

California Annual Report to the W-6 Technical Committee for distribution year 2018

June 21, 2019

Prepared by Dan E. Parfitt

562 requests for plant introductions from California users were filled by the NPGS in 2018, somewhat fewer than the 624 from last year, representing 323 different users, similar to the 341 from last year. Figure 1 shows the usage of germplasm in California from the National Plant Germplasm System expressed by the number of requests for California from 1993 to the present.

Collection of germplasm information: The collection methodology was the same as used in the last few years.. 323 queries were sent by e-mail. 3.4% of the e-mail addresses were not received. This is more than last year, but still a low number. 87 recipients sent reports, for a 27 % response rate, much higher than last year. (Figure 2). This change is likely due to the change in methodology initiated by the committee this year. Rather than a simple request for users to reply to, all state representatives were provided three questions for the recipients to answer:

1. What is the planned use for the NPGS germplasm(s) you received in 2018?
2. Did you release any plant material(s) to the public in 2018 that was partially or fully derived from any NPGS germplasm(s) that you received in 2018 or previously? If yes, please provide as much information as possible about the released plant material(s).
3. If you published an article in 2018 that includes NPGS germplasm that you received in 2018 or earlier, please provide the publication citation (authors, title, journal, etc.).

Responses to each question per individual recipient are provided in summary form.

The distributed germplasm was used for plant breeding research, testing in home gardens, and propagation of both clonal and seed propagated species. Several researchers used materials as reference materials or checks in their experiments. Academic institutions were significantly represented in the reports and the germplasm was used for a wide variety of research purposes. Much of the germplasm continues to be used for commercial breeding research (private, university or USDA). There continues to be interest in using the collections for molecular/biochemical studies, especially development of markers and molecular clones. Fewer reports were received from California Rare Fruit Growers members than in past years. Descriptions of intended germplasm use by the respondents are presented in a summary form below. I did not include institutional affiliations for the respondents, although that information is available if needed.

The Viticulture Department at UC Davis continues to maintain grape collections for teaching and research. Several Plant Science fruit and nut germplasm collections continue to be maintained (walnut, pistachio, pecan, and some persimmon cultivars). There is no formal mechanism for ensuring their continued protection and the Pis that assembled and/or used them are retired or retiring soon. Dr. Pat Brown has been hired to carry on the walnut breeding program, formerly led by Dr. McGranahan (and will also be continuing the pistachio program from Dr. Parfitt). He will supervise the department walnut and pistachio collections. The pecans and persimmons will probably disappear although Dr. Brown has expressed an interest in doing some pecan research. The Department of Botany and Plant Science at UC Riverside maintains several collections of *Citrus* germplasm for cultivar evaluation and disease related research, as well as collections of avocado, cherimoya, and persimmon. Annual reports from the UC Davis Seed Biotechnology program may be accessed at http://sbc.ucdavis.edu/News/Reports_and_Brochures_655/ and other SBC information at <http://sbc.ucdavis.edu/>. Information on the UCD Plant Breeding Center, directed by Dr. Charles Brummer is available at: <https://plantbreeding.ucdavis.edu/>

Figure 1. Requests for NPGS Germplasm from California

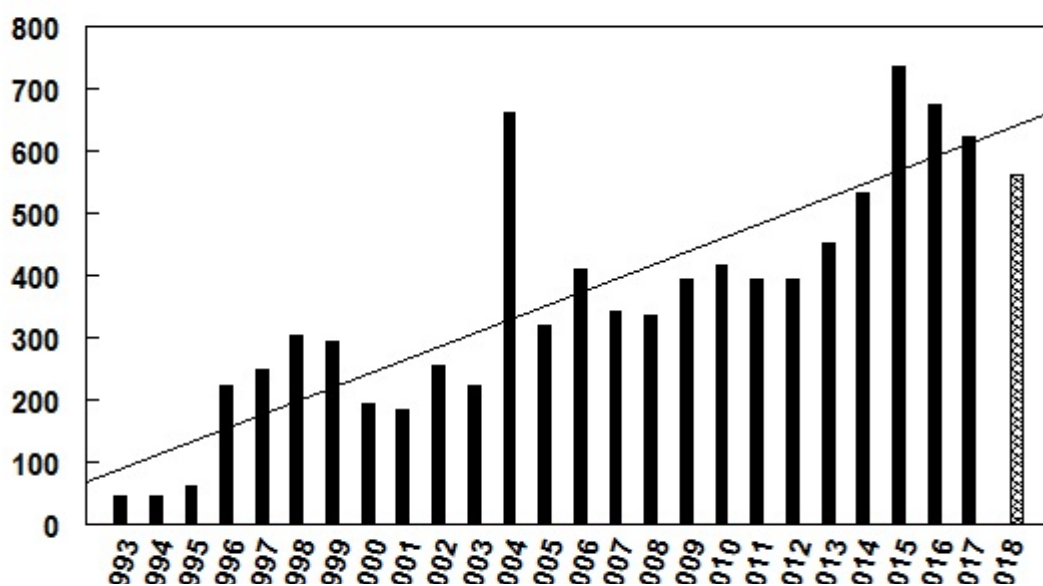
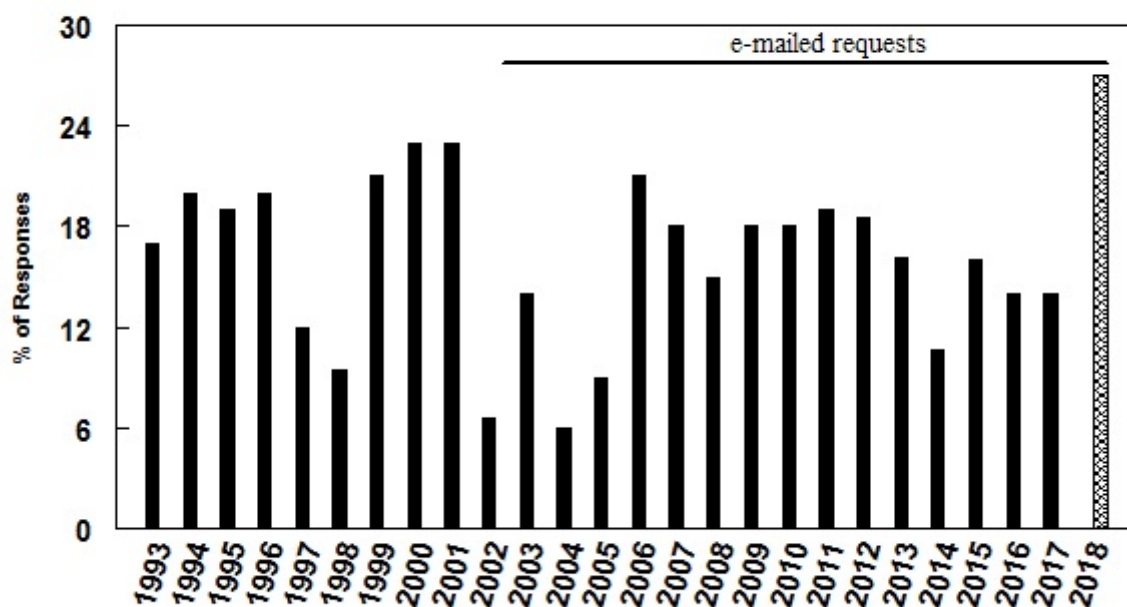


