Minutes of the Sugar Beet CGC Meeting

(Held at the ASSBT Meeting (February 27 – March 2, 2016) Greenville, SC
Monday, February 27, 1:00 pm until 5:00 pm
The Regency F room of the Hyatt Greenville Hotel

Agenda of the Meeting

1. Membership Elections (list of members is below)
   - Members whose seat is up for election
     - Lee Panella
     - Imad Eujayl
     - Mohamed Kahn
     - Margaret Rekoske
     - Kelley Richardson
   - The Sugar Beet CGC Chairperson position also will be up for election

2. Curator's Report – Barbara Hellier

3. Collection Trips – Barbara Hellier

4. Update concerning the CGC Chairs Teleconference – Imad Eujayl
   - There is a full summary available at http://www.ars-grin.gov/npgs/cgcweb.html (click on 2016 CGC Chair Meeting)

5. Reminder to send seed from new releases to Pullman

6. Request for help in increasing sugarbeet germplasm in the collection

7. Status of Germplasm in the United States/crop vulnerability

8. New Business

Current Membership

Term	role	first name	last name	position	organization
2017	Chair	Lee	Panella	Supervisory Research Geneticist	USDA, ARS
2019	member	Melvin	Bolton	Research Plant Pathologist	USDA, ARS
2017	member	Imad	Eujayl	Research Molecular Biologist	USDA-ARS-NWISRL
2017	member	Mohamed	Kahn	Professor	North Dakota State University
2019	member	Robert	Harveson	Professor	University of Nebraska
2019	member	Anna	Murphy	Plant Breeder	Syngenta Seeds, Inc.
2019	member	Mitch	McGrath	Research Geneticist	USDA, ARS
2017	member	Margaret	Rekoske	Plant Breeder	Betaseed, Inc.
2017	member	Kelley	Richardson	Research Geneticist	USDA, ARS
2019	member	Jan	Sels	Plant Breeder	SESV VanderHave NV/SA

Minutes of the Sugar Beet CGC Meeting

Attending the Meeting

Members of the CGC attending were: Lee Panella (ARS Fort Collins), Kelley Richardson (ARS Salinas), David Boehm (SES VanderHave for Jan Sels), Melvin Bolton (ARS Fargo), Margaret Rekoske (Betaseed), Imad Eujayl (ARS Kimberly), Mitch McGrath (ARS East Lansing), and Anna Murphy (Syngenta).

Ex-Officio members and other attendees included: Barbara Hellier (*Beta* curator), Joe Munyaneza (NPL), Mark Boetel (NDSU), Ann Fenwick (ARS Fort Collins), Jinguo Hu (ARS – WRPIS), Friedrich Kopisch-Obuch (KWS), and Carl Strausbaugh (ARS Kimberly).

Excused were Bob Harveson (U of Nebraska) and Mohamed Kahn (NDSU).

1. Membership Elections

- Members whose seat is up for election
  - Lee Panella
  - Imad Eujayl
  - Mohamed Kahn
  - Margaret Rekoske
  - Kelley Richardson

All members whose term was up for election were reelected. Kelley Richardson asked that she be able to continue on the committee even though here research duties are transitioning out of sugar beet and the membership agreed.

- The Sugar Beet CGC Chairperson position also will be up for election

Lee Panella announced that he would be retiring before the next CGC Meeting (2019). He mentioned that Devon Doney had been CGC Chairperson from its inception in 1983 until Lee took over in 1995. Nominations were sought for the Sugar Beet CGC Chairperson position and the membership asked Lee Panella to continue in that role until his retirement. He agreed and there was no change in the Sugar Beet CGC Chairperson position.

2. Curator's Report – Barbara Hellier

Status Report on the *Beta* Collection at the
Western Regional Plant Introduction Station (WRPIS) to the Sugar beet Crop Germplasm Committee – Barbara Hellier (Curator) February 27, 2017

The *Beta* collection at the Western Regional Plant Introduction Station in Pullman, WA currently has 2,749 accessions with 1,730 accessions (63%) available and 2007 (73 %) backed-up at the National Laboratory for Genetic Resources Preservation (NLGRP), Fort Collins, CO. Table 1 contains a breakdown of the collection by species.

