viruses, and they are working with curators to maintain material and keeping things clean in the repository (working with apple right now)
    - Something is coming out of the rootstocks in some cases –this is pretty newly ID'd
- Using SNP fingerprinting for QC – want to make sure to deliver the right accessions
- Come across different viruses that unsure of impact, but they still put the information out there – let you know
    - Recent pome field surveys of viruses – they'd like to do this for Pyrus
- Informational video on youtube

National Lab for Genetic Resource Preservation Report (Gayle Volk)
Powerpoint presented summarizing activities of the NLGRP. Slides on the training programs and educational resources attached.

- Background on unit
    - Goals: long term backup of species
    - National plant and animal groups located in the same place
    - Maria and Gayle focus on clonal collections
- About 12% of the clonal accessions backed up
- Cryopreservation
    - 230 accessions in liquid nitrogen
    - Ongoing research to improve pear dormancy bud and shoot tip preservation
- Training program and educational resources
    - Check out GRIN-U.org website
    - Youtube channel
    - Classes through Colorado State (have small fee, but don't have to be CSU student)
- If you have training content, please share with Gayle
- Infographics coming out of this too

Pear Rootstock Breeding Program – Washington State University, Evans Lab (Soon Li Teh)
Powerpoint presented, highlights below:

- Program has been collecting germplasm since 2009, and initiated crosses in 2016

    - ~2000 rootstock seedlings – first batch planted in 2018 – and been phenotyping since (focus has been dwarfing and precocity)
    - Lots of phenotyping and genotyping for all ongoing
    - 10 precocious individuals identified and micropropagated
    - Genetic maps assembled and refined
    - Preliminary QTL associated with dwarfing – novel locus but preliminary and will be confirming
- Diverse germplasm set
    - Fire blight screen of 25 accession
- Funded through Fresh and Processed Pear Research Committees

Pear Scion Breeding – Appalachian Fruit Research Station, Kearneysville, WV (Chris Gottschalk)
Powerpoint presented, highlights below:

- New pome geneticist and breeder in Kearneysville
- Focusing on fruit quality in apple and taking over Richard Bell's work in pears
- Past year has focused on evaluation of germplasm on site
    - A lot of germplasm purged in 2017, but going through what was kept for value
    - Looking at architecture, fruit quality, red skin, etc
    - Looking for novelty
        - One has extreme acidity and polyphenols
        - Another with high spurring, and semi dwarf when grafted, determined pedigree – maybe psylla resistant?
    - Looking for fire blight and psylla resistance
- Bell was released just a few weeks ago
- 2022 will be a big crossing year now that germplasm on site evaluated

2021 Evaluation Grant Results (Ryan King / Nahla Bassil)
The Pear CGC Evaluation Grant was awarded to Nahla Bassil's lab in 2021 to focus on developing markers for fire blight resistance. A large amount of genotyping has been prepared and submitted to evaluate and develop fire blight markers this year. Related work includes the development of 10 SSR for genotyping, highlighting genotyping efforts in heritage trees and from other countries, and working to phenotype and evaluate traits.

Curator Report (Lauri Reinhold)
Powerpoint presented summarizing recent activities in pear curation at the NCGR. Highlights below:

- New hires – Lauri
    - Retirements – Kim Hummer and Barb Gilmore
    - New field technicians (3), vacant field tech
    - TC technician Gabriel Flores
    - Two undergrads
- Accessions: 2300 pear, 1300 cultivars, 900 wild relatives, 36 Pyrus taxa, 55 country origins
- Field efforts
    - Continuity is a priority
    - Labor has been a challenge for maintenance – playing some catchup
    - New equipment coming in that will help a lot
    - Joseph been helping a lot with transition

    - Updated irrigation
    - Intense pruning this past year for ease of management
- Disease pressures
    - FB the biggest issue
        - Labor constraints has made it hard to manage
        - Informs prioritization of backup
    - What diseases are we missing?
- Acquisitions: Two scion collections donated recently (Braunworth Pear – creeping architecture, Barlow Pear – good quality and maybe from FB resistance)
- Backups
    - NLGRP: 26 accessions of Pyrus communis, 2 of P. pyrifolia, 3 of P. ussuriensis. Visited recently to learn TC techniques.
    - NCGR: FB affected accessions in TC. TC lab undergoing renovations.
- Inventory
    - Over next 2-3 year, reconcile inventories, update labels, renovate screenhouse
    - Removing duplicates and adding QR or barcodes
- GRIN
    - Next 2-3 years -updating info on database! Reconcile with inventory
- Long term updates
- Collab Research Projects
    - Duplicates
    - Disease screening – for resistance
    - Phenotype screening
    - Pathogen clean-up
    - Dormant bud cryopreservation

Discussion topics:

- Molecular techniques have been great for improving efficiency in quarantine process, and there is a major benefit of integrating SNP and SSR markers for ID of varieties (making sure duplicates are not coming out)

- Virus issues: Getting clean plant material is a major bottleneck for new variety releases (one example is Gem). There was also discussion of unexpected virus contamination from rootstocks and how to avoid this in the future. Lack of clarity of whether it's coming from seeds, nematodes, or elsewhere. Suggestions to work with Oscar to make sure lines are clean, as well as trying to get stock from TC over hardwood.

- Questions about where there are gaps in the collection. Red flesh as a suggestion. Also brought up that this is a hard thing to tackle, as there are many different types of gaps to consider, thus this hasn't been something tackled in the past by the CGC.

- Prospects for explorations? Unknown at this time, due to travel restrictions.

- Questions whether Romanian pears have been looked at or included. There are some at AFRS, which they will make sure go to Lauri too. There might be more recent selections from Eastern Europe.

- Discussion of educational materials for growers. There is interest from the industry to have a sort of Genetics 101 educational effort. GRIN-U has a lot of educational resources that may help in this.

The National Plant Germplasm System: 2021 Status, Prospects, and Challenges

Peter Bretting

USDA/ARS Office of National Programs

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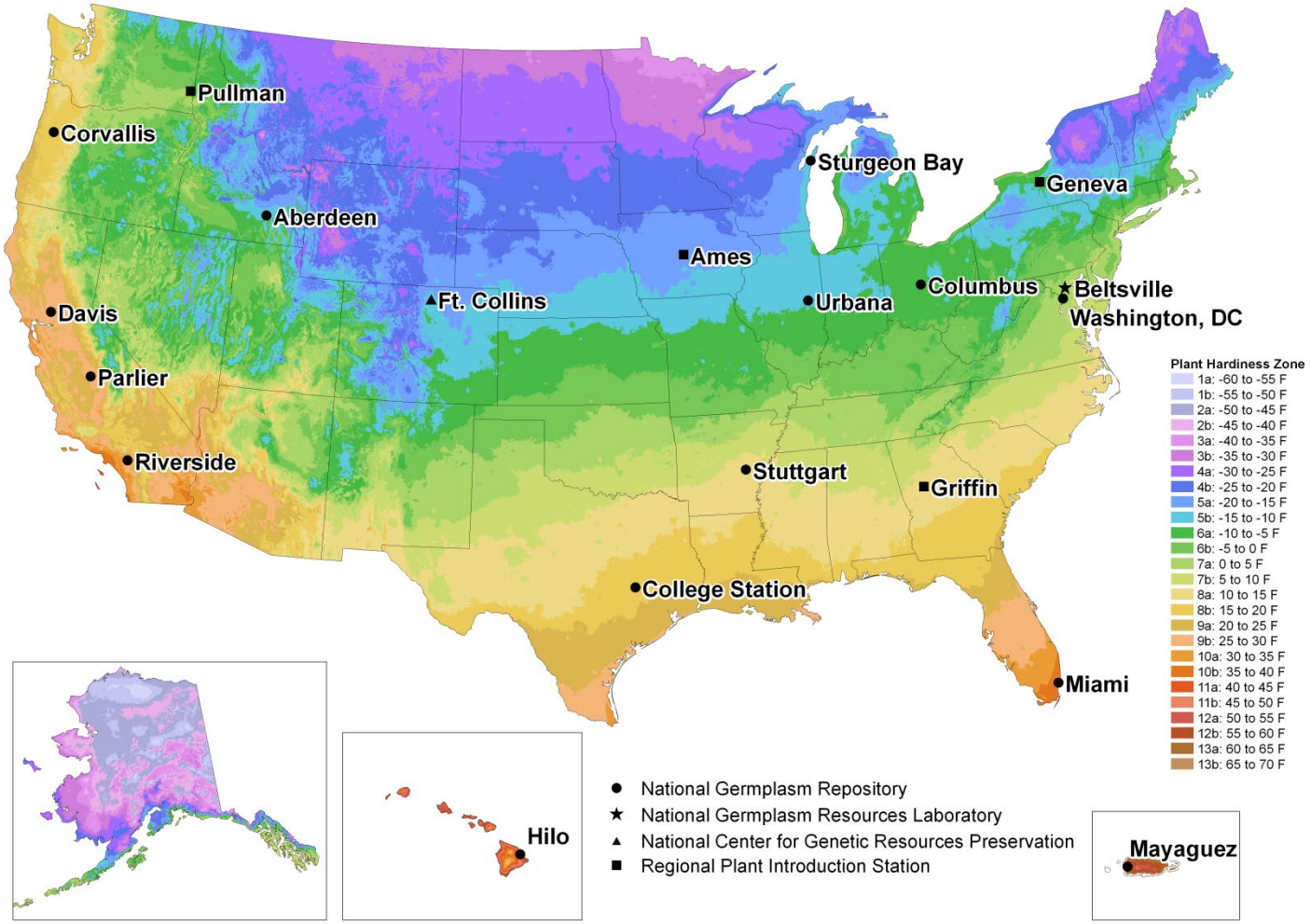
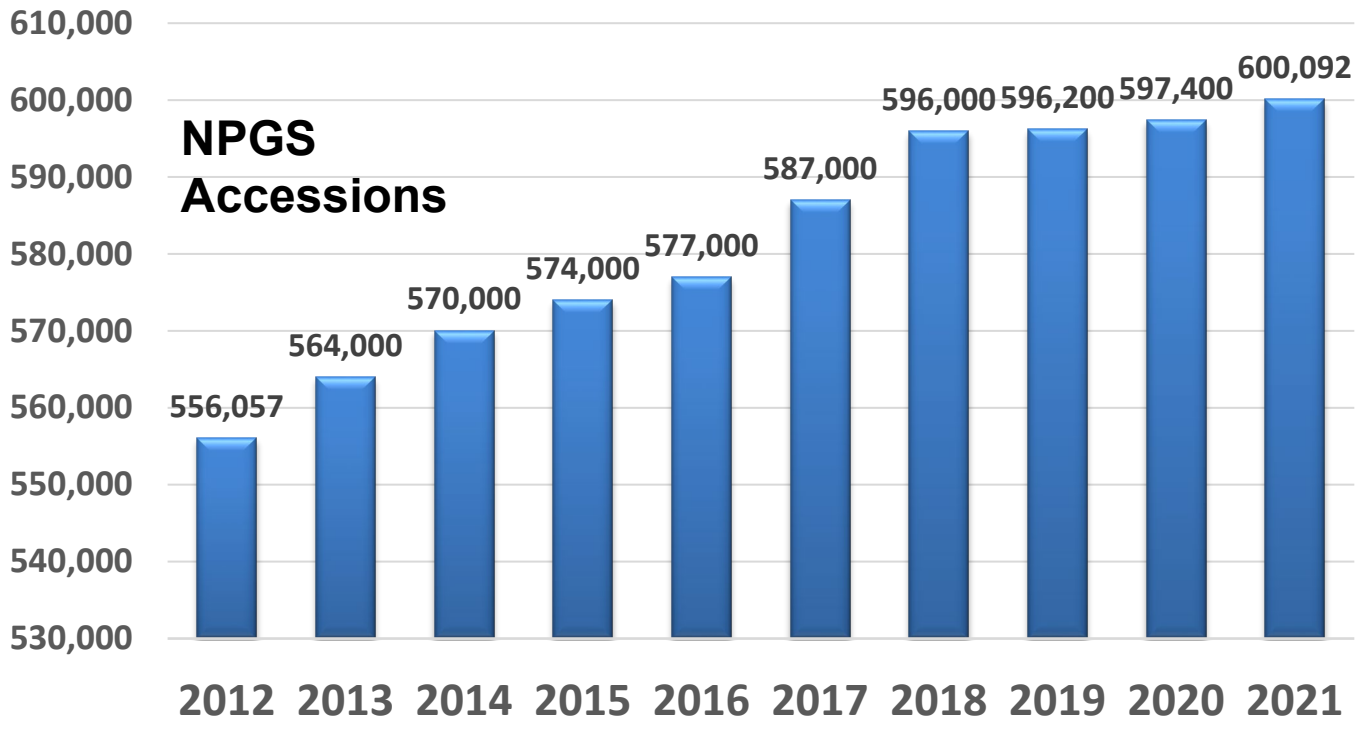
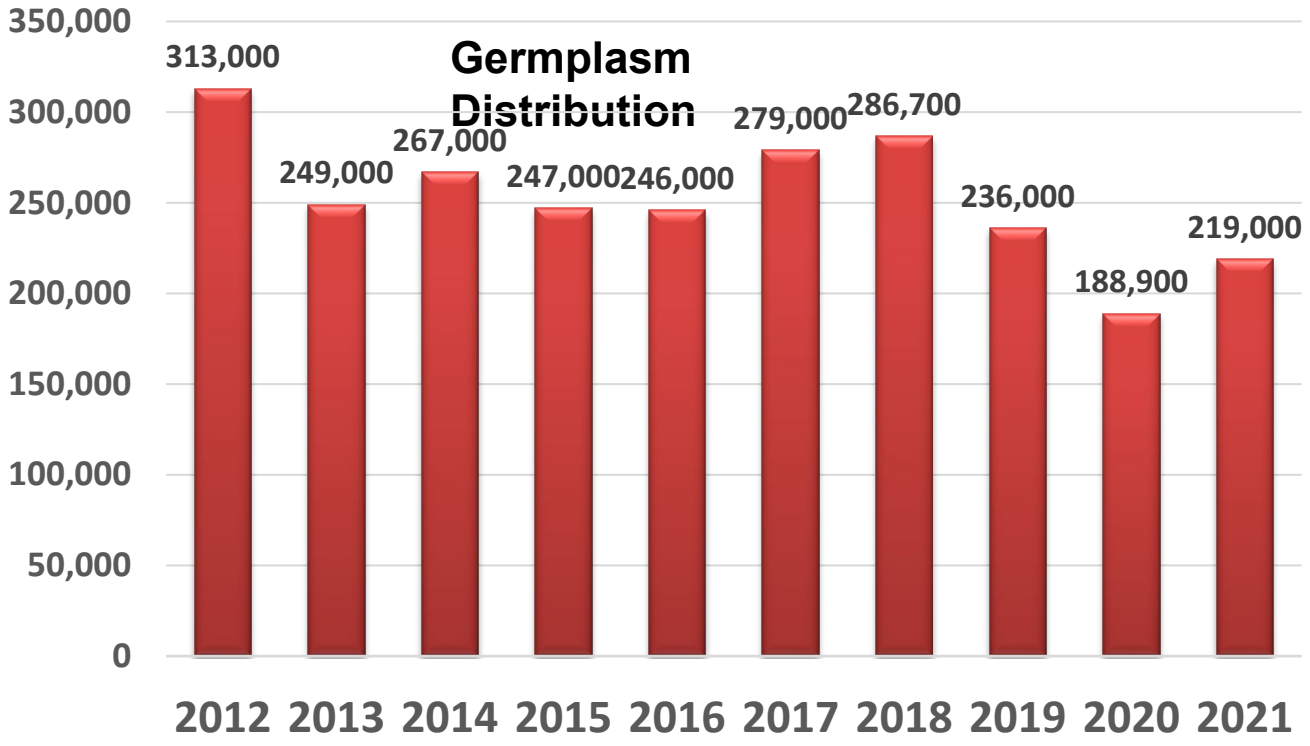
USDA National Plant Germplasm System (NPGS)