Figure 2: % of Responses



Summary of answers to Committee Questions concerning use of NPGS germplasm in California 2018.

1. What is the planned use for the NPGS germplasm(s) you received in 2018?

Kelly Gabrysch: To do research on hardiness and compatibility of fruit trees in the Southern California growing environment

Padma Sudarshana, Ph.D.: Answer: Phytopathological investigations identify resistance traits to diseases.

Pat McGuire: In 2018 I received five accessions maintained by NPGS under the binomial *Thinopyrum elongatum* (which should be a diploid taxon, $2n=14$). However these five lines are suspected of being octaploid ($2n=56$) based on other information in their GRIN records. My plan is to verify the chromosome numbers of the accessions and then determine the crossability of each accession that is octaploid to hexaploid wheat.

Nuri Benet-Pierce: I received the germplasm with the purpose of confirming the ID or re-identifying some *Chenopodium* plants and fruits at NPGS.

I have worked with *Chenopodium* fruits and seeds for several years now. For the most part can identify the plants using their fruits as they provide a much more accurate diagnostic tool for doing so, given the plasticity of vegetative characters in *Chenopodium*.

Initially my plan was to grow some at SDSU, but as a taxonomist I am not really set for more intense plant growing. So, at the moment, no material has been released at all. However, I did respond with corrected identifications, which I believed proved useful to improve the collections there. Please see below recent publications. My most recent paper covers *Chenopodium* in California and it is in the process of publication at Madroño.

Unfortunately it was necessary to provide me with material in excess of what I actually needed. But, my research is progressing and I may try to grow some of the material in the near future. I hope this covers the points mentioned in your email. Please do let me know if I need to add anything else to it.

Kate Rockenbach: We planned to use the seed as a known example of different ploidy for a RT-PCR experiment we had planned for internal validation use.

Michael P Muessig: I am sending you a project outline on how the LF Trial Test Garden here in McKinleyville, Ca. is using the germplasm plant material scion wood soon. The material shipped to the trial garden was used to make grafted young trees. Simple field note observations on the young trees will start in June. It will be likely be 3-5 years before these small trees produce any fruit for evaluation and a field note record with pictures. The next 3-4 years will focus on how the fruit varieties grow in our local micro climate and problems the young trees encounter.

Menkir Tamrat: The plan for this trial involved 16 different durum wheat types from Ethiopia. The purpose is to document the response of the plants to only rain fed watering with no irrigation involved.

Clayton J Visger: I was beginning a new project aimed at developing Hops as an evolutionary model of polyploidy in plants. Hops are an ideal model for studying polyploidy as they can be propagated clonally, have established cell culture protocols, have a high quality sequenced, are economically important, and polyploidy is used strictly as a seedless breeding tool. However, only an extremely limited amount of work has focused on the impact of polyploidy in Hops beyond the use of tetraploids as breeding stock. I acquired NPGS germplasm of several Hop varieties and my students have begun optimizing the tissue culture of Hop meristems with the goal of inducing polyploidization, and developing multiple, independently derived, ploidy level series. These ploidy series lines will form the basis for experimental gardens, and will serve as the experimental material for a host of interdisciplinary studies focused on the basic evolutionary question "are there any rules associated with polyploidy"? In other words, do independent polyploidizations of the same genetic background yield a similar impact on drought tolerance, water-use efficiency, transcription/translation, genomic shock, etc. Very little is known about the repeatability of polyploidy-derived genomic impacts and Hops is an ideal model to continue contributing to this area.