From January 1, 2015 to December 31, 2016, we received 214 requests (a decrease of 115 from

the previous reporting period) from 190 requestors. A total of 1044 accessions and 1889 seed packets (a decrease of 318 from the previous reporting period) were distributed. In the same time period, we acquired 12 new accessions: 10 *B. vulgaris* accessions collected in northern California and 2 USDA-ARS releases. Thirty-nine accessions were sent to NLGRP for long-term back-up and 287 to the Svalbard Global Seed Vault.

Table 1. Total number of accessions, number backed-up and number available per species in the NPGS *Beta* collection (includes the genus *Patellifolia*, formerly classified as *Beta*).

Taxon	Total Accessions	Accessions Backed-up	Accessions Available
Beta corolliflora	4	3	0
Beta lomatogona	29	4	2
Beta macrocarpa	55	12	28
Beta macrorhiza	19	2	1
Beta nana	21	0	0
Beta patula	3	3	1
Beta sp.	16	5	3
Beta trigyna	48	5	7
Beta vulgaris ssp. *maritima*	627	409	408
Beta vulgaris	12	2	5
Beta vulgaris ssp. *vulgaris*	1819	1549	1247
Beta vulgaris ssp. *vulgaris (NLGRP)*	19 *		
Beta x intermedia	8	1	1
Patellifolia patellaris	45	14	13
Patellifolia procumbens	13	5	5
Patellifolia webbiana	8	2	1
Patellifolia hybrid**	2	1	1

*Recent USDA-ARS releases

**One accessions *P. patellaris* x *procumbens* and one P. *procumbens* x *webbiana*

Regeneration and maintenance activities:

The majority of our increases are done in the greenhouse. We are using all available, suitable spaces in the WRPIS and Washington State University greenhouse systems, a total of 13-19 rooms. In 2015 and 2016 we started a total of 49 accessions and harvested a total of 59 accessions: 49 *B.v*.spp *maritima*, 18 *Patellifolia*, 1 *B. trigyna* and 1 *B. corolliflora.*

We continue to work on increasing the new collections from Morocco. Currently we are growing material collected in 2012 in the greenhouses. We had good luck with our outside increase locations in 2015 and 2016. All plots produced abundant quantities of seed. We had to abandon 2 of our field locations due to deer pressure and an unknown pathogen or herbicide interaction with our plants. We currently have 5 field increase locations.

In 2015 and 2016 we had help increasing accessions from Beta Seed, SESVanderHave, Dr. Richardson in Salinas, CA and Dr Campbell in North Dakota. They increased 65 accessions. **We greatly appreciate their help**.

Only 3 accessions were tested for viability 2015 and 2016 and had viabilities between 99 and 88%. At WRPIS we had complications with our germinators. Older germinators stopped working and the replacements needed reconfiguration. We now have 3 new germinators and my group has restarted performing viability tests on *Beta* accession. We are continuing to collect descriptor data on increased/regenerated accessions. Data collected is hypocotyl color, bolting tendency, cluster fasciation, flowering pattern, leaf hairiness, leaf width (min. and max.), leaf length (min. and max.), leaf pigment, petiole color, susceptibility to *Erysiphe* sp., and images of pre-bolt plants, roots and flowering plants of wild species.

In 2016 I updated the TYPE descriptor data in GRIN-Global. All *Beta vulgaris* and *Beta v.* ssp *vulgaris* accessions in the collection as of Dec. 2016 have a TYPE designation (sugar, table, leaf, fodder, wild, mix, other, and unknown). Type was determined from previous evaluation data or passport data. There are 290 accessions that have little to no passport or evaluation data. I am continuing to search for information on these accessions. We have also added a table beet "group" to the database so table beet accessions can be queried using advanced queries in GRIN-Global.

WRPIS changes and updates:

At the Pullman Plant Introduction station there were several personnel changes in 2015 and 2016. Brian Irish was hired as the forage curator. He is located in Prosser, WA. We have hired a new seed storage/germination technician, an agronomy research technician, a *Phaseolus* technician and a cool season food legume technician. Dr Richard Johnson, agronomist, retired at the beginning of 2016. His position will not be filled. The other vacancy in our Unit is the technician at our Central Ferry farm.