Number of NPGS Accessions 2012-2021



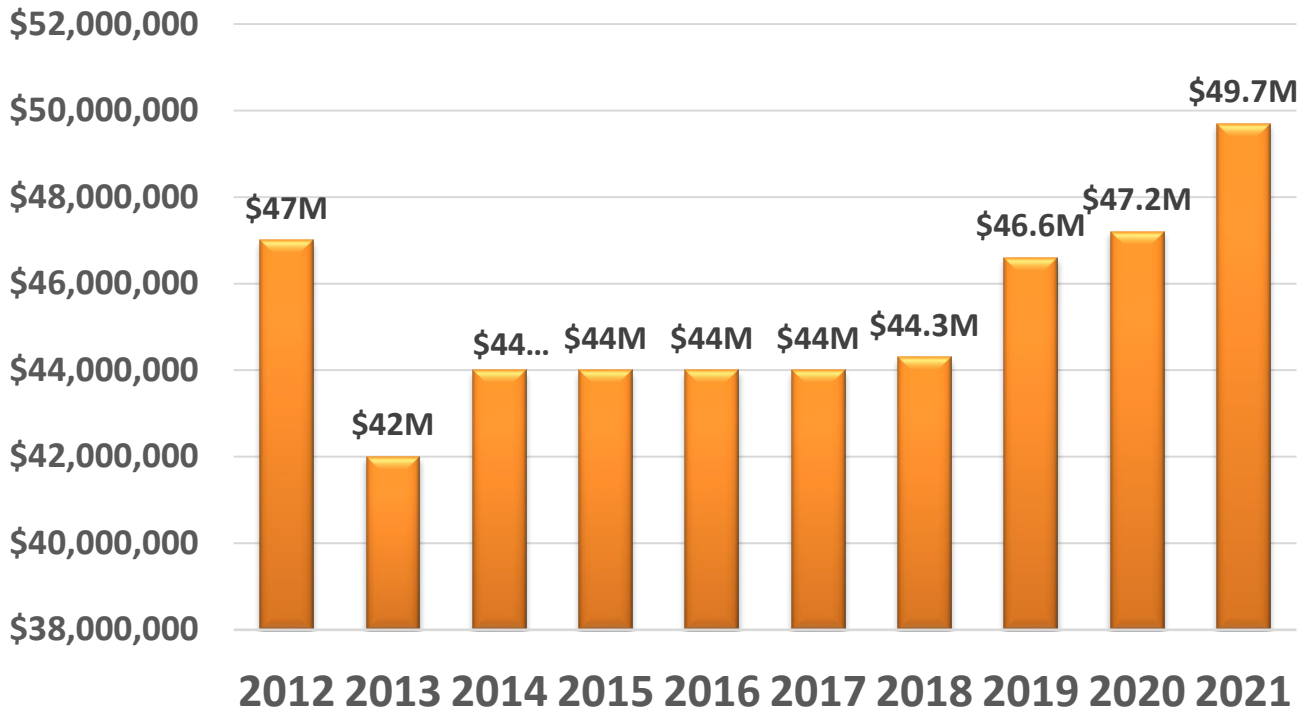
Demand for NPGS Germplasm
2012-2021



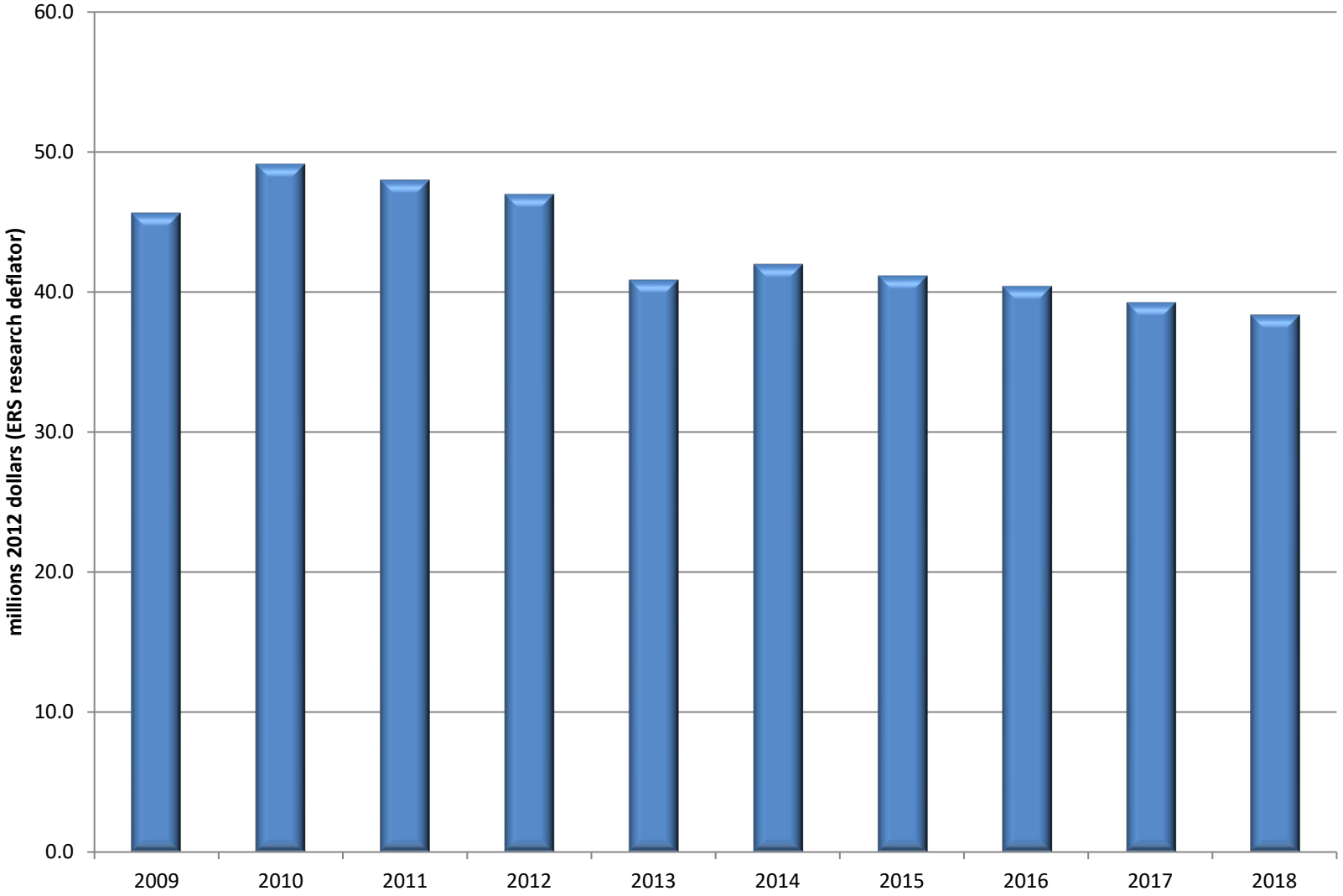
Effects of CoVID-19 as of February 2022

- **All NPGS genebanks are shipping germplasm (PGR).**
- **# of samples distributed fell by ca. 20% in 2020. The distribution rate in 2021 increased substantially in 2021.**
- **Operational status at genebanks ranges from fully to 50% operational. Some genebanks can hire temp (often student) labor, some can hire fewer than usual, and others cannot hire at all. Most genebanks have planted regeneration plots in the field or GH. Some cannot yet resume normal indoor laboratory or seed processing operations.**
- **During the pandemic, some genebanks accomplished more information management tasks than in prior years, whereas others didn't.**
- **GRIN-Global has functioned normally throughout.**