Ellen Thompson: Interspecific hybridization of wild *Rubus* material into our domestic breeding stock. This pre-breeding goal is to capture genes of interest from species held at the NCGR in Corvallis. This unit does and excellent job of curating *Rubus* species of interest.

Dr. Roy Wiersma:

Thanks for the annual notice of request for usage information of USDA germplasm material. I missed the *Prunus* scionwood order deadline in the fall of 2018 due to too many obligations related to my work, family property management, and the like. Eager as always to get back into my historic plant research I've purchased 6 domains (3 related to L. Burbank, 3 related to I.V. Michurin) with the plan to set up two web sites featuring their

respective plant introductions. The Burbank plant web site especially will feature photographs of USDA germplasm material I've requested in the past.

For this years' report to you I'm sending a total of 10 photos directly uploaded from my SD card. The plum pictures are self explanatory and I'll include additional info as I have it. These will be sent as multiple e-mails due to memory size. If you need more specific info just ask and I'll check through my papers for exact dates and accession numbers. Good luck with your final report and continued germplasm funding!

Paul Ladeira: My rhubarb starts did not survive the cold and rain of this historic winter. Looks like I will have to try again next year.

Nestor Kippes: The germplasm received in 2018 is being characterized for disease resistance, genotyped and utilized as parental lines in our crosses.

Allison Krill-Brown: breeding

Ryohei Hirose: We have a breeding program of strawberry in Japan. So we collect the germplasms.

Elizabeth Johnson: I received four sample packets of *Triticum turgidum* subsp. durum varieties in 2018 - to plant for 2019 harvest, to monitor which ones seem to do well in our central coast environment, and to get a modest seed increase to plant next year if they do well. SLO Seed Exchange supports organic heirloom and heritage seeds of all kinds. My personal interest is in food grains - heirloom, heritage, and ancient barley and wheats - in order to support small scale growers and gardeners planting for commercial and home use. I support local bakers and pasta makers who use fresh heritage California grains, and in general, am encouraging more farming here for local human use.

Daniel Gobena: spreadsheet Brassicas

Gabriel Olson-Jensen: My name is Gabe Olson-Jensen and I am 14 years old. I am very involved in fruit breeding and growing. I love grafting and growing Citrus, Pome fruits, and stone fruits. I recently planted 100 G11 apple rootstock that I am going to graft all Honeycrisp onto. This spring I plan on doing some crosses with some red fleshed apples and Honeycrisp. I was wondering if I could buy some apricot pollen for doing some crosses on some plum varieties that are cold hardy for Wisconsin and Minnesota to create a hardy Pluot?

Virgilio Vidor Viticultura Tropical: Unfortunately, the cuttings received and the successive derived seedlings, have suffered several negative accidents, so we could not continue with the planned use plan. The hybrids and varieties received were wanted to verify the possible adaptation of the same ones to the local conditions, to then proceed opportunely in future to possible crossings among those that demonstrated more viability. There were 25 varieties and multispecies hybrids for temperate, tropical and subtropical climates.

Development of the stages in the short time elapsed:

First, they did not take root satisfactorily, so in general, there was not an appreciable number of plants to develop the plan. The above, especially as regards some varieties and hybrids with genes of *Vitis Aestivalis*, as well as other hybrids of the subgenus *Muscadinia*. Of the 125 cuttings, they took root only 85.

Second, there was a nocturnal invasion of a family of deer, which uprooted and ate several seedlings, which produced a drastic decrease in the number of seedlings to develop the local adaptation test plan.

Third, because they are hybrids and varieties mostly for subtropical and tropical climates, there were many problems for some varieties in overcoming the winter of northern California, producing additionally the death of other seedlings. The previous thing, in spite of being these seedlings, in a mini-greenhouse (which did not seem to be very efficient). The final situation is such that it does not allow to continue with the planned plan. The surviving varieties were not released or disseminated. They were grafted onto other adult vines from our own vineyard and others were sown directly without grafting, with good apparent growth (Orlando Seedless). These varieties are: Trifera, Stravaganza Vidor, Lambrusco, Orlando Seedless.

Conclusion: Obviously, the short time and the reduced number of varieties and plants that were alive, were not enough to continue a systematic plan to control the adaptation and therefore, nothing has been written or published in merit, but at least, in terms of the adversities found, we can confirm that the only subtropical hybrid that exceeded local conditions well is the Orlando Seedless. The other varieties, such as Trifera, Stravaganza Vidor and Lambrusco, are of the *Vitis Vinifera* species, which is a species that can notoriously thrive well in the Ukiah Valley.

Hans-Karl Frautschi: My plan for the received germplasm is to select for drought tolerant strains within landraces of wheat, corn, tomatoes and lettuce

Louise M. (Marlene) Biller: In my lab we work with mitochondria and will try to insert DNA fragments into the mitochondrial DNA. We will make protoplasts, then transfect these protoplast with DNA fragments and analyze them for insertion. All work is done in a sterile hood.

Shyamal Talukder: The germplasms will be used for crossing with breeding materials

Randi Jimenez: The germplasm was used to screen for virus resistance as well as a susceptible control and inoculum maintenance.