Collecting and evaluation:

In 2015 my technician, Marie Pavelka and I evaluated the *Patellifolia* collection for morphologic characteristics. The characters collected were days to seed maturity, branching pattern, seed shape, hypocotyl color, growth habit, plant diameter, leaf shape, leaf width, leaf length, petiole length and petiole width. We collected the leaf data using WinFOLIA. In addition, tissue samples for DNA extraction and herbarium samples were collected for all the accessions in the evaluation. Also, using flow cytometry we have almost completed ploidy analysis on this collection. We still have 9 accessions to analyze, but with these, all extant *Patellifolia* accessions will have a ploidy determination.

Dr. Panella, Dr. Richardson and I received funding from the NPGS Plant Exchange Office to collect *Beta* species in the Imperial Valley and along the coast of southern California in 2014. We were granted a deferral to 2015 because of the severe draught in California. Since southern California was still very dry in 2015 we were given permission to collect in the California San Francisco Bay area and explore the Sacramento River delta. We collected seed from 10 populations of naturalized *Beta vulgaris*: two populations were collected by Morro Bay, two in

the Gilroy area, four in the south Bay and two in the east Bay. We did not find populations in the Sacramento River delta. This material is currently being increased in Salinas, CA by Dr. Richardson.
The Presentation that went with this presentation follows as Appendix 1.

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3. Collection Trips – Barbara Hellier

Barbara Hellier discussed the collection trip to Northern California (Morro Bay (San Louis Obispo) and San Francisco Bay. The PowerPoint presentation she gave is in Appendix 2.

4. Update concerning the CGC Chairs Teleconference – Imad Eujayl

Imad Eujayl sat in on the CGC Chairs Teleconference and reported on that. Presentations were given by Peter Bretting (NPS), Stephanie Greene (NLGRP), and Karen Williams (USDA-ARS National Germplasm Resources Laboratory, Beltsville, MD). They stressed the need for an updated 'Crop Vulnerability Statement' for each crop. There also was discussion about a new protocol to prevent accessions of crops in the USDA-ARS National Plant Germplasm System (NPGS), which have commercial GE cultivars, from being contaminated by GE crops. This protocol should be in place by 2018. Mitch McGrath (ARS East Lansing) worked very hard on the sugar beet portion of this document. There also was discussion of the UN Treaty on Plant Genetic Resources and the effect it might have on our NPGS. There is more information at the URL below or in the updated 'Status of Sugar Beet Germplasm in the United States'.

- **There is a full summary available at http://www.ars-grin.gov/npgs/cgcweb.html (click on 2016 CGC Chair Meeting)**

Gary Kinard at USDA-ARS National Germplasm Resources Laboratory Beltsville, Maryland provided his report to the Germplasm community after our meeting and it is Appendix 3.

5. Reminder to send seed from new releases to Pullman

All ARS scientists that are releasing germplasm are reminded to send seed not only to the NLGRP but also to Barbara Hellier at Pullman. She would like up to 100 gr of seed, this is especially necessary if you are not planning on distributing the seed. It provides a backup for future use at our active site.

6. Request for help in increasing sugarbeet germplasm in the collection

We want to thank the seed companies that have increased seed from our NPGS *Beta* collection. Thanks also to all of the scientists that have increased seed, especially to Kelley Richardson, who

has made good use of the isolators and other sugar beet infrastructure present in Salinas, CA.

7. Status of Germplasm in the United States/crop vulnerability

All of the Sugar Beet CGC members were given a copy of the template for CGC Crop Vulnerability Statements along with some examples. They also were given a draft of a statement for sugar beet. It is important to update this report continually as conditions in the crop change. This allows our USDA-ARS Office National Programs to make decisions concerning the protection of genetic resources and the allocation of funding to support this important mission. **Please send your corrections/improvements to the draft you received by the end of March.**

All of the Sugar Beet CGC members were given a copy of the recently updated "Status of Sugar Beet Germplasm in the United States" to review and update ARS and Company information. **Your corrections/improvements on the Status of Sugar Beet Germplasm in the United States need to be returned to Lee Panella by the end of March.**

8. New Business

Concern was expressed about the accessibility and stability of the Russian collection and Greek collection. Discussion ensued and both are thought to be underfunded and have limited accessibility and concern was raised over the potential viability of these collections. It was asked if IPK has back-up of their core collections. If we were to pursue an exchange, the Russian core collection would be the most important.