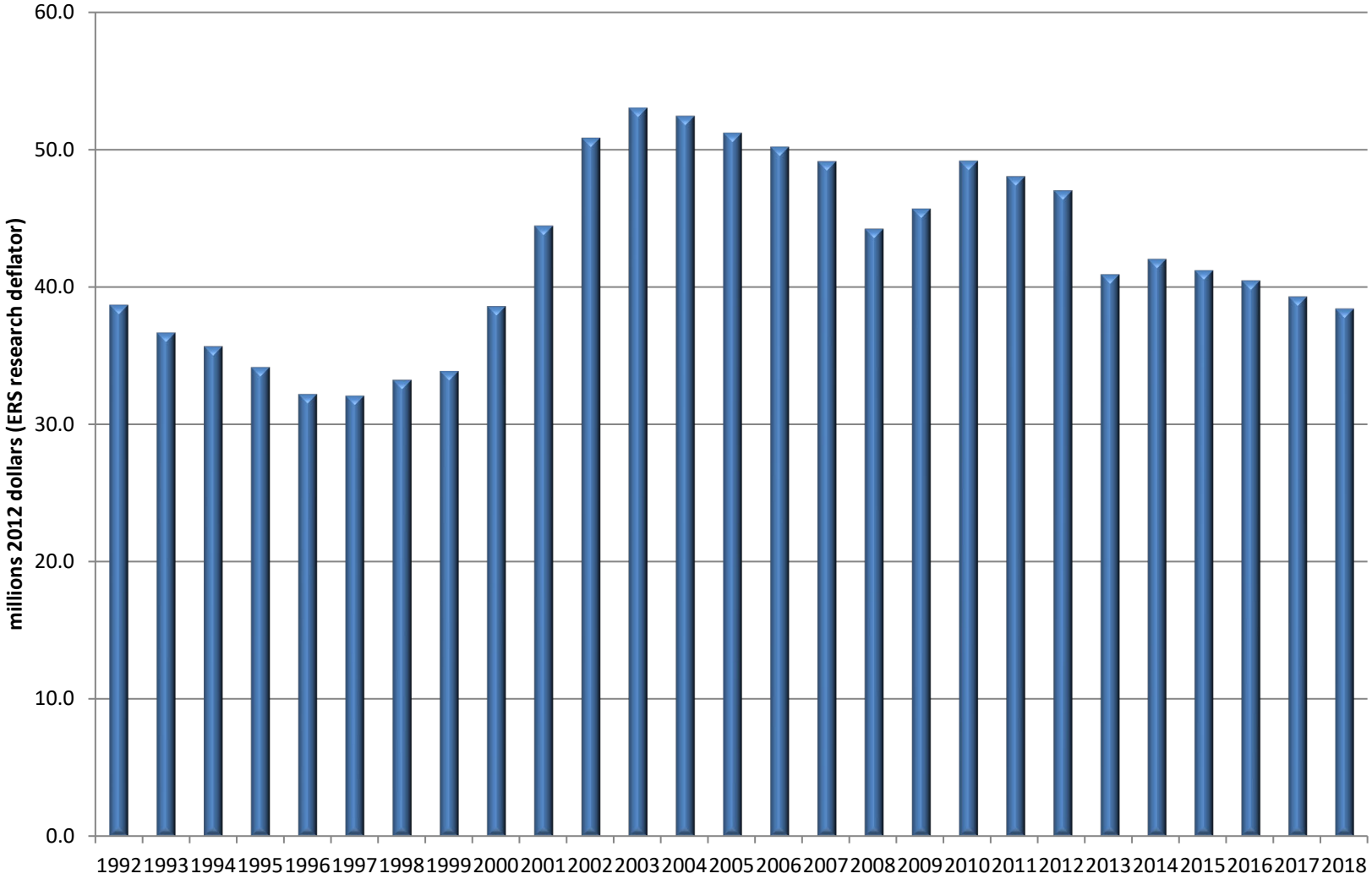
ARS National Plant Germplasm System
Budget
2012-2021



ARS NPGS real (deflated) budget, 2009-2018



ARS NPGS real (deflated) budget, 1992-2018



Some key challenges for the NPGS

- **Expanding the NPGS operational capacity and infrastructure to reduce PGR management backlogs and meet increased demand for PGR and associated information.**
- **Recent and upcoming NPGS personnel retirements; hiring and training new staff.**
- **Developing and applying cryopreservation and/or in vitro conservation methods for clonal and some seed PGR.**
- **BMPs and procedures for managing accessions (and breeding stocks) with GE traits and the occurrence of adventitious presence (AP).**
- **Acquiring and conserving additional PGR, especially of crop wild relatives.**

PGR Management Priorities: Foundations for Crop Innovation

- Acquisition
- Maintenance
- Regeneration
- Documentation and Data Management
- Distribution

- Characterization
- Evaluation
- Enhancement
- Research in support of the preceding priorities

Personnel Changes

- **Farewell and best wishes to Candice Gardner, RL (ARS-Ames); John Preece, RL (ARS-Davis and Parlier); Esther Peregrine, Soybean Assistant Curator, (ARS-Urbana); Joanne Labate, Vegetable Curator (ARS-Geneva); and Max Martin, Research Program Manager (UWisconsin, Sturgeon Bay).**
- **Welcome and best wishes to Dave Peters, RL, and Colleen Warfield, Plant Pathologist (ARS-Ames); Jeff Gustin, Maize Genetic Stock Curator (ARS-Urbana); Adam Mahan, Soybean Curator (ARS-Urbana); Zach Stansell, Hemp and Vegetable Curator and Erin Galarneau, Grape Curator (ARS-Geneva); Madhugiri Nageswara-Rao, Tropical Ornamental Curator (ARS-Miami) and Gul Shad Ali, Tropical Crops Curator (ARS-Miami), Lauri Reinhold, Curator (ARS-Corvallis) and Anne Frances, Botanist (ARS-Beltsville).**
- **We are recruiting staff at Davis, CA; Hilo, HI; Pullman, WA; Riverside, CA; College Station, TX; and Geneva, NY.**

PGR Management Training Initiative

- **Numerous NPGS PGR managers have retired recently; no formal, comprehensive program existed for training new PGR managers.**
- **G. Volk (ARS-Ft. Collins) and P. Byrne (CSU-Ft. C.) lead a project, supported by ARS and a NIFA grant, to design and develop a training program for PGR management to be delivered primarily through distance-learning.**
- **The effort has culminated in a new 1-credit Colorado State online course Plant Genetic Resources: Genomes, Genebanks, and Growers, offered for the first time in Aug.-Sept. 2021. http://pgrcourse.colostate.edu/**
- **PGR training/educational materials are freely accessible from GRIN-Global at https://grin-u.org/**
- **Infographic posters for PGR, genebanks and conservation, and PGR and food security in 6 languages; download at http://genebanktraining.colostate.edu/trainingmaterials.html**

FY 20-21 ARS NPGS Budgetary Increases

- **Small grains PGR ($190,000): Aberdeen, ID.**
- ***Vaccinium* PGR ($150,000): Corvallis, OR.**
- **Hemp PGR ($1.35 million): Geneva, NY.**
- **Pecan PGR ($400,000): College Station**

NPGS Video

- **Pullman, Griffin, Ames, Corvallis, and Geneva staff developed a new tactic for discouraging "non-research requests" for germplasm by communicating that the NPGS benefits everyone by ensuring global food security through research and breeding, not by providing seeds for home gardens.**
- **Led by Barbara Hellier at Pullman, the NPGS genebanks and USDA Communications filmed a video of NPGS operations accessible from the ARS YouTube site at: https://youtu.be/uHOclGNELuw**
- **Feel free to post this link on your websites, and share it with customers/stakeholders, colleagues, family, and friends.**

USDA-ARS
National Germplasm Resources Laboratory
Beltsville, Maryland
2022 Report to PGOC, RTACs, and CGCs

The National Germplasm Resources Laboratory (NGRL) supports the acquisition, introduction, documentation, evaluation, and distribution of germplasm by the National Plant Germplasm System (NPGS) and other components of the U.S. National Genetic Resources Program (NGRP). The Laboratory is comprised of the Plant Exchange Office (PEO), the Database Management Unit (DBMU), and the Plant Disease Research Unit (PDRU).

Dr. Dimitre Mollov transferred to the ARS Horticultural Crops Research Unit in Corvallis, OR, in June 2021. NGRL hopes to fill this vacant Plant Pathologist position in 2022.

Dr. Anne Frances joined NGRL as a Botanist in August 2021. Anne comes to ARS and NGRL after serving as the Lead Botanist for NatureServe, a conservation science-based NGO, for ten years. Anne is a scientist in the Plant Exchange Office project.

Plant Exchange Office

Plant Exploration and Exchange Program:

- The PEO supports the collection of germplasm for the NPGS through the management of the Plant Exploration and Exchange Program. Guidelines for developing plant exploration and exchange proposals will be distributed to CGC chairs in February 2022. Proposals must be endorsed by the appropriate CGC or other crop experts to be considered for funding.
- Most explorations approved for funding in FY 2020 and FY 2021 were postponed due to the pandemic. It is unclear at this writing (January 2022) whether the postponed explorations and any new ones approved for FY 2022 will be able to proceed this year. Due to funding constraints imposed by proposals already approved, it may not be possible to approve new exploration or exchange proposals for funding in FY 2023. Please consult with PEO before developing proposals for FY 2023.
- Two explorations were conducted in FY 2021. One international exploration was conducted in the country of Georgia for *Salix* by in-country scientists. One domestic exploration was conducted in Illinois for *Aronia* species, deciduous shrubs used as ornamental landscape plants and as an edible fruit crop. All postponed explorations will be rescheduled when pandemic-related travel restrictions are lifted and conditions are considered safe.
- All foreign explorations supported by PEO must comply with the principles in the Convention on Biological Diversity covering access and benefit sharing related to genetic resources. Prior informed consent to collect genetic resources is obtained from the host country before the exploration. The PEO is involved in most requests to foreign

governments for permission to collect and negotiates the terms of agreements when necessary.

Collaboration on Crop Wild Relatives in the U.S.:

The NGRL is collaborating with NatureServe, the US Botanic Garden, and other partners on the conservation of *Vitis* species native to North America, which are crop wild relatives and used as rootstock for the cultivated grapevine (*Vitis vinifera*). Conservation status assessments are being completed and an invitational workshop is planned for fall of 2022.

GRIN Taxonomy for Plants:

- GRIN Taxonomy, available through GRIN-Global (https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch), provides online current and accurate scientific names and other taxonomic data for the NPGS and other worldwide users. This standard set of plant names is essential for effective management of ARS plant germplasm collections, which now represent ca. 16,300 taxa. A broad range of economically important plants is supported by GRIN nomenclature, including food, spice, timber, fiber, drug, forage, soil-building or erosion-control, genetic resource, poisonous, weedy, and ornamental plants. The search page (excluding the World Economic Plants search) was rewritten in 2021 to allow a broader range of searches and provide the option to export most search results.
- GRIN Taxonomy includes scientific names for 27,931 genera (14,715 accepted) and 1,422 infra-genera (1,355 accepted) and 125,758 species or infra-species (69,125 accepted), with over 67,798 common names, geographical distributions for 61,212 taxa, 510,559 literature references, and 32,468 economic importance records. These numbers increase regularly.
- Since 2008, a project to provide thorough coverage of wild relatives of all major and minor crops in GRIN Taxonomy has been underway. We have completed our initial work on 386 major and minor crops from 174 genera, and CWR from 4,295 taxa have been mapped to these crops and others under progress. An interface to query these data is available (https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearchcwr.aspx). We invite feedback from NPGS curators and CGC members for those CWR classifications already developed.