Kristine Elvin Godfrey: The Rangpur Lime and Cleopatra Mandarin seeds were used to grow seedlings for use in studies on Citrus Tristeza Virus by a researcher in the Department of Plant Pathology at UC-Davis. This research is not completed, however, the researcher has chosen to only use the Cleopatra Mandarin seedlings for the research. The Rangpur Lime seedlings were disposed of according to the protocols in place at the Contained Research Facility.

Yongliang Zhang: I planned to inoculate the plant virus like BNYVV onto the NPGS germplasms.

Ayla Norris: Stylosanthes varieties will be sown and measured for heat tolerance, to be compared with the heat tolerance of other cultivars in the future. If promising results are found, some relevant genes may be sequenced.

Jenifer Bliss: We planted them into containers to allow the cuttings to grow large enough to be planted in our botanical preserve orchard. We are adding them to our collection, as they were a portion of the many plant introductions of Felix Gillet, Barren Hill Nursery in Nevada City CA in the 19th century.

Adam Steinbrenner: Germplasm has been critical for an ongoing research project on legume immune receptors. We screen different accessions and species for responses to elicitor peptides derived from herbivore pests (caterpillars). We anticipate publishing this work in 2020.

Eric Christopher Holmes: I used the NPGS lines I received (G. max Pella 86 and Z. mays B73) to screen these plants for production of N-hydroxy-pipecolic acid, a metabolite we previously identified in Arabidopsis to be necessary for systemic defense against pathogens.

Celia Del Cid: The germplasm received by our company in Spring 2018 and previously was obtained with the purpose of studying plant secondary metabolites. Unfortunately, we were not able to surface sterilize and germinate all the seeds. In 2018 we received seeds of Mentha arvensis, Thalictrum minus, Momordica Charantia, and Rubus chamaemorus of which none were viable.

The callus cultures and plantlets we were able to obtain from an earlier order; Glycyrrhiza glabra (PI 674775) and Trigonella foenum-graecum (PI 613629) are now being maintained in our germplasm bank. We have no plans for them currently.

Davide Sosso - Carnegie: We were planning to plant the seeds for seed propagation, but no seed was planted/used;

Betsy & Bill Nachbaur: Grafted it in a field blend vineyard block.

Olga Batalov: I ordered grape cuttings and apple scionwood this year. I got my grape order safe and sound, albeit unexpectedly right before Christmas. Due to lack of funding, the apple order was delayed until the government shutdown ended and funding was restored. I was not expecting to get the apple order this year, and would have understood and appreciated this service even if that was the case. As such, I was all that much more appreciative when the apple order did come in.

Jenny Mortimer: testing the regeneration capacity of different sorghum germplasms in tissue culture

Carlos F. Quiros: Accessions PI 542054, Imperial Star and PI 601507 Big Heat XR-1

Receives from Geneva Unit on July 31, 2018

The intended use for this material is observation in a San Diego garden for possible selection of desirable types. The amount of seed received was quite small so I was able to grow only a handful of plants that they are still too young for evaluation.

Unfortunately the artichoke collection at USDA is limited to only these 2 accessions. According to the curator Joann Labate the plants sent from NPGS to Geneva never flowered, therefore there is no seed available. This germplasm collection is in urgent need of rescue.

Katherine Waselkov: We plan to use the USDA germplasm (1 accession of Amaranthus palmeri seeds from Arizona from 1981, Ames 5370/PI 632235) as a control population from before the spread of glyphosate resistance in this species into Arizona. We are including material from this accession in our RADSeq analysis of population genomics of the species.

Barbara Alonso: Genetic studies in sorghum.

Liz Robertson: The planned use for the NPGS germplasm is to do a growout Summer 2019 for the lines to be evaluated for performance in the Northern California climate.

Magi Richani: Some of the seeds were germinated and we collected leaf tissue to clone some promoter sequences.

Seung Yon (Sue) Rhee: The germplasms were used for upscaling but currently have no planned use. Initially, they would have been used in a screen that compares the expression pattern of genes involved in salt stress among different varieties of grass pea.

Nastaran Tofangsazi: 1. The seeds I received from NPGS were used at the following research project "Herbivorous arthropods associated with *Taeniatherum caput-medusae* in California and host range testing of *Aculodes altamurgiensis*, a candidate for its biological control".

Christopher J. Borkent: Our only use in the past year was last week when we went to get 100 cuttings from three mission olive trees (pictures of labels attached). These will be rooted in our greenhouse and used as host plants for Olive Psyllids (*Euphyllura olivine*) in our rearing facility. *Olea Europa* WEO 59, 4, 5

Chris Smallwood: Planned use for seed obtained is to serve as crossing parents to incorporate disease resistance into dehydrator onion varieties. We planted the seed in 2018, and will harvest bulbs in 2019. The bulbs can then be planted in 2019, to serve as crossing parents in 2020.

Barry Silva: I plan to do some cross-breeding with other strawberry varieties. One of the Fairfax plants survived, grew and sent out 1 runner last season. This year both plants have fruit. I am just finishing the beds now and will receive the other varieties I plan to use next spring.

