

Annual Report for Calendar Year 2013

USDA-Agricultural Research Service
Plant Germplasm Introduction and Testing Research
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The Western Regional Plant Introduction Station welcomes Suksdorf's desert parsley (*Lomatium suksdorfii* (S. Watson) J.M. Coult. & Rose), one of the newest additions to the National Plant Germplasm System. This plant species, a member in the carrot family (Apiaceae) and native to the Pacific Northwest, is a part of Native American culture. It also has ecological importance to our natural environment and is known to have medicinal qualities (See cover story on Page 3; Photo of *L. suksdorfii* in bloom by Paul Slichter).

June 2014

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EXECUTIVE SUMMARY AND HIGHLIGHTS

The Western Regional Plant Introduction Station (WRPIS) is one of the four regional plant introduction stations in the United States. Activities at WRPIS focus on acquisition, preservation, evaluation, documentation and distribution of plant species assigned to the station and conducting research related to its primary mission. This station includes five curatorial programs, one DNA marker lab and three research programs (agronomy, plant pathology and genetics). The operation is primarily funded by two CRIS projects managed through the USDA-ARS Plant Germplasm Introduction and Testing Research Unit at Pullman, WA, and the National Temperate Forage Legume Genetic Resources Unit at Prosser, WA. The Regional Research Project (W-6) also contributes considerable (approximately 15% of the total) funding which covers the salary and fringe benefits of six full time state employees working in WRPIS, as well as partial cost of land, equipment and farm operations for germplasm regeneration, seed increase, evaluation and enhancement research. We achieve our goals through close collaboration among scientists in various disciplines such as agronomy, horticulture, plant pathology, genetics, plant physiology and botany. As part of a Regional Multi-State Project (W-6), we work in close association and collaboration with scientists of the State Agricultural Experiment Stations, other state and federal agencies, and the private sector. Our scientists are also actively collaborating with scientists in international centers, foreign universities and research institutes, as well as foreign companies. The global crop plant research community showed high interest in the WRPIS collection. In 2013, seed samples of 22,924 accessions, approximately a quarter of the WRPIS' total collection, were distributed in 38,022 packets to requesters residing in each of the 50 domestic states and 43 foreign countries. Satisfactory progress was made in the WRPIS's mission areas. Our scientists published 22 research papers in peer-reviewed journals; contributed to two book chapters; and presented 24 oral or poster presentations at various international, national and regional conferences.

The following are the 2013 highlights:

- On December 31, 2013, there were 94,642 plant accessions belonging to 1,308 genera, 4,802 species and 5,397 taxa in the WRPIS collection.
- We acquired 1,556 new accessions including 1,304 native plant accessions from the SOS (Seeds of Success) project.
- We distributed a total of 38,022 packets of seed samples to 1,220 requestors with addresses in each of the 50 domestic states and 43 foreign countries. Sixty percent (22,833 packets) were distributed to the U.S. and forty percent (15,189 packets) were distributed to foreign countries. Year 2013 was the third consecutive year in which WRPIS germplasm was distributed to all 50 US States. Approximately 38.5% (8,806 out of 22,833 packets) of the domestic distribution went to the 13 Western states.
- We uploaded 25,969 evaluation data points on 12,618 accessions into the Germplasm Resources Information Network (GRIN) database, which is accessible by researchers worldwide via the internet. These data points are on 106 established descriptors of 20 different crop species. Our collaborators contributed 48% and WRPIS staff collected 52% of the evaluation data.