Friedrich Kopisch-Obuch mentioned he has a collaborator in Armenia who may be willing to collect *Beta*.

Imad Eujayl mentioned he may be able to collect in Egypt if there are gaps.

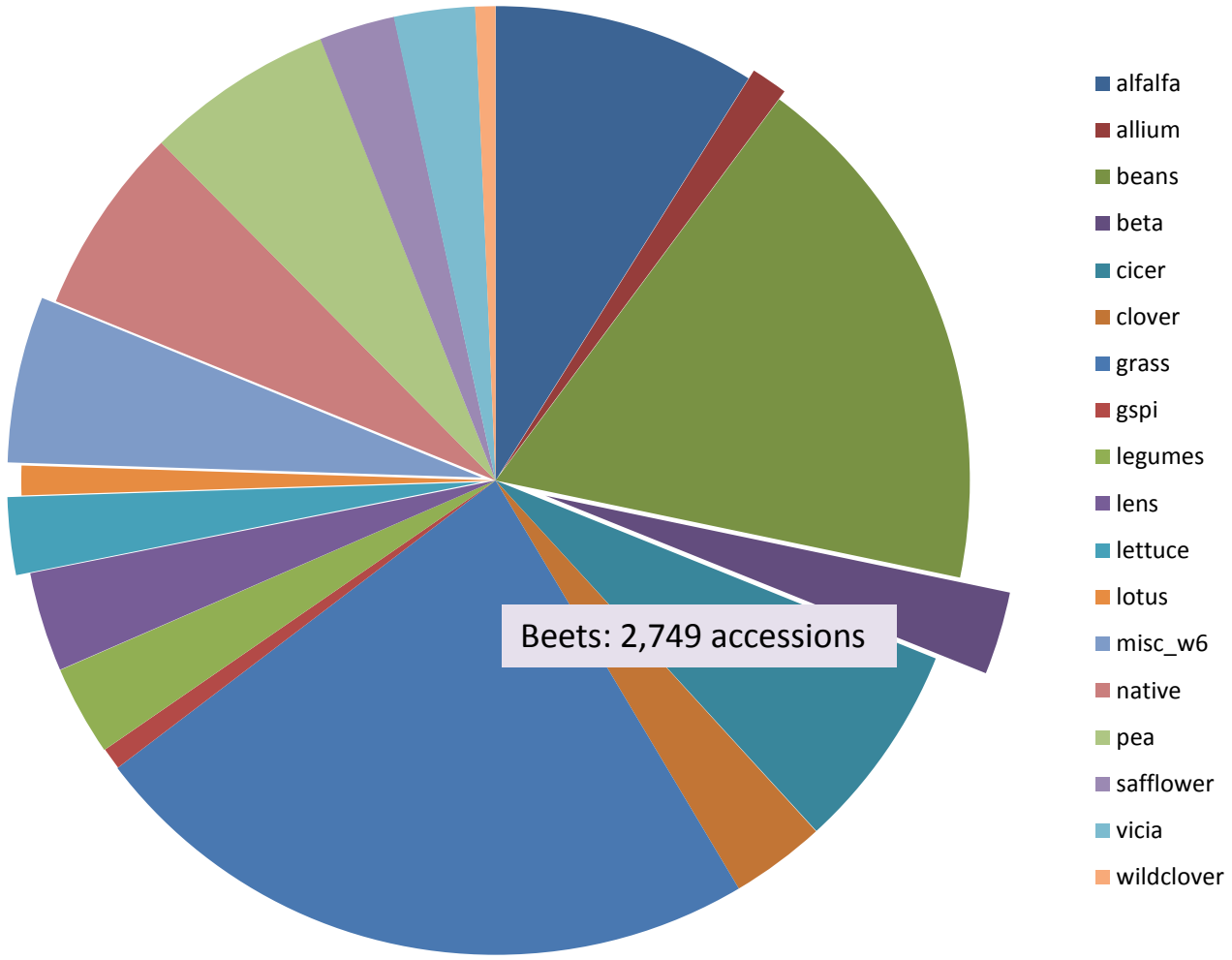
Appendix 1

Status report on the *Beta* collection at the Western Regional Plant Introduction Station, Pullman, WA to the Sugar Beet Crop Germplasm Committee