David Hansen: We received 3 packets of about 100 seeds each of alfalfa, clover and sainfoin. We planted the seeds between young citrus trees along the dripline watering the trees. This gives us a nitrogen-fixing ground cover while the trees are young. The trees are planted around the perimeter of our community garden here in Modesto. Unfortunately, the ground squirrels really prefer the clover and keep it very short.

Sukhi Pannu: To develop SSR markers for fingerprinting

Rose Iris Rehrig: The purpose was to screen the materials for geminivirus in Mexico field.

Sara Montanari: In 2018 I received the following material from the NCGR in Corvallis, OR:

1. Hardwood cuttings of ~60 *Pyrus* accessions: we attempted rooting of this hardwood cuttings, testing different protocols in the greenhouse
2. Seeds from six open pollinated *Pyrus* accessions: we tested different in vitro germination protocols and inoculation with *Armillaria mellea*

Both were pilot tests for future, larger experiments that have not led to a publication or a cultivar release yet.

Jeff Dahlberg: We utilized the germplasm in two research programs, one studying germplasm for responses to drought tolerance and increasing germplasm for use in 2019 and 2020 in further research on drought tolerance in sorghum.

Kurt Barrett: The planned use for the NPGS is grow out in green house and then evaluate if we can use for seed rice.

Kevin Schneider: we use the germplasm for R&D research in the lab,

Karine Prado: In the 1970s, scientists from our institute (Carnegie Institution for Science, Stanford, CA) studied *Tidestromia oblongifolia* in Death Valley, a C4 plant belonging to the Amaranth family that grows abundantly in one of the hottest natural environments on Earth. They discovered that it is highly adapted to high temperatures and has optimal photosynthetic rate at 47°C, which is comparable to crop plants in their most favorable conditions. The molecular basis of this remarkable thermo-adaptation of photosynthesis remains largely uninvestigated. To decipher the mechanisms of thermo-adaptation of *T. oblongifolia* at multiple scales, we have assembled an interdisciplinary team with expertise in ecophysiology, genomics, biochemistry and modeling of photosynthesis.

In November and December of 2018, we collected seeds and samples of *Tidestromia oblongifolia* in the Death Valley National Park. To enable the application of powerful new molecular tools to study this non-model organism, we established infrastructure and protocols for examining molecular acclimations to contrasting temperatures. Specifically, we have recreated Death Valley summer and winter conditions in custom-engineered high-temperature growth cabinets in our lab and started to grow the plants. We have also identified the closest relative of *Tidestromia* with a sequenced genome, *Amaranthus hypochondriacus*, and started to grow this species as a heat sensitive plant comparator. We have also established a collaboration that will enable sequencing of the

Tidestromia genome. We are currently comparing the photosynthetic performance between these species under summer and winter Death Valley conditions over time. These investigations will inform the critical timepoints for collecting samples to perform transcriptomics, proteomics, and biochemical analyses and identify phenotypic differences. We will use a quantitative model of photosynthesis currently being developed in our institute to quantitatively decompose the high-temperature limit of photosynthesis. We hope that these initial studies will create a solid foundation upon which to develop a comprehensive understanding of thermo-adaptation in plants in the context of climate change, which is critical and timely for global sustainability, food security and species conservation.

Polly Goldman: We are trying to find and/or breed a short-statured rye variety that produces well in our local environment (NW San Benito County, CA). We planted the seeds in November 2018 and are currently monitoring them for final height, noting as we go which ones have the lowest prevalence of negative traits (highly variable maturation times, high disease levels, lodging, etc.).

Joshua M Puckett: Virus Research -Propagation for maintenance as a positive control.

Jessica Audrey Lee: I am growing the soybean species that I obtained from the NPGS as host organisms for some plant-associated bacteria that I study. I am a microbial ecologist, interested in microbial adaptations to life on plant leaves.

Philipp Zerbe: Due to a delay in hiring new staff and student for the project associated with the received germplasm, we have not yet used this material, but plan to do so this year. The germplasm will be used for genomic and metabolomic analysis of these species to investigate the impact of plant secondary metabolic pathways and products in the response to drought stress. As all planned experiments will be conducted in green house facilities, we are not planning to release any of the received germplasm. However, should the experimental design change, we will inform you accordingly. Likewise, we will be happy to share any publications associated with the use of this material.

Please do not hesitate to contact me, should you require any additional information at this time.

Ryan Raes: I used this material to try and propagate for trials in extreme northern California. Specifically Siskiyou county's Scott Valley. Cold hardiness and other weather and animal pest factors are of interest.

Nir Sade: I am planning to test the material for stress tolerance response.

Johannes Scharwies: The NPGS germplasm received in 2018 is used for phenotyping of maize roots. The maize inbred lines B73 and Oh7B have been used for creating crosses with Pin1-YFP, DR5::RFP, and DII-YFP reporter lines in a B73 background to observe auxin distribution in maize root. I'm currently setting up a GWAS using the 282-diversity panel of maize lines provided by the NPGS to screen them for hydropatterning of the roots.

Sarah Cohen: Nothing was ever received. So, no to all 3.

Jay Ram: Use in trials to identify appropriate fruiting cultivars for introduction to the Coachella valley.

Chitose Nomura: 1, Evaluated in the California climate. 2, Use cross to improve California germplasm for commercial use.