- We entered 3,575 seed viability records into GRIN in 2013. The Pullman location tested 1,186 and the National Center for Genetic Resources Preservation (NCGRP), Fort Collins, CO tested 2,389 accessions.
- We packed and stored 1,280 newly regenerated/harvested inventories of a broad range of plant species. We determined the quantity of 20,124 inventories by weight.
- We shipped 2,174 seed inventories to the National Center for Genetic Resources Preservation (NCGRP), Fort Collins, Colorado and 2,875 inventories to the Svalbard Global Seed Vault, Svalbard, Norway for secured backup.
- We made good progress in improving the oil content and percentage of oleic fatty acids in winter hardy safflower to meet the need for the edible oil market. Segregating populations derived from crosses between high oil and high oleic acid lines and winter-type safflower germplasms were evaluated for cold tolerance under controlled conditions, and in the field. Seed from this screening was increased and fall planted for overwinter field evaluation in 2013-14. This project will identify useful new sources of cold tolerant safflower germplasm with a desired fatty acid profile.
- We formed a special collection of 298 lettuce pure-lines. Each of these lines was derived from a single plant that had been identified as homozygote at all 322 EST-derived SNP (single nucleotide polymorphism) loci. This collection included 53 romaine, 63 crisphead, 53 leaf, 122 butterhead, and 7 stem types. We published the result of a preliminary marker-trait association study and made the seeds available to the research community. This set has been distributed to requesters for uses in various research projects such as screening for lines with ability to germinate at a lower temperature in Washington and resistance to lettuce bacterial leaf spot, a devastating foliar disease in Florida.

Cover: The Western Regional Plant Introduction Station maintains many species which are included in the category of medicinals. Among these are 18 species of *Lomatium*, native plants important to the ecosystems of the Great Basin, the Pacific Northwest, and others. The habitat of *Lomatium suksdorfii*, pictured on the cover, is limited to Wasco, Hood River, and Klickitat Counties of the Columbia Gorge in Washington and Oregon, and is ranked as “Rare or Uncommon” in Washington and is federally listed as a species of concern. Six populations of *L. suksdorfii* were collected by our Plant Geneticist, Ted Kisha, with the help of volunteers from the Native Plant Society and with funds provided by the USDA Plant Collection Office. Suksdorfin, a compound isolated from the fruit of *L. suksdorfii* was found to have anti-HIV activity (Lee et al. 1994. *Bioorganic & Medicinal Chemistry* 2(10):1051-1056). This germplasm will be available to all eligible qualified scientists and organizations, both foreign and domestic, for research and breeding programs, and for investigation of its medicinal qualities.

REPORT

ADMINISTRATION

Jim Moyer/Michael Kahn (Administrative Advisor)

Ann Marie Thro (NIFA Representative)

Michael Fitzner (NIFA Representative)

Peter Bretting (ARS National Program Staff)

Andrew Hammond (ARS, PWA Area Director)

Jinguo Hu (Research Leader and Station Coordinator)

Carla Miles (Program Support Assistant, Started on September 1, 2013)

PERSONNEL

The sequestration had a significant impact on the operation of the station and caused a major change for the research and curatorial staff. The vacant position of the *Phaseolus* (common bean) Germplasm Collection Curator was forced to be abolished due to insufficient operation funds. A vacant term technician position in the DNA marker lab was also abolished. Plant Geneticist Theodore Kisha was reassigned to be the common bean germplasm curator starting September 1, 2013. Dr. Kisha has had experience in plant breeding and molecular biology but had never worked with *Phaseolus* before. Since he is supported by an experienced Agricultural Technician (Ms. Julie Thayer) funded through the W6 project, the collection of over 17,000 accessions is being adequately curated. The vacancy of the Program Support Assistant could not be filled until September when Ms. Carla Miles was transferred from another ARS research unit. All the duties of the vacant PSA were carried out by PSAs of other ARS Pullman units, staff at the ARS Pullman location office and various individuals of the ARS Western Business Supporting Center. The WRPIS staff truly appreciated the collaborative spirit of those who helped us out through the year. The list of the current WRPIS staff is shown on Page 19 (Appendix 1). Due to the labor-intensive nature of our operation we hired more than 40 part time helpers (mostly WSU students) for field, greenhouse and laboratory activities throughout the year.

On the State side, two Plant Technicians (one working in the seed cleaning lab and the other on Central Ferry farm) resigned from the positions. Fortunately, WSU was able to fill these two critical positions. Ms. Jacqueline Cruver, who went to work on the WSU Organic Farm, was replaced by Ms. Saber Jewell, who had been helping with our horticultural crop program as a student assistant for two years. Mr. Charles Cook went to a company after the busy season on the farm. WSU recruited Mr. Kyall Hagemeyer who started in spring 2014.