Status report on the *Beta* collection at the Western Regional Plant Introduction Station, Pullman, WA to the Sugar Beet Crop Germplasm Committee

Jinguo Hu, research leader
Barbara Hellier curator,
Marie Pavelka, technician
February 27, 2017 Greenville, SC

Total number of accessions at the WRPIS is 96,346



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Beta x intermedia	8	1	1
Patellifolia patellaris	45	14	13
Patellifolia procumbens	13	5	5
Patellifolia webbiana	8	2	1
Patellifolia hybrid**	2	1	1

Total Accessions = 2749

Total Available = 1730

Total Backed-up = 2007

*Recent USDA-ARS releases

** One accession *P. patellaris* X *procumbens* and one *P. procumbens* X *webbiana*

Orders, new inventories, and accessions sent to NLGRP and Svalbard.

From Jan. 1, 2015 to December 31, 2016:

Distributions

No. of orders = 214 (decrease of 115 from previous reporting period)

No. of requestors = 190

No. of accessions distributed = 1,044

No. of seed packets distributed = 1,889 (a decrease of 318 from previous reporting period.)

New inventories

10 *B. vulgaris* collected in northern California

2 USDA-ARS releases

Back-up to NCGRP and Svalbard

39 beet accessions sent to NLGRP and 287 to Svalbard

Regeneration and maintenance activities:

Regenerations:

Pullman started 49 accessions, harvested 59 accessions:

49 B. maritima

18 Patellifolia patellaris

1 B. trigyna

1 B. corolliflora

Cooperators increased 65 accessions

Viability tests:

3 tests in 2015 and 2016

.

PI 604030, *B. corolliflora*, Turkey

Descriptor: Type of Beet (TYPE)

Download list of accessions evaluated for this trait

Definition:	General growth type and/or use type
Crop:	SUGARBEET
Category:	Production descriptors
Status:	Crop Germplasm Committee approved
Data Type:	Alpha/numeric descriptor
Maximum Length:	6
Responsible site:	Western Regional PI Station (W6)

Studies or environments for this trait

- SUGARBEET.KOPISCH-OBUCH.GERMANY - (53 Accessions)
- SUGARBEET.PASSPORT.DATA - (24 Accessions)
- SUGARBEET.PULLMAN.2004-2007.GREENHOUSE - (44 Accessions)
- SUGARBEET.PULLMAN.2008-2009.GREENHOUSE - (21 Accessions)
- SUGARBEET.PULLMAN.2010-2014.GREENHOUSE - (45 Accessions)
- SUGARBEET.TYPE.1995.DONEY - (1068 Accessions)
- SUGARBEET.TYPE.2016.HELLIER - (1815 Accessions)

Distribution of Values for Type of Beet (TYPE)

Code	Definition	Number of Accessions
FODDER	Swollen hypocotyl and root used as animal feed	140
LEAF	Leaves used as vegetable, includes the chard types	109
MIX	Accession has more than one TYPE of beet	4
OTHER	TYPE partially known but there is not enough passport , evaluation or other data to make a TYPE assignment (eg can place to fodder or sugar beet but not enough info to assign to either)	16
SUGAR	Used for sucrose production	1064
TABLE	Swollen hypocotyl used as vegetable, includes garden beets and red beets	203
UNKNOWN	Passport and other associated data does not clearly indicate TYPE or there is not enough data to make a TYPE assignment.	290
WILD	Collected from a wild population	737

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NPGS Home Page > Accessions > General

Search For: Beta

Match All Terms

Display: Accessions

Accessions: Include unavailable | Include historic | With images | With NCBI link | With genomic data

Advanced Search Criteria

Return up to 500 accessions

Search

Accession Collecting Site Search Criteria

Choose Criterion 1: accession group name | Equal To

Beta (table beets)
Cicer CSP (Cicer single plant descent)
GlycinePerennial.CSIRO
Lens LSP (Lens single plant descent)