Dorota Kawa: In 2018 we received from GRIN:

PI 656027 - SRN39 - Sorghum bicolor subsp. bicolor

This line is routinely used in our lab in a project studying root system architecture, root cellular anatomy and root transcriptome. Within PROMISE project (<https://promise.nioo.knaw.nl>) we investigate how above mentioned traits can be modulated by distinct soil microbiomes and how these changes translate to responses to infection with Striga hermontica. SRN39 line is resistant to Striga hermontica.

Luis Salazar: The planned use for the germplasm received is to evaluate the genetic variation in wild lettuce (*Lactuca serriola*) for salt tolerance. The goal of my research is to create hybrid populations of *L. serriola* and lettuce (*L. sativa*) to understand the genetic basis of salt tolerance in lettuce and to identify candidate genes associated with salt tolerance in lettuce.

Jared Zystro: In partnership with UC-Davis, we are increasing the lines of exPVP spring wheat and screening them for stripe rust resistance in Davis and at Tulelake. In 2020, we plan on conducting organic on-farm trials of promising lines. We are also planning on using some of the lines as parents in new breeding populations for organic systems.

Doug Heath: In 2018 I procured some accessions to test if they might have resistance to a breaking strain of a virus now occurring in limited range in the California valley. Unfortunately I have not been able to get my company to commit to a rather costly disease screen but I am continuing with the breeding anyway to make segregating populations ready just in case. I have also procured field space in an area of the valley that has had the highest incidence of this breaking strain in the past few years so I will attempt to see if I can run a successful field screen. Another option may be testing in an isolated screenhouse our company owns in Guatemala but we need to get approval for that.

Eileen Kabelka: Molecular marker development.

Damien Drouet: This material has only been used as reference / control varieties in our company and we didn't use them for breeding and or research purposes. They will be no release of material partially or fully derived from this material. (6 *Lactuca sativa* lines).

Jade Chu: Planned to crossbreed, but was not successful in establishing the cuttings.

Ivaylo Datchev: In 2018 Advanced Plant Nutrition LLC received a single runner of the "Pocahontas" strawberry variety, which was planted but soon after died. Thus, no further work was conducted with the material received from the National Plant Germplasm System.

David O'Donnell: We intend to multiply and characterize this material over a course of many years (in concert with our materials acquired prior to 2018). Our main goal is to identify within these accessions attributes that would be amenable for incorporation into our breeding programs. Thus far, we have not yet grown out/ used any such materials.

Ivan Simko: Phenomic studies.

Diana Swisher: We planted the seed to grow into a flowering plant for a botanical specimen for our herbarium and to be officially identified by a botanist. Once confirmed we take what bulk material is left and have it chemically fingerprinted along side other same species material on the commercial and wildcrafted market. We also use the live plant for botanical, microscopy, and macroscopy imagery for possible monograph publication. This data is filed internally towards possible monograph development and the AHP Verified Botanical Reference Material project. www.herbal-ahp.org for quality control standards.

Aaron Baltayian III: The fig cuttings that we recieved in 2018 have been rooted with 90% success rate and they are in 1Gallon nursery pots now ranging hight from 10 inches to 1.5 feet tall.

These plants are strictly for research purposes and will not be distributed around not sold.

When they reach early maturity (3 years of age) we will put them through test circulation for various tests for mainly sap density and evaluations for specific component concentrations in sap.

There is no publication so far for this group of starter plants.

Eric Lopresti: Continued studies of seed mucilage. I have also been screening a bunch of seeds for mucilage production; this is a pretty easy thing to do (though I am going slowly since it is just me). The results of this will not be in a paper, per se, as I am just trying to find new examples of plants with mucilaginous seeds, i.e. eventually I will report the positives (with accession numbers and confirmatory photographs of stained seed; attached is a *Salvia sclarea* PI 212326), but I also have the negatives. Would a full list of that be something that you would be interested in?

Chuck Fleck: Horticultural evaluation

Clare Casteel: To evaluate plant resistance to virus and aphids

Alyssa Ferris: Purifying promoters for use in cloning gene expression constructs.

Ariel Zajdband: Evaluate the effect of different cultivars on the soil microbiome.

Bryan Cameron: All germplasms were used for basic experimentation and were disposed of accordingly. None were released to the public and no articles were written or published.

C Chan: *Vasconcellea stipulata* seeds were ordered from the germplasm and germinated for breeding cold tolerant papayas including recreating the natural hybrid *Vasconcellea xheilbornii* (V.M. Badillo) V.M. Badillo 2000. Traits from *V. stipulata* that are desirable for breeding include size, flavor and PSRV-P resistance.

Angela Davis: As a control for multi-disease resistances.

Melvin Kadle: See scanned report

2. Did you release any plant material(s) to the public in 2018 that was partially or fully derived from any NPGS germplasm(s) that you received in 2018 or previously? If yes, please provide as much information as possible about the released plant material(s).

Kelly Gabrysch: no

Padma Sudarshana, Ph.D.: no

Pat McGuire: no

Nuri Benet-Pierce: no

Kate Rockenbach: We did not release and never plan to release any plant materials that are derived from the germplasm we received per this request.

Michael P Muessig: no

Menkir Tamrat: The plan for this trial involved 16 different durum wheat types from Ethiopia. The purpose is to document the response of the plants to only rain fed watering with no irrigation involved.

Clayton J Visger: no

Ellen Thompson: no

Dr. Roy Wiersma: no

Paul Ladeira: no

Nestor Kippes: No. I haven't release any material.