Facilitation of Germplasm Exchange:

The PEO helps expedite the distribution of germplasm from the NPGS to foreign scientists and international genebanks through a long-standing collaboration with USDA-APHIS at Building 580, BARC-East in Beltsville. The pandemic caused a backlog in shipment of orders in 2020. Although the backlog was significantly reduced in 2021, international shipments remain challenging. Only one APHIS inspector is currently available to inspect NPGS outgoing shipments, and logistical delays related to global shipping are continuing.

In 2021, 735 public orders containing a total of 48,196 samples of NPGS accessions were shipped from Beltsville to individuals in 72 countries for research and education. This is more

orders than have been shipped from Beltsville in any previous year. In addition, PEO facilitated the agricultural inspection of arriving germplasm shipments containing accessions from numerous foreign countries for researchers and curators at NPGS sites.

Crop Germplasm Committees:

- Many committees continue to meet regularly and are active, although the second year of the pandemic continued to create challenges, especially for committees that typically meet in person. Committees are urged to meet at least annually, and especially to update their Crop Vulnerability Statements. Several CGCs recently completed new versions. The NPGS has been fortunate to fill numerous vacant positions in the last 1–1.5 years, and we hope more will be filled in 2022. These new staff would especially benefit from active and supportive CGCs.
- A virtual meeting/web conference for CGC Chairs is scheduled for March 3, 2022. The 2021 CGC Chairs meeting was held February 21, 2021, and the presentations are archived on the CGC page at https://www.ars-grin.gov/CGC.
- NGRL has a Zoom conferencing account that is available to the CGCs to use for hosting virtual meetings.
- Please send updates to the individual crop committees of the CGC page on GRIN (https://www.ars-grin.gov/CGC) to Gary Kinard.

Database Management Unit

GRIN and GRIN-Global:

- At the time of this report, the GRIN-Global plant database included the following:

  600,495 active accessions representing 16,308 species and 2,568 genera
  3,506,531 inventory records
  2,147,592 seed germination/viability testing records
  9,126,834 characteristic/evaluation records
  1,404,683 attachment files, primarily digital images

  These numbers increase regularly, some almost daily.

- Incremental improvements were made in the GRIN-Global applications throughout 2021. One of the major enhancements was in GRIN Taxonomy, which received a major redesign. Search pages, especially for nodulation data, received a new interface, a browse feature was added with family, genus, species, and common name search options, and the capability to perform species-level searches on geographical distribution was improved. In June 2021, a major enhancement was made to allow for public display and ordering, if the curator implements it, of multiple inventories or propagule forms of single accession. This is particularly relevant for clonal collections that may curate both asexual (whole plant with cuttings, stolons, etc. distributed) and sexual (seeds, pollen, fruit) forms of a

single accession This also assists with requesting cuttings from a specific gender of dioecious accessions where both male and female plants are curated. Another feature added in 2021 was implementation of a tool to filter automatically incoming orders that have characteristics potentially indicative of illegitimate requests, which we call Non-Research Requests (NRR). This NRR Tool allows staff to manage efficiently and consistently such requests NPGS-wide, including using system-generated emails to communicate decisions about submitted orders.

- Current information about the project, including user documentation and release notes from each version of the software, can be found on the project website at https://www.grin-global.org/.

Plant Disease Research Unit

The PDRU conducts research on pathogens that infect clonally propagated prohibited genus (i.e., quarantine) plant germplasm, including their etiology, detection, and elimination by therapeutic procedures. This project provides direct support to the APHIS Plant Germplasm Quarantine Program and helps facilitate the safe introduction, conservation, and international exchange of valuable plant germplasm. PDRU also collaborates on virus related problems with NPGS germplasm repositories, state departments of agriculture, and university scientists. Additional updates will be provided for those committees whose crops are within the scope this project's research.

Key NGRL Contacts

Research Leader
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Crop Germplasm Committees
Gary Kinard (gary.kinard@usda.gov, 301-504-5951)

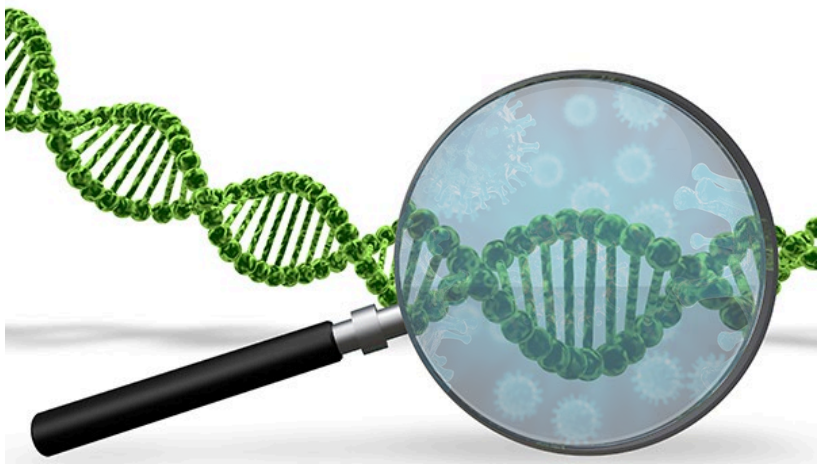
Plant Disease Research Unit
Ruhui Li (ruhui.li@usda.gov, 301-504-7653)

APHIS PGQP Report for Pyrus

USDA-APHIS Plant Germplasm Quarantine Program (PGQP)
Beltsville Agricultural Research Center, MD, USA

Oscar P. Hurtado-Gonzales

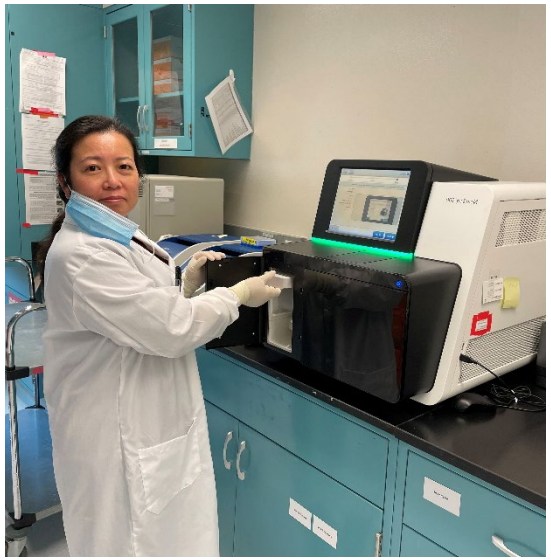
February 18th, 2022



PGQP located at the old BARC airport site

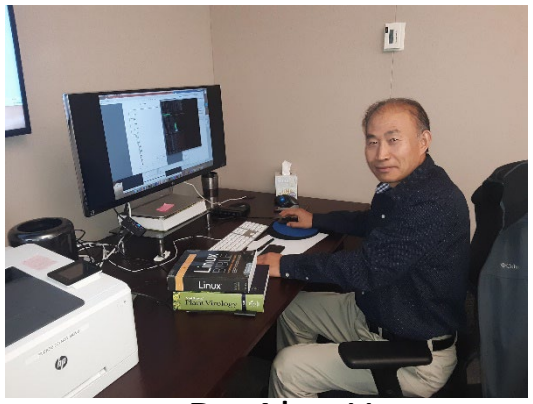
PGQP Pomes+HTS Program

Bob Jones Mike Meadows



Yu Yang

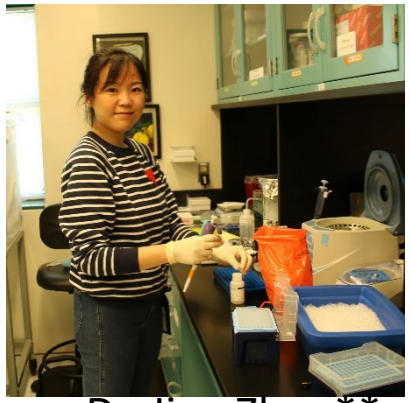
Emily Wirt*



Dr. Alex Hu

Dr. Larissa Costa**

Rick Slocum(r)

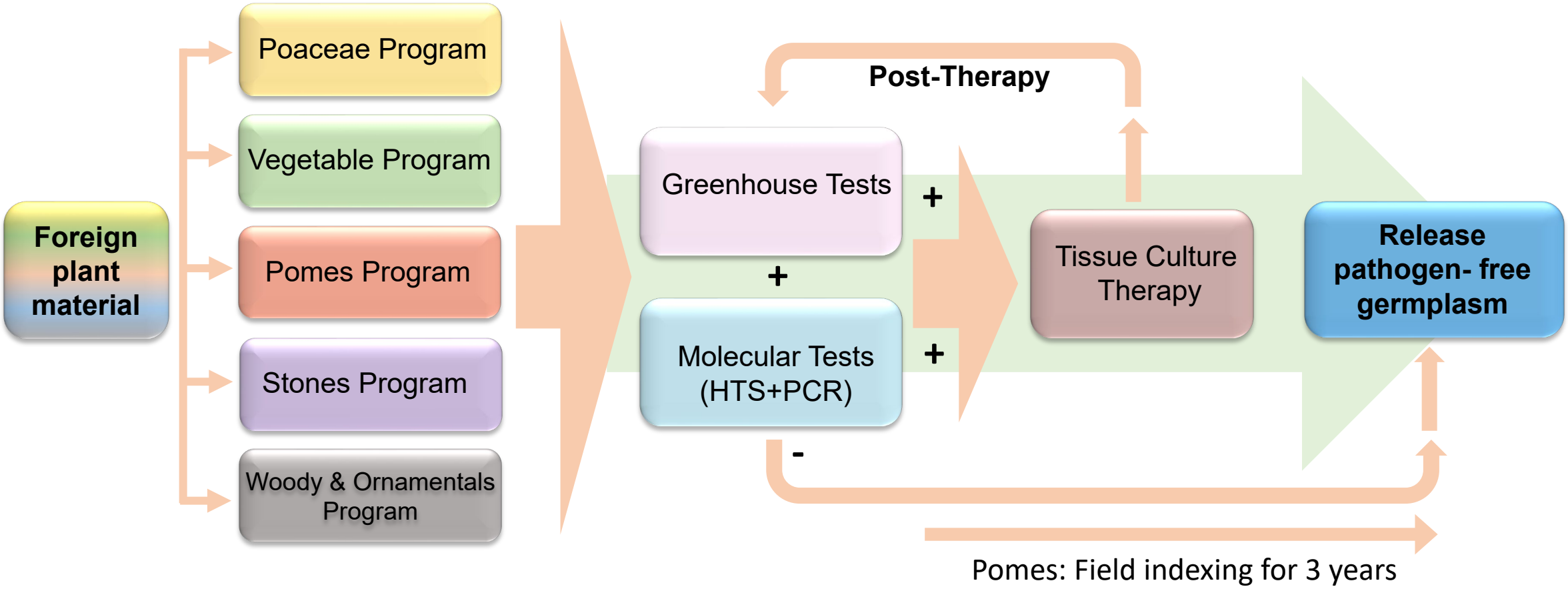


Dr. Jing Zhou**

Ben Atha

* intern/contractor
**visiting scientist

PGQP WORKFLOW- OVERVIEW



PGQP - POMES woody virus indexing

Mid February → **May**

Over 5000 grafts!

PGQP - POMES Greenhouse bioassays (woody indicators)

ACLSV

ASPV

ASGV

APHIS PGQP - POMES Field Indexing

Field and soil preparation for bio-fumigation due to the presence of dagger nematodes

New tree planter
(highly recommend this!)