Clear Criterion

Choose Criterion 2: -- Select One -- | - Select -

Clear Criterion

Add More Criteria

Clear All Criteria

Alternative Search method using a list of accession identifiers

CROP TRUST

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Appendix 2

Evaluation and Collecting Activities:

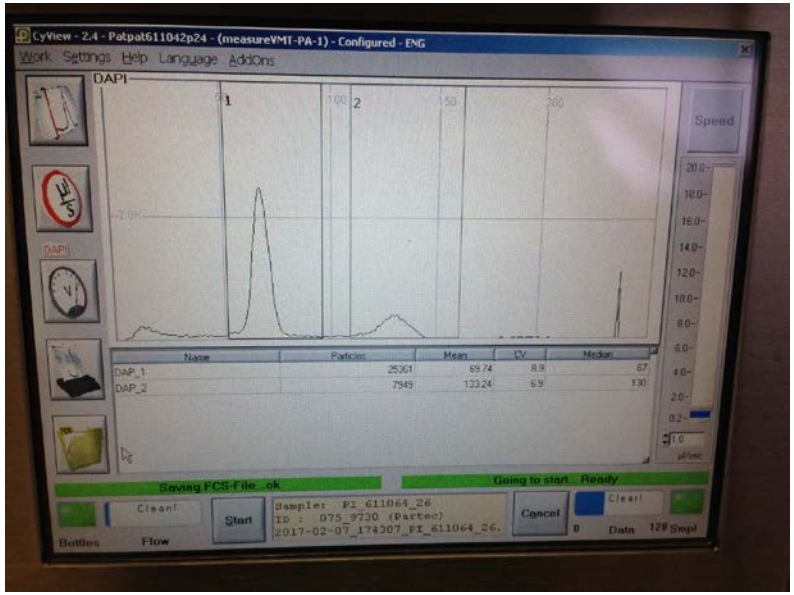
Patellifolia collection evaluation, 2015

Collecting Naturalized Populations of *Beta* in northern California, 2015

Patellifolia collection evaluation, 2015

Patellifolia collection evaluation, 2015

54 accessions evaluated in field plots at WRPIS farm at Central Ferry, WA
Planted in a complete block design with 2 reps and 1-5 plants/rep. Data collected: days to seed maturity, branching pattern, seed shape, plant diameter, growth habit, leaf shape, leaf width, leaf length and petiole length and width.