Allison Krill-Brown: no

Ryohei Hirose: no

Elizabeth Johnson: No, I have not released any of this material to the public yet. SLO Seed Exchange is an educational organization, so we are happy to share small amounts of seed with anyone interested in trying them. If one or all varieties are really excellent and have potential as a future commercial crop, a majority of seed from this year's trials will be saved for the next larger planting.

Hans-Karl Frautschi: As of yet no new varieties have been released

Louise M. (Marlene) Biller: . We have not released any plant material to the public.

Shyamal Talukder: no

Randi Jimenez: No materials were released.

Kristine Elvin Godfrey: None of this plant material was released to the public.

Yongliang Zhang: No, I did not release any materials to others.

Ayla Norris: no

Jenifer Bliss: no

Adam Steinbrenner: no

Eric Christopher Holmes: I did not release any plant materials to the public.

Celia Del Cid: In 2018 we sent callus cultures derived from a seedling of *Trigonella foenum-graecum* (PI 613629) to a customer.

Davide Sosso - Carnegie: We did not release any plant material to the public;

Olga Batalov: I have always ordered as a home gardener and, while I have not give out any of my 2018 order to the public (not yet anyway), I have given out extra rooted grape cuttings to friends and coworkers in the past. I always have too many of each variety and hate to see ones that take languish when they could have had happy homes elsewhere. I really appreciate the genetic diversity that is maintained and distributed by the USDA; this is a really important service that sadly the general public does not seem to appreciate enough, if they are even aware of its existence.

Jenny Mortimer: no

Carlos F. Quiros: None of the material was distributed to the public and no publications were produced based on this material.

Katherine Waselkov: We did not release any plant material to the public in 2018.

Barbara Alonso: no

Liz Robertson: no

Magi Richani: no

Seung Yon (Sue) Rhee: Non of the plant materials that were harvested have been released. Only seeds were

propagated and harvested.

Nastaran Tofangsazi: no

Christopher J. Borkent: We have not released any plant material to the public, or published any new papers that included germplasm material.

Chris Smallwood: No plant materials derived from these lines were released by us in 2018. Given the biennial nature of these Allium lines, the timeframe for cultivar development is several years out. Particularly since the seed acquired is not dehydrator type, it will take more generations of crossing to achieve the desired results.

Barry Silva: No material has been released nor will any be released in the future. This is a private experiment.

David Hansen: The Church of Jesus Christ of Latter-day Saints sponsors the garden. I manage the garden. None of the materials received from you will be release to the general public.

Sukhi Pannu: no

Rose Iris Rehrig: no

Jeff Dahlberg: no

Kurt Barrett: no

Kevin Schneider: we have not released any germplasm to the public or published any articles with the germplasm

Karine Prado: Carnegie Institution is housing the full set of seeds. We are growing plants from the seeds, and plants are destroyed after analysis. There is no release of material to public.

Polly Goldman: no

Joshua M Puckett: Successfully eliminated virus from DVIT 1118. Available to the public as FPS selection Pione 01.1

Jessica Audrey Lee: No, I have not released any such plant materials.

Ryan Raes: no

Nir Sade: no

Johannes Scharwies: No plant material has been released to the public in 2018 that was partially or fully derived from any NPGS germplasm.

Jay Ram: no

Chitose Nomura: no

Dorota Kawa: We did not release this line to public.

Luis Salazar: No plant material using the NPGS germplasm was publically released in 2018.

Jared Zystro: no

Eileen Kabelka: no

Jade Chu: no

David O'Donnell: no

Ivan Simko: No release.

Diana Swisher: We have not released any plant material to the public and it is not our intention to do so with the PNPGS seed growth. I must admit our grow trials are not always successful. But it is always good to know we can rely on NPGS for seed which allows us latitude to try again and continue any other botanical for research.

Eric Lopresti: no

Chuck Fleck: Released no material to the public

Clare Casteel: no

Alyssa Ferris: No, I did not release any plant material that includes NPGS germplasm in 2018.

Ariel Zajdband: no

C. Chan: no

Angela Davis: no

Melvin Kadle: No, the trial garden did not release an NPGP plant material last year to an one. All material was used at the trial garden site.

3. If you published an article in 2018 that includes NPGS germplasm that you received in 2018 or earlier, please provide the publication citation (authors, title, journal, etc.).

Kelly Gabrysch: no

Padma Sudarshana, Ph.D.: no

Pat McGuire: no

Nuri Benet-Pierce: Benet-Pierce, N. and M. G. Simpson. The taxonomy of *Chenopodium hians*, *C. incognitum*, and ten new taxa within the narrow-leaved *Chenopodium* with special attention to California. *Madroño* (In press, 2019).

Kate Rockenbach: We did not publish anything related to the materials requested.

Michael P Muessig: no

Menkir Tamrat: no

Clayton J Visger: My lab's involvement with hops has been temporarily put on hold while we focus on a separate, recently funded project.

Ellen Thompson: no publications

Dr. Roy Wiersma: no

Paul Ladeira: no

Nestor Kippes: We haven't published in a journal yet but we hope to do it soon. A poster at the PAGXXVI conference was presented: Using a Combination of Sequencing Methods for Improved De Novo Genome Assembly. Firl A, Kippes N, Dowd E, Comai L and Henry IM. Plant and Animal Genome XXVI Conference, January 13-17, 2018 San Diego, CA, USA.