RT-PCR-based testing panel for Pyrus (August 2021)

Family	Genus	Species	Symbol
Betaflexiviridae	Foveavirus	Apple stem pitting virus	ASPV
Betaflexiviridae	Capillovirus	Apple stem grooving virus	ASGV
Betaflexiviridae	Trichovirus	Apple chlorotic leaf spot virus	ACLSV
Bromoviridae	Ilarvirus	Apple mosaic virus	ApMV
Phenuiviridae	New	Rubbery wood associated virus	ARW-1, 2
Bunya	Coguvirus	Citrus concave gum associated virus	CCGaV
Bunya	Coguvirus	Citrus Virus A	CiVA
Luteoviridae	Luteovirus	Apple Luteovirus 1	ALV-1
Betaflexiviridae	Foveavirus	Apple green crinkle associated virus	AGCaV
Secoviridae	Nepovirus	Tomato Ringspot virus	TomRSV
Secoviridae	Nepovirus	Tobacco Ringspot virus	TobRSV
Betaflexiviridae	Tepovirus	Prunus virus T	PrVT
Pospiviroidae	Apscaviroid	Apple dimple fruit viroid	ADFVd
Pospiviroidae	Apscaviroid	Apple scar skin viroid	ASSVd
Pospiviroidae	Apscaviroid	Apple fruit crinkle viroid	AFCVd
Avsunviroidae	Pelamoviroid	Apple hammerhead viroid	AHVd

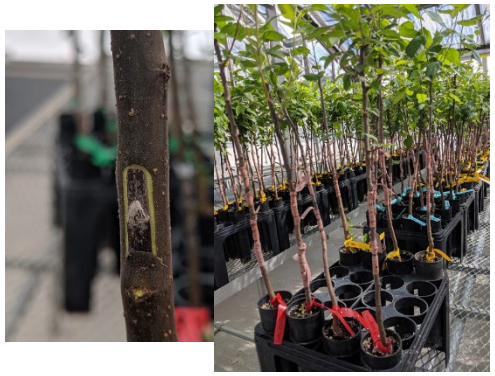
Expansion of diagnostic capabilities since 2018: from **7 viruses/viroids to 17**

HTS applied on the first year of tree establishment

February — April-May — May-June — 1.5 week to process-analyzed

1. Importation of dormant materials

2. Establish imported trees in virus–free rootstocks



3. Total RNA extraction

QIACUBE (QIAGEN)
QIAGEN RNeasy Plant Mini Kit.

TAPESTATION (Agilent Technologies)
RNA integrity number

4. RNA sample preparation (Library preparation)

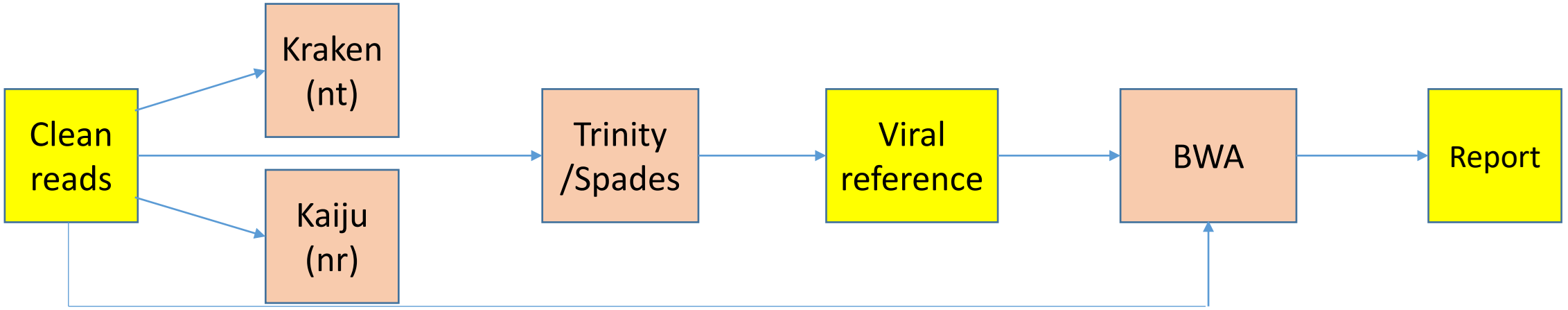
TruSeq ribodepletion kit
(Illumina)

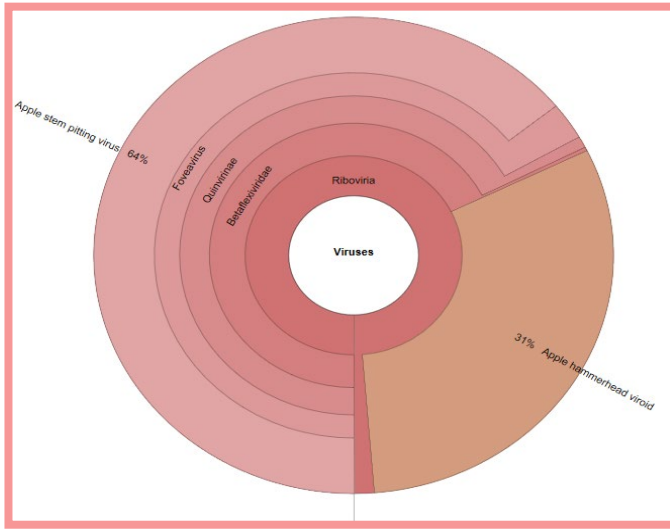
5. Shotgun metagenomics sequencing

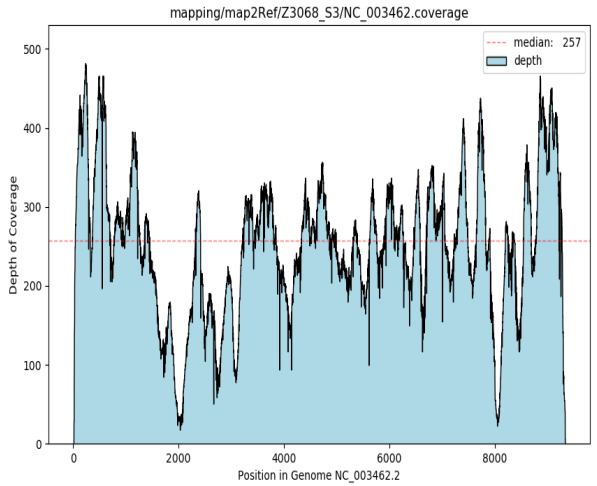
Illumina NextSeq 500

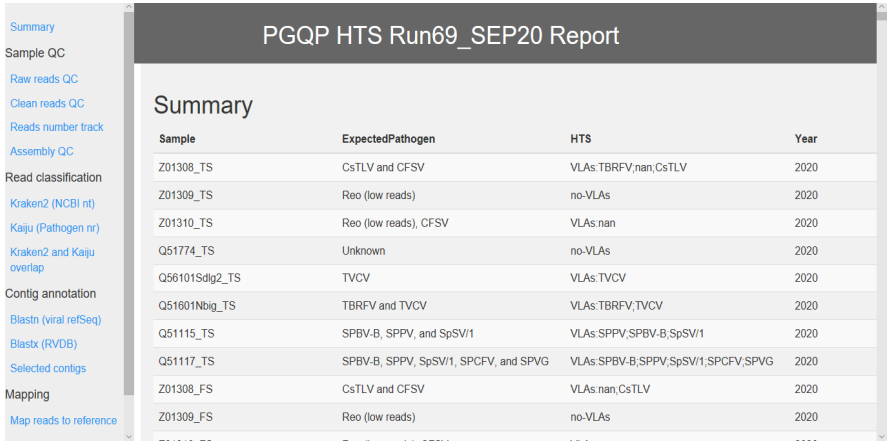
PGQP HTS analysis pipeline (VDFlow)

1.QC → 2. Read classification → 3. De novo assembly → 4. Reference mapping → 5. Report