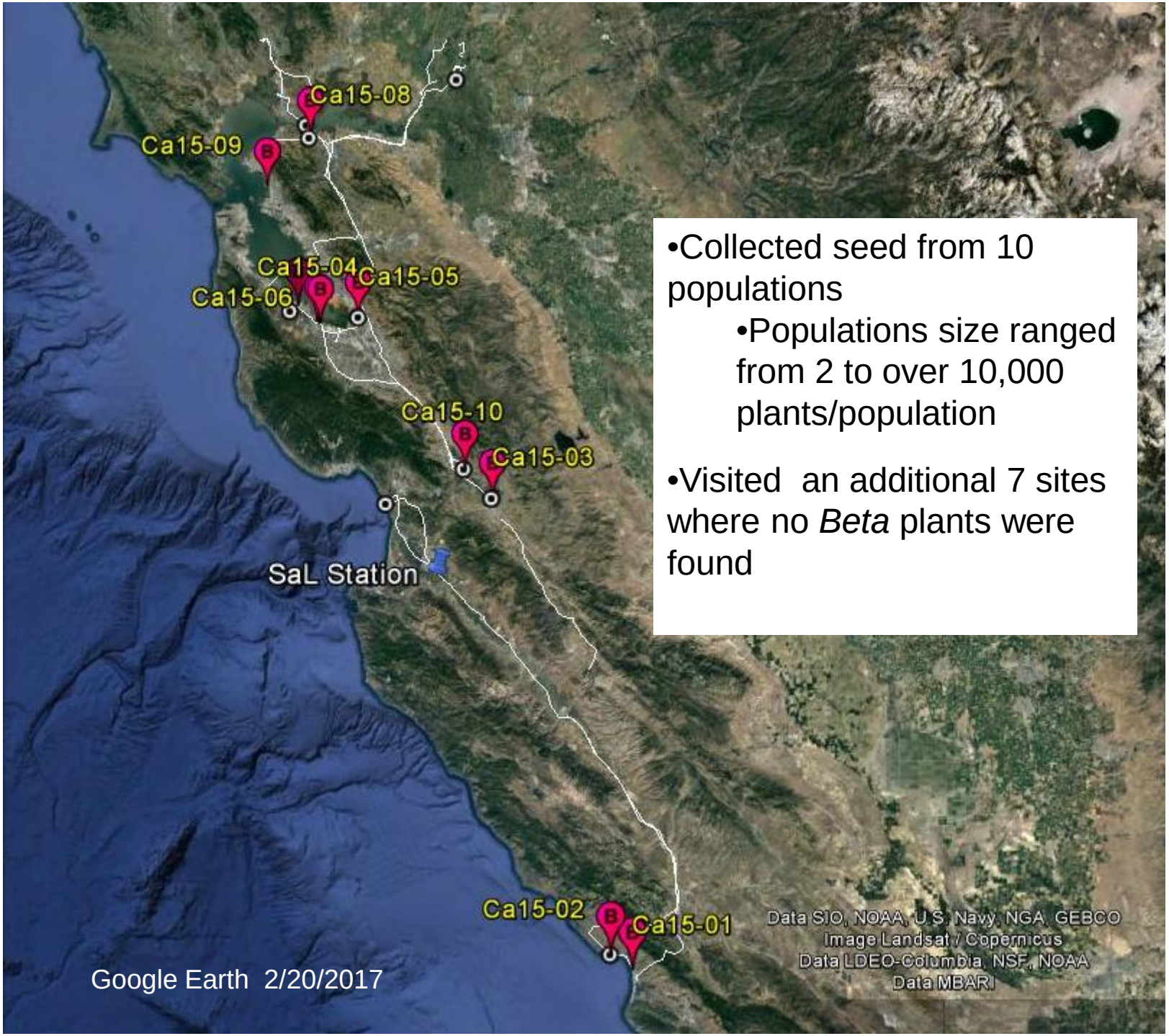
- Leaf characteristics and scans collected with WinFOLIA
- Ploidy analysized using DAPI buffer system, a Partec Flow Cytometer and 1-6 plants/accession.
- Of the 38 *P. patellaris*, 6 *P. procumbens* and 3 *P. webbiana* accessions analyzed all the *P.patellaris* are tetriploids, and the *P. procumbens* and *webbiana* are diploids.

Collecting Naturalized Populations of *Beta vulgaris* in Northern California, 2015

Funded by the NPGS Plant Exploration Office

Participants: Lee Panella, Kelley Richardson, Barbara Hellier

July 20 to 26, 2015



- Collected seed from 10 populations
  - Populations size ranged from 2 to over 10,000 plants/population
- Visited an additional 7 sites where no *Beta* plants were found

Site 1, Morro Strand State Beach

Site 4 Shoreline Park, Mt View, CA

Site 5 Santa Clara Water District Coyote Creek mitigation site.

Site 7 Bedwell Bayfront Park, Menlo Park

Site 8 Martinez Marina, Martinez


Thank you for your attention!
Central Ferry Farm, Summer 2017

Appendix 3

USDA-ARS National Germplasm Resources Laboratory Beltsville, Maryland
2017 Report to PGOC, RTACs, and CGCs
Gary Kinard

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. Melanie Schori joined NGRL as a Botanist on January 9, 2017. She will be a work colleague of Dr. John Wiersema in curating GRIN-Taxonomy.

Plant Exchange Office

Plant Exploration and Exchange Program:

- The PEO supports the collection of germplasm for the NPGS through the management of a Plant Exploration and Exchange Program. Guidelines for developing plant exploration and exchange proposals will be distributed to CGC chairs in January 2017. Proposals must be endorsed by the appropriate CGC or other crop experts.
- The deadline for submitting proposals for explorations or exchanges to be conducted in FY 2018 is July 21, 2017.
- All foreign explorations supported by PEO comply with the Convention on Biological Diversity on 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.