Allison Krill-Brown: no

Ryohei Hirose: no

Elizabeth Johnson: no

Hans-Karl Frautsch: No publications on this project have been released.

Louise M. (Marlene) Biller: We have not published anything that includes this material yet.

Shyamal Talukder: Not applicable

Randi Jimenez: The publication is currently in the manuscript stage and will be published later this year.

Kristine Elvin Godfrey: No articles have been published on the research that is using the seedlings.

Yongliang Zhang: We have not yet published an article related to the NPGS germplasm.

Ayla Norris: No publications.

Jenifer Bliss: none

Adam Steinbrenner: not yet

Eric Christopher Holmes: Holmes, E. C.*; Chen, Y-C*; Sattely, E. S.; Mudgett, M.B. "Conservation of N-hydroxy-pipecolic acid-mediated systemic acquired resistance in crop plants" BioRxiv 2019 doi: <https://doi.org/10.1101/537597>.

Celia Del Cid: N/A

Davide Soso - Carnegie: We did not publish any article involving NPGS plant material.

Jenny Mortimer: Not yet (sorghum is slow!)

Jorge Dubcovsky: We published several papers that used NSGC germplasm

Mo, Y., L.S. Vanzetti, I. Hale3, E.J. Spagnolo, F. Guidobaldi, J. Al-Oboudi, N. Odle, S. Pearce, M. Helguera, J. Dubcovsky. 2018. Identification and characterization of Rht25, a locus on chromosome arm 6AS affecting wheat plant height, heading time, and spike development. *Theor Appl Genet* 131:2021-2035

Zhang, J., S.A. Gizaw, E. Bossolini, J. Hegarty, T. Howell, A.H. Carter, E. Akhunov, J. Dubcovsky. 2018. Identification and validation of QTL for grain yield and plant water status under contrasting water treatments in fall-sown spring wheats. *Theor Appl Genet*. 131: 1741-1759

Chen, S., W. Zhang, S. Bolus, M.N. Rouse, J. Dubcovsky. 2018. Identification and characterization of wheat stem rust resistance gene Sr21 effective against the Ug99 race group. *PLOS Genetics* 14: e1007287

Kippes, N., M. Guedira, L. Lin, G.L. Brown-Guedira and J. Dubcovsky. 2018. Single nucleotide polymorphisms in a regulatory site of VRN-A1 first intron are associated with differences in vernalization requirement in winter wheat. *Molecular Genetics and Genomics*. 293: 1231-124

Katherine Waselkov: . I did publish an article in 2018 including NPGS germplasm that I received several years ago: here is the citation.

Waselkov, K.E., A.S. Boleda, and K.M. Olsen. 2018. A phylogeny of the genus *Amaranthus* (Amaranthaceae) based on several low-copy nuclear loci and chloroplast regions. *Systematic Botany* 43: 439-458.

Barbara Alonso: no

Liz Robertson: no

Seung Yon (Sue) Rhee: No articles have been published.

Nastaran Tofangsazi: We are planning to repeat *Taeniatherum caput-medusae* survey in spring and summer 2019. We are hoping to submit our data for publication during fall 2019.

I will keep you posted when we publish our data.

Chris Smallwood: No publications were derived from this seed.

Barry Silva: There are no plans for any articles to be published.

Sukhi Pannu: no publication

Rose Iris Rehrig: no

Jeff Dahlberg: Spindel, J. E., J. Dahlberg, M. Colgan, J. Hollingsworth, J. Sievert, S. H. Staggenborg, R. Hutmacher, C. Jansson, and J. P. Vogel. 2018. Association mapping by aerial drone reveals 213 genetic associations for *Sorghum bicolor* biomass traits under drought. *BMC Genomics*, 19:679.
<https://doi.org/10.1186/s12864-018-5055-5>.

Kurt Barrett: no

Karine Prado: No article has been published yet. However, this work was presented as a poster at Stanford University's PhD candidate interview week in February 2019, an internal department talk called the Roundtable at Carnegie Institution in February 2019, and will be presented at the American Society of Plant Biologists conference in San Jose in August 2019. We are also seeking funding to pursue the investigations both internally and externally.

Joshua M Puckett: Not personally, Including our laboratory director Maher Al Rwahnih as he may have.

Jessica Audrey Lee: No, I have not published any articles using the NPGS germplasm, yet.

Ryan Raes: no

Nir Sade: no

Johannes Scharwies: No article has been published in 2018 that includes NPGS germplasm by myself.

Jay Ram: no

Chitose Nomura: no

Dorota Kawa: We did not publish any paper in 2018

Luis Salazar: No articles using the NPGS germplasm were published in 2018.

Jared Zystro: no

Eileen Kabelka: no

Ivan Simko: No publication.

Diana Swisher: We have not published on the seed material provided to us by NPGS.

Eric Lopresti: I have a paper in review right now that uses many of the accessions; the table of those is attached. I will send the citation when it gets published.

Chuck Fleck: Did not publish

Clare Casteel: Not yet.

Alyssa Ferris: No, I have not published an article that includes NPGS germplasm in 2018.

Ariel Zajdband: no

C Chan: no

Angela Davis: I did not publish last year.

Melvin Kadle: See scanned report.