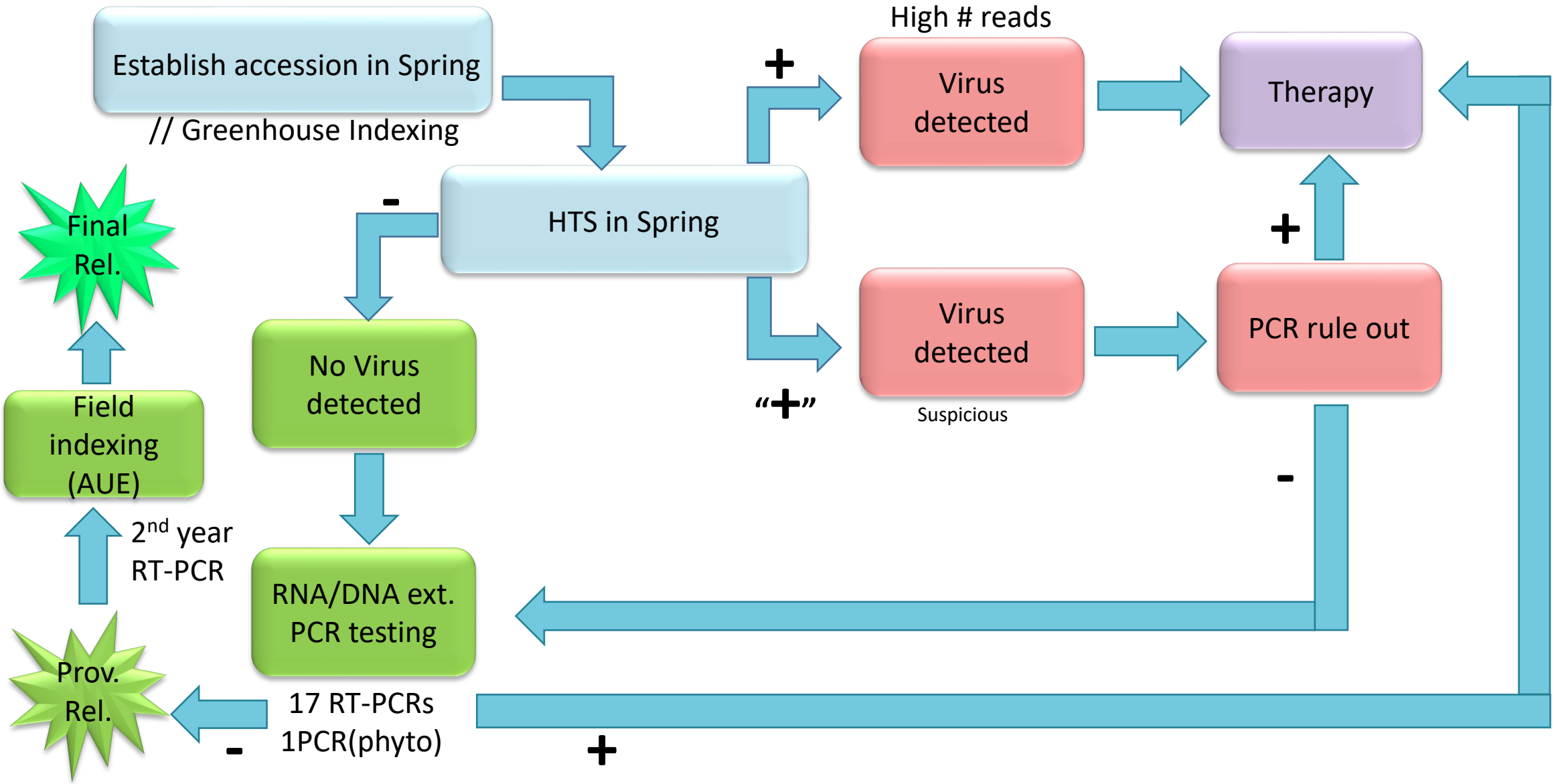






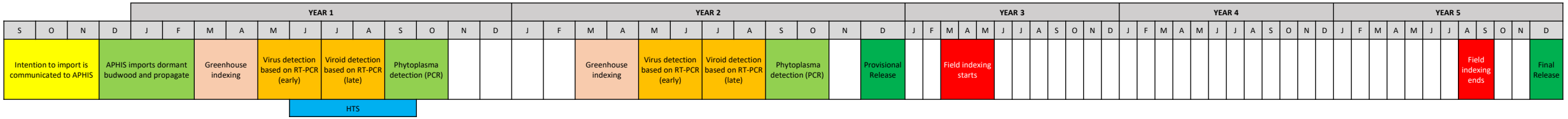
Sample	ExpectedPathogen	HTS	Year
Z01308_TS	CsTLV and CFSV	VLAs:TBRFV;nan;CsTLV	2020
Z01309_TS	Reo (low reads)	no-VLAs	2020
Z01310_TS	Reo (low reads), CFSV	VLAs:nan	2020
Q51774_TS	Unknown	no-VLAs	2020
Q56101Sdlg2_TS	TVCV	VLAs:TVCV	2020
Q51601Nbig_TS	TBRFV and TVCV	VLAs:TBRFV;TVCV	2020
Q51115_TS	SPBV-B, SPPV, and SpSV/1	VLAs:SPPV;SPBV-B;SpSV/1	2020
Q51117_TS	SPBV-B, SPPV, SpSV/1, SPCFV, and SPVG	VLAs:SPBV-B;SPPV;SpSV/1;SPCFV;SPVG	2020
Z01308_FS	CsTLV and CFSV	VLAs:nan;CsTLV	2020
Z01309_FS	Reo (low reads)	no-VLAs	2020

HTS and RT-PCRs diagnostics at multiple stages

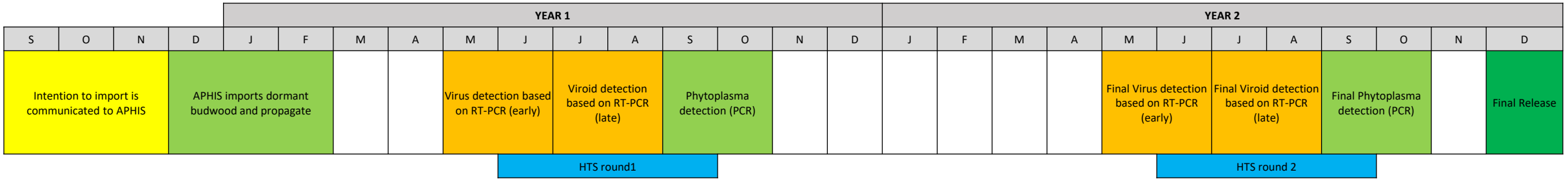


Regulatory updates affecting Pyrus quarantine importations (announced Sept 20, 2021; proclaimed Nov 5 2021)

OLD PIPELINE



NEW PIPELINE



New Regulations should accelerate the access to international Pyrus germplasm

Pomes PGQP by the numbers in 2021:

FRUIT	# Unique Imports	Bioassays
Apples	33	804
Pears	33	236
Quinces	0	0
Total	66	1040

FRUIT	# HTS*	# Clean	# w/Virus(es)
Apples	117	100	17
Pears	89	74	15
Quinces	12	9	3
Total	218	174	44

*HTS mostly on therapy samples

FRUIT	# Unique Imports	# PCRs
Apples	53	500
Pears	57	664
Quinces	14	102
Total	124	1266

FRUIT	# Imports under Field index	# Field indicators
Apples	50	225
Pears	34	255
Quinces	4	60
Total	88	540

Pomes PGQP by the numbers in 2021:

FRUIT	# Target for therapy
Apples	44 (25%)
Pears	33 (30%)
Quinces	3
Total	80

FRUIT	# Prov. Rel.	# FINAL
Apples	14	47
Pears	9	9*
Quinces	0	0
Total	23	56

Commercial rootstocks are not virus-free: be aware!

First clues:

- Original importation virome: ASPV, ASGV
- Therapy clone of importation: CCGaV

HTS results:

- WA Nursery 1: 18% positive rate for CCGaV
- WA Nursery 2: 3% positive rate for CCGaV

Potted seedling rootstocks 3/8 caliper

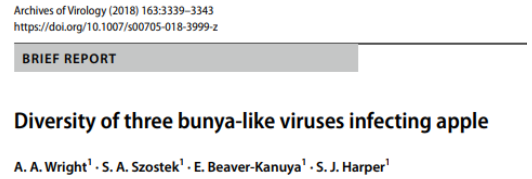
Extract RNA from each rootstock

RNA pools (32 samples/pool)

Vdflow pipeline

Pool deconvolution based on specific RT-PCR

Developed a HT inexpensive RNA isolation method (96 well plate)



Archives of Virology (2018) 163:3339–3343
https://doi.org/10.1007/s00705-018-3999-z

BRIEF REPORT

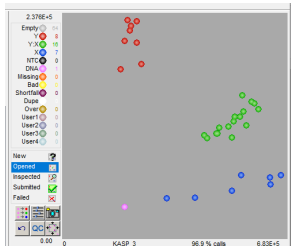
Diversity of three bunya-like viruses infecting apple

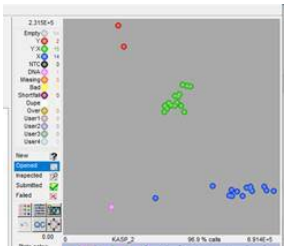
A. A. Wright[1] · S. A. Szostek[1] · E. Beaver-Kanuya[1] · S. J. Harper[1]

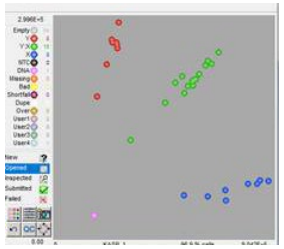
Fingerprint quarantine germplasm as QC (adapted from Windfield PLOSone) in Apples

Quick 10 min DNA extraction

Run battery of 21 KASPs



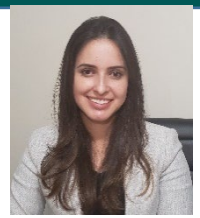


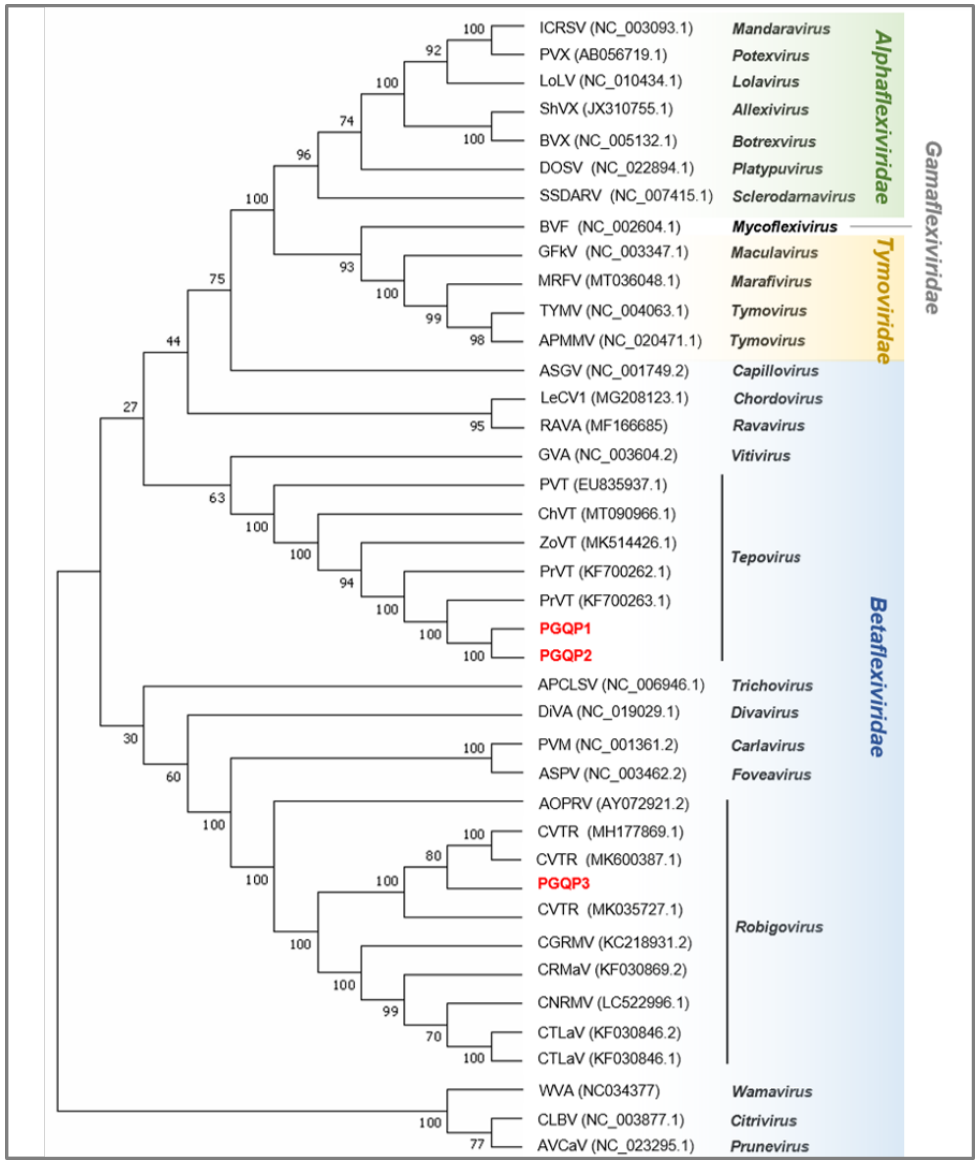


	2015	2021
	IN	OUT
Marker name	Q47929A	H47929A1
KASP_1	AA	AA
KASP_2	AA	AA
KASP_3	BB	BB
KASP_4	BB	BB
KASP_5	BB	BB
KASP_6	AB	AB
KASP_7	AA	AA
KASP_8	AA	AA
KASP_9	AA	AA
KASP_10	AB	AB
KASP_11	AB	AB
KASP_12	AB	AB
KASP_13	BB	BB
KASP_14	BB	BB
KASP_15	BB	BB
KASP_16	BB	BB
KASP_17	AA	AA
KASP_18	AB	AB
KASP_19	AA	AA
KASP_20	AA	AA
KASP_21	BB	BB