FY 2016 NPGS Plant Explorations:

Target Crop	Country	Principal Contacts
Small fruits	Vietnam	K. Hummer, J. Oliphant, T.T.T. Hoai, N.V. Kien
Wild carrot and onion (2 trips)	Spain	D. Spooner, P. Simon
Woody landscape and herbaceous ornamentals	Georgia	M. Eristavi, G. Tedoradze
Wild sunflower	United States (AL, FL)	L. Marek, G. Seiler
Ash, dogwood, birch	United States (MN, ND)	J. Zeleznik
Herbaceous ornamentals	United States (TX)	P. Jourdan
Kentucky coffeetree	United States (IL, IN, MI))	J. Carstens, A. Schmitz
Wild apple	United States (AR, LA, MI)	T. Chao
Wild potato	United States (AZ)	J. Bamberg, C. Fernandez, A. del Rio, I. Bamberg

Target Crop	Country	Principal Contacts
Wild bean	United States (OH)	A. Egan, T. Kisha
Wild bean	United States (NC, SC, VA)	A. Egan
Hardy kiwifruit (exchange)	United States	I. Hale, B. Guthrie

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

In 2016, ARS and the U.S. Forest Service established a new agreement to foster collaboration on conservation of crop wild relatives on U.S. National Forests. A pilot project on complementary (*in situ* and *ex situ*) conservation of CWR of the genetic resources of wild cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*) in National Forests is underway.

Discovery and Documentation of Historical Plant Introductions:

A project to identify historical plant introductions (PIs) that are not in the NPGS continues. In 2015 and 2016, over 110 historical PIs were located, identified, and documented at the former USDA Plant Introduction Garden in Chico, CA. The PIs include woody landscape plants, fruits, and nuts. Many of the PIs are original specimens collected by Frank Meyer in China. Germplasm has been collected from more than 40 of the Chico accessions. One notable discovery was a grove of 26 diverse oriental persimmons (*Diospyros kaki*) collected in China, Korea, and Japan between 1905 and 1964 that had not been incorporated into the NPGS.

GRIN Taxonomy for Plants:

- GRIN Taxonomy, now available through GRIN-Global (https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomyquery.aspx), 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. 15,500 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.
- GRIN Taxonomy includes scientific names for 27,207 genera (14,203 accepted) and 1,399 infra-genera and 107,689 species or infra-species (62,656 accepted), with over 64,300 common names, geographical distributions for 55,084 taxa, 460,591 literature references, and 31,636 economic impacts. 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 190 major and minor crops from 99 genera, and an interface to query these data in various ways will be developed (https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearchcwr.aspx) for the GRIN-Global public site. 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 other international genebanks through a long-standing collaboration with USDA-APHIS at Building 580,

BARC-East. In 2016, 614 public orders containing a total of 52,099 samples of NPGS accessions were shipped from Beltsville to individuals in 67 countries throughout the world for research and education. 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:

- The CGC section in GRIN (http://www.ars-grin.gov/npgs/cgcweb.html) was given a minor facelift in the transition to GRIN-Global.
- Please send updates to the individual crop CGC sections to Gary Kinard.
- Most committees continue to meet regularly and are active. Committees are particularly urged to update their Crop Vulnerability Statements.
- A virtual meeting/web conference was held for CGC Chairs on December 1, 2016. Updates were provided on the activities of ARS and the NPGS, international issues related to plant genetic resource exploration and exchange, GRIN-Global, and the activities of the CGCs.
- NGRL also has a conferencing account that is available to the CGCs to host virtual meetings (teleconference and/or webinar).

Database Management Unit

GRIN and GRIN-Global:

- At the beginning of 2017, the GRIN-Global plant database included the following:

  576,796 accessions representing 15,130 species and 2,407 genera
  2,971,657 inventory records
  1,923,611 germination records
  8,152,624 characteristic/evaluation records
  394,342 digitized images

  The numbers regularly increase.

- The U.S. NPGS made the transition from GRIN for plants to GRIN-Global on November 30, 2015. The GRIN-Global Development Team initiated improvements and enhancements to both the Curator Tool and Public Website, and corrected any bugs that were reported in 2016.
- Comments, ideas, and suggestions on GRIN-Global can be sent to the entire development team at feedback@ars-grin.gov.

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 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

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