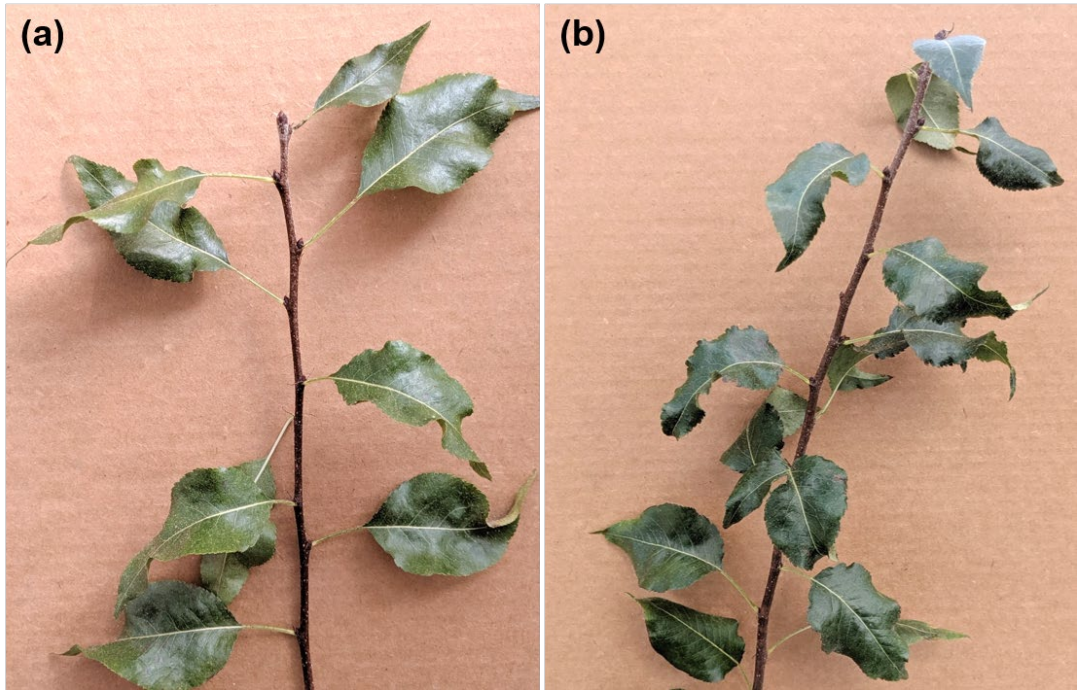
Develop similar tool for Pyrus will ensure true-to-type ID of germplasm passing through Quarantine

2021 HTS findings: Prunus Virus T and Cherry Turkey Virus in pears





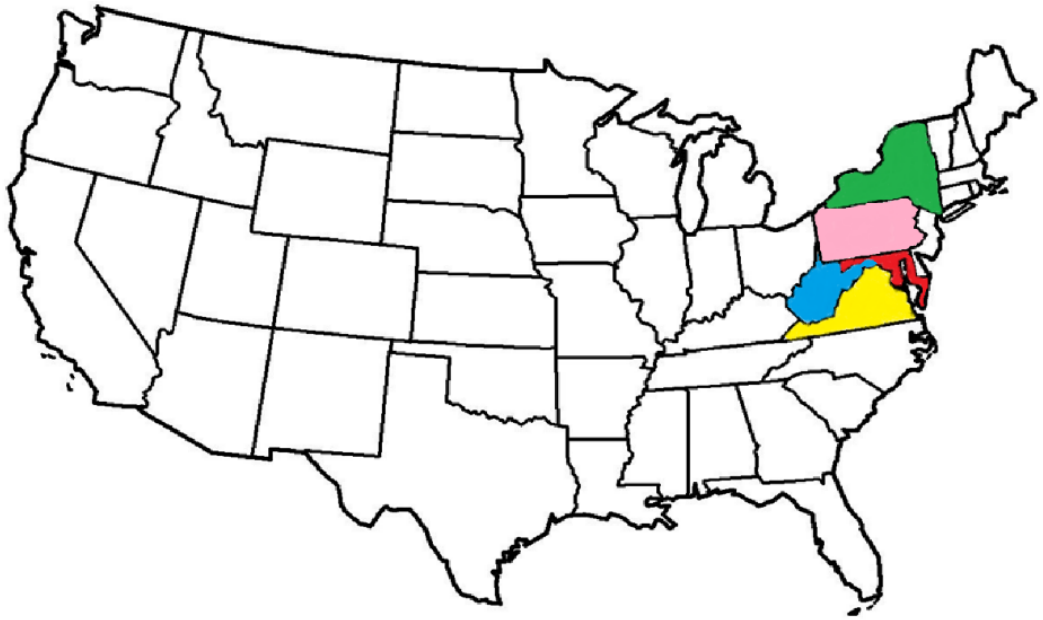
Both viruses are graft-transmissible to *Malus domestica*



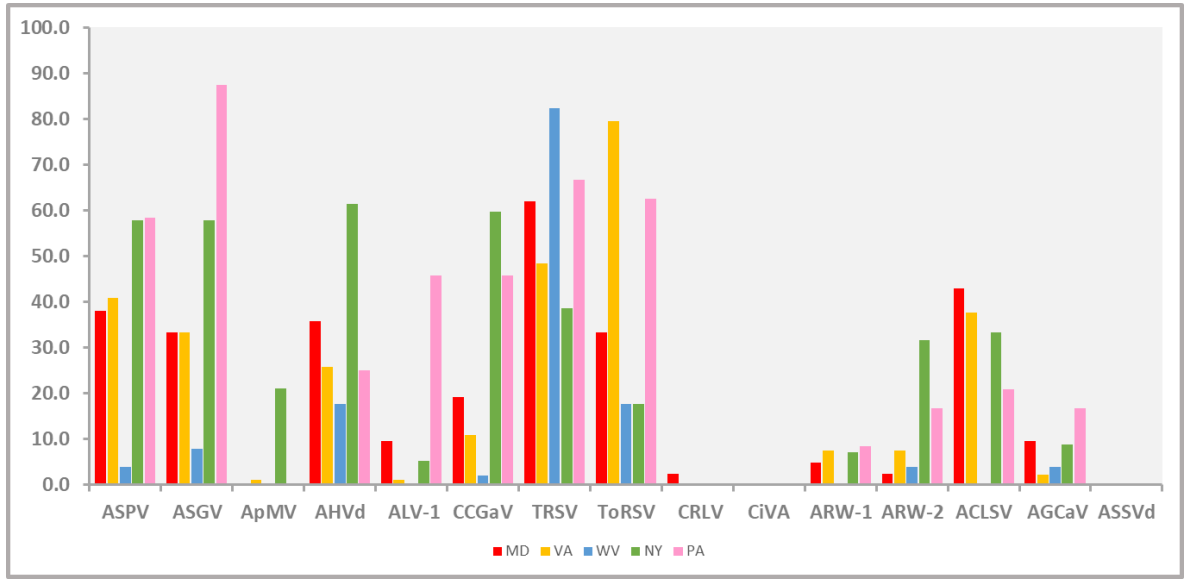
PGQP1 **PGQP2**

Further studies are needed to associate symptoms and economic impact

PGQP Pomes Field Survey in East Coast States



% incidence



Number of samples

- MD 42
- VA 93
- WV 51
- NY 57
- PA 24

We have come a long way

1930's Naturalized Plant Immigrants: A Bureau of Plant Industry Picture by the National Agricultural Library

https://www.youtube.com/watch?v=EFpYl9eN-kg

Pomes Plant Pathologist- contact info

- Oscar P. Hurtado-Gonzales, Ph.D.
- Oscar.Hurtado-Gonzales@USDA.GOV
- Office phone: 301-313-9252
- Physical location: 9901 Powder Mill Road, **Bldg 580**, BARC-EAST, Beltsville, 20705, Maryland

VISIT US

Developing training materials for Plant Genetic Resources Management and Use

- ~30% of NPGS staff will retire during the next few years
- Training content for current staff and future generations
- NIFA Grant: CSU, USDA, ISU

Online Courses Offered!

Course 1: Origins
Course 2: Conservation
Course 3: Discovery

GRIN-U.org

For more information contact:
Gayle Volk: Gayle.Volk@usda.gov
Pat Byrne: Patrick.Byrne@colostate.edu

Public Ebooks on GRIN-U.org

Crop Wild Relatives and their Use in Plant Breeding

Gayle Volk and Patrick Byrne

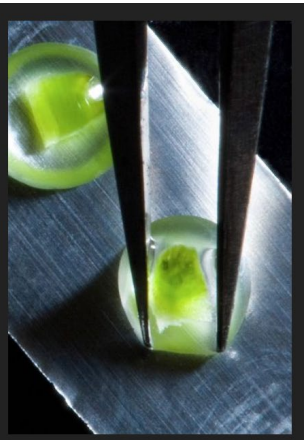
Public Domain

Training in Plant Genetic Resources: Cryopreservation of Clonal Propagules

Gayle Volk

Public Domain

READ BOOK



Field Tour of the USDA National Clonal Germplasm Repository for Tree Fruit, Nut Crops, and Grapes in Davis, California

Gayle M. Volk and John E. Preece

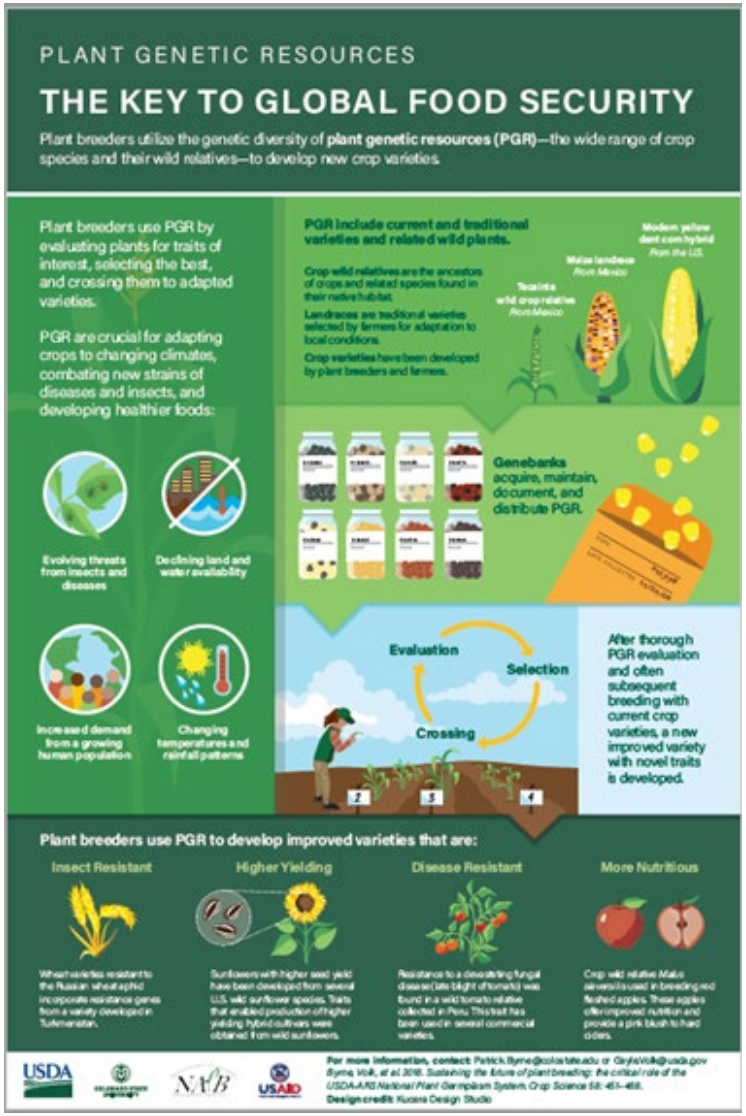
Public Domain

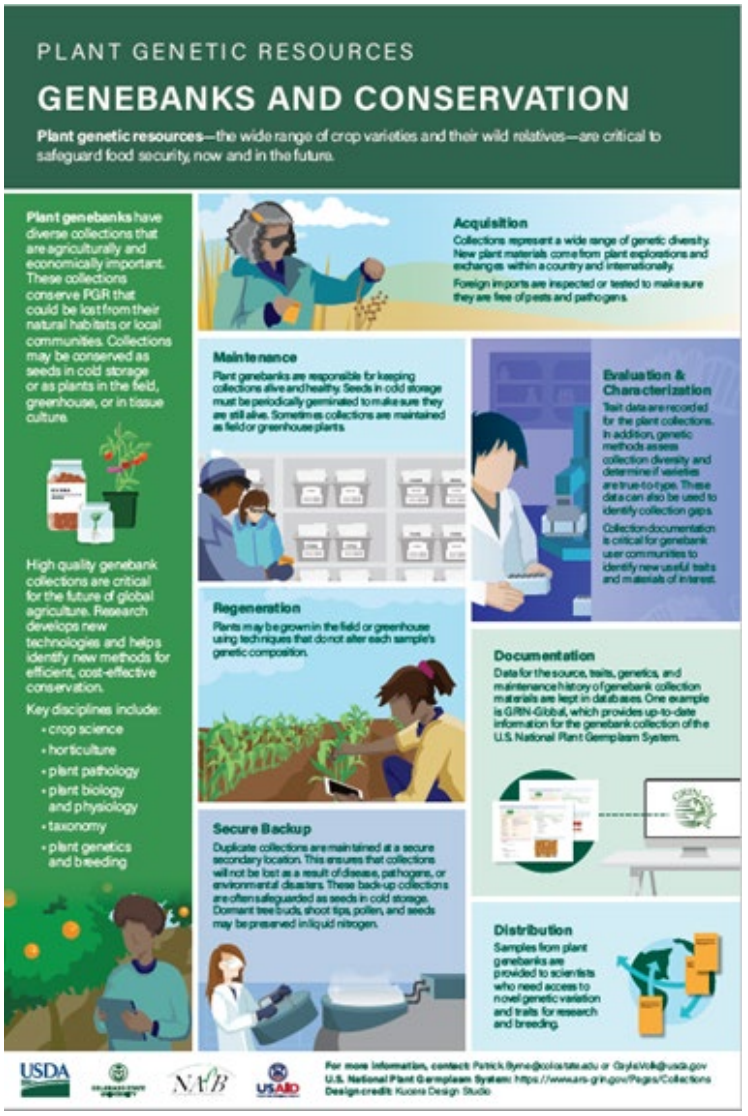
READ BOOK

Crop Diversity: A Virtual Crop Science Field Tour

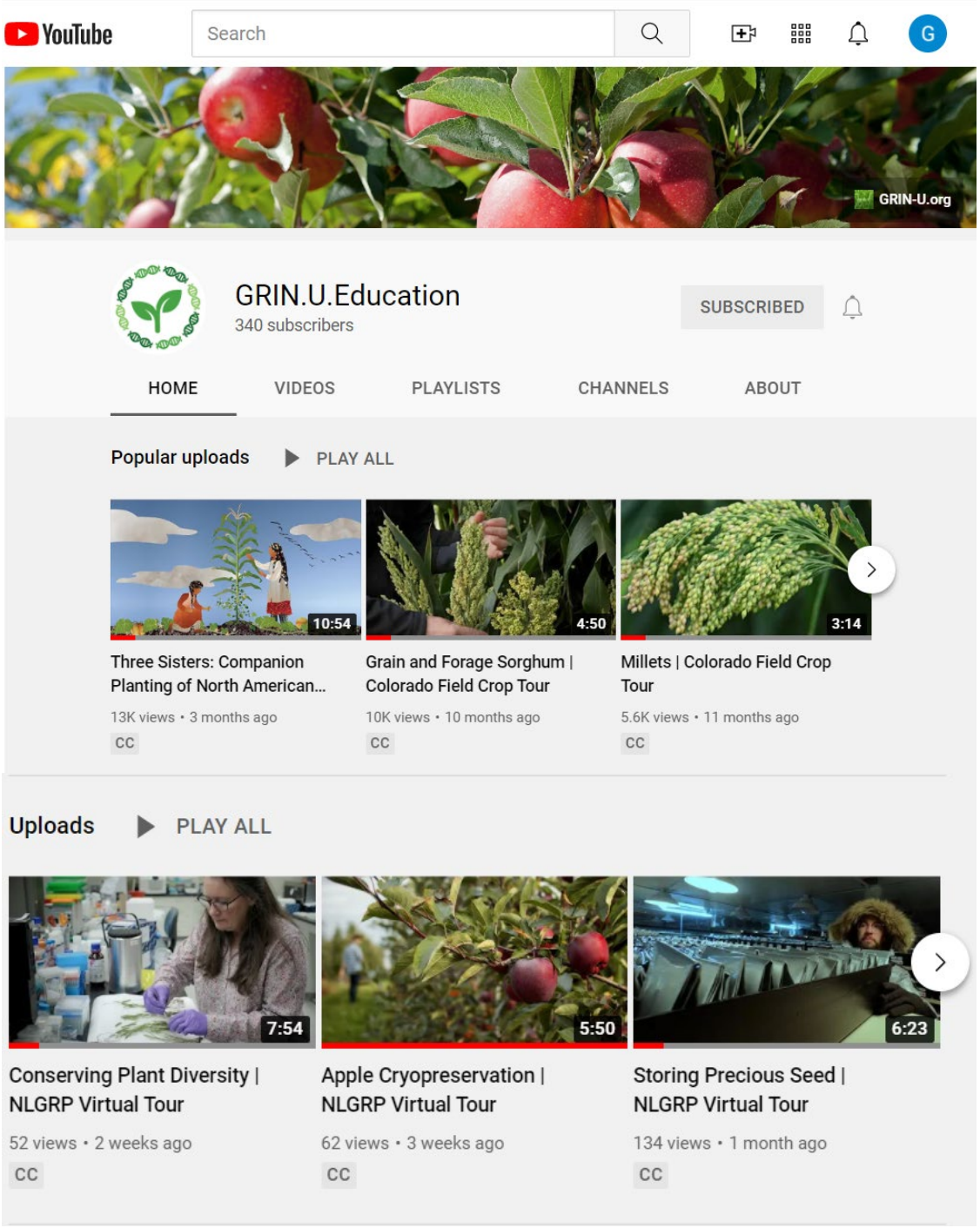
- Fundamentals of Plant Genebanking
- Applications of Plant Pathology

Infographics on GRIN-U (poster size or one-page handouts)





English, French, Spanish, Arabic, Chinese, Portuguese



GRIN.U.Education YouTube Channel

Videos, webinars, virtual tours

New NLGRP Virtual tour videos (3 of 6 are released)

CGCs can submit Genebanking and Breeding Success Stories!

Use fillable template
We will:

- Convert to PDF
- Release as chapters in eBooks
- Approved/credited to authors

Plant Genetic Resources Success Story Submission Template

Documenting Success Stories

Documenting success stories and making them available to the public are important for ensuring continued su plant genetic resources conservation and plant breeding efforts. Our goal is to document successes, broadly d relate to plant genetic resources conservation and use, and crop improvement activities.

To ensure this information is accessible to the broadest possible audience, please keep content concise, minin jargon and acronyms, and write with a general audience in mind. It is the contributors' responsibility to seek p share success stories from other researchers and breeders.

Once completed, email this form and 1-3 high-quality images to PGRSuccesses@gmail.com. Content may be e formatted before being posted on the public GRIN-U website and/or the National Association of Plant Breede edits will be shared with the contributor for final approval before posting to websites.

For questions or comments, please contact Pat Byrne (Patrick.byrne@colostate.edu) or Gayle Volk (Gayle.Volk

*Required fields

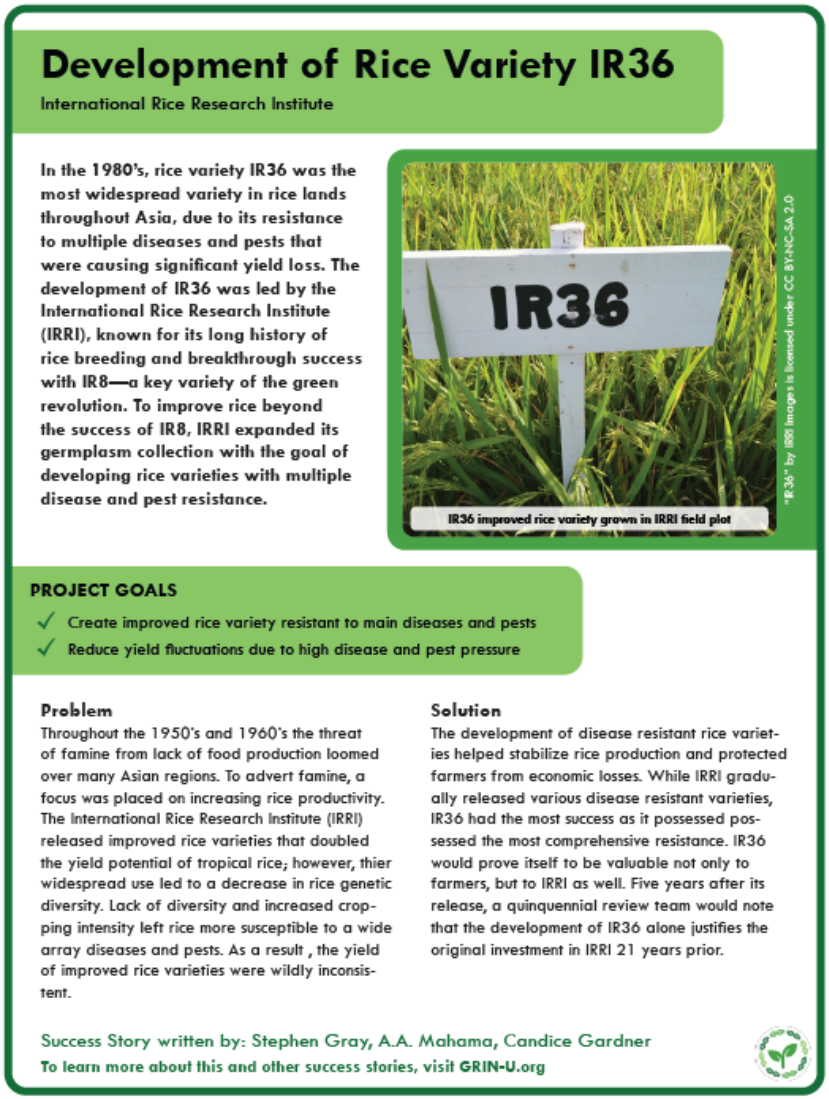
Contributor Information

***Contributor(s) name:** Author1 and Author2

***Contributor email:** email@colostate.edu

***Contributor address:** Institution and address

Success Story Overview



Development of Rice Variety IR36

International Rice Research Institute

In the 1980's, rice variety IR36 was the most widespread variety in rice lands throughout Asia, due to its resistance to multiple diseases and pests that were causing significant yield loss. The development of IR36 was led by the International Rice Research Institute (IRRI), known for its long history of rice breeding and breakthrough success with IR8—a key variety of the green revolution. To improve rice beyond the success of IR8, IRRI expanded its germplasm collection with the goal of developing rice varieties with multiple disease and pest resistance.

IR36 improved rice variety grown in IRRI field plot

"IR 36" by IRRI Images is licensed under CC BY-NC-SA 2.0

PROJECT GOALS

- ✓ Create improved rice variety resistant to main diseases and pests
- ✓ Reduce yield fluctuations due to high disease and pest pressure

Problem

Throughout the 1950's and 1960's the threat of famine from lack of food production loomed over many Asian regions. To advert famine, a focus was placed on increasing rice productivity. The International Rice Research Institute (IRRI) released improved rice varieties that doubled the yield potential of tropical rice; however, thier widespread use led to a decrease in rice genetic diversity. Lack of diversity and increased cropping intensity left rice more susceptible to a wide array diseases and pests. As a result , the yield of improved rice varieties were wildly inconsistent.

Solution

The development of disease resistant rice varieties helped stabilize rice production and protected farmers from economic losses. While IRRI gradually released various disease resistant varieties, IR36 had the most success as it possessed possessed the most comprehensive resistance. IR36 would prove itself to be valuable not only to farmers, but to IRRI as well. Five years after its release, a quinquennial review team would note that the development of IR36 alone justifies the original investment in IRRI 21 years prior.

Success Story written by: Stephen Gray, A.A. Mahama, Candice Gardner

To learn more about this and other success stories, visit GRIN-U.org