RESEARCH PROJECT

In January 2013, WRPIS scientists and curators submitted the final version of the new project plans for the two appropriated projects for the next five years (2013-2018), after a minor revision as requested by the OSQR (Office of Scientific Quality Review) panel.

Both project plans, entitled “Management of Plant Genetic Resources and Associated Information” and “Temperate Forage Legume Genetic Resource Management, Characterization, and Evaluation” for Pullman and Prosser, respectively, were certified in February 2013 and enacted in April 2013.

The NIFA Multi-State Research Project W-6 has been on a five-year cycle for project renewal and the current project entitled “Plant Genetic Resource Management, Preservation, Characterization and Utilization” will end in September 2014. In November, 2013, the office of the Western Association of Agricultural Experiment Station Directors instructed WRPIS to submit a proposal for a renewal for one-year only since the office is considering changing the funding mechanism for all the regional projects. A renewal proposal entitled “Management and Utilization of Plant Genetic Resources” was submitted in January. In April, 2014 WRPIS was notified that the proposal was funded for two years, from October 01, 2014 to September 30, 2016. After that it will be on the regular five-year cycle.

FUNDING

The implementation of FY13 budget sequestration resulted in a total ARS budget of \$2,529,920 for WRPIS with \$2,255,598 for Pullman, WA and \$274,322 for Prosser, WA. The discretionary dollar per SY dropped to only \$6,238. This situation forced us to reduce the work force by abolishing two vacant positions. The \$405,288 ‘in kind’ support from a NIFA Multi-State Research Project W-6, through Washington State University was also subjected to the roughly 8% sequestration (to \$382,632) in 2013. Projected discretionary funds per SY are \$28,284 for FY14 and \$25,458 for FY15 after reducing our work force.

Other research funds received in 2013 by our scientists totaled \$330,051 and included: 1) a research grant of \$156,401 from NIFA-BRAG for the proposal entitled “Industry-driven Field and Landscape Research on Pollen-mediated Gene Flow in Genetically Engineered Alfalfa” to Stephanie Greene, a postdoc research associate was hired to work on this project in Prosser, WA through WSU on a SCA; 2) \$125,000 of Reimbursable Agreement with Bureau of Land Management with Dr. Richard Johnson entitled “Management, Evaluation, Acquisition, and Distribution of Native Plant Germplasm for Research and Restoration”; 3) \$35,000 grant to Dr. Richard Johnson from US Forest Service to conduct a research project entitled “Conservation, Adaptation and Seed Zones for Key Great Basin Species”. The above two grants support one temporary full time (GS-11 supporting scientist), and one part time (GS-6 technician) employees, other temporary help, supplies and travel; 4) \$9,900 research grant to Dr. Clarice Coyne from the United States-Israel Binational Agricultural Research and Development (BARD) Fund to support a collaborative project entitled “Winter Chickpea; Towards a New Winter Pulse for the Semiarid Pacific Northwest and Wider Adaptation in the Mediterranean Basin”; and 5) \$3,750 from the Beet Sugar Development Foundation to Ms. Barbara Hellier in supporting Beta germplasm conservation and regeneration. In addition, WRPIS obtained \$29,087 from the Office of National Program through Dr. Peter Bretting to enhance capacity to maintain, regenerate, and evaluate priority germplasm accessions.

FACILITIES

There was no change in the WRPIS facilities during the year. There are 34,800 square feet of growth facilities (22,375 sq ft Federal, 12,425 sq ft Washington State University) and 157.3 acres of farm land (86.2 acres Federal, 71.1 acres WSU). WRPIS staff uses 12 laboratories (5 Federal, 7 WSU), and 22 offices (4 in Federal buildings, 6 in Federal mobile office building, 12 in WSU buildings). Good progress has been made in assembling a bubble greenhouse in Central Ferry. The frame was set up by the farm manager and the technician. We are working on contracting a certified electrician to do the wiring for lighting and temperature control of the greenhouse. The *Phaseolus* germplasm program will use it to regenerate/increase day-length sensitive accessions.

The WRPIS Seed Storage Building underwent a substantial retrofit with the available year-end money from ARS Headquarters and PWA Area Office. Although all the paper work for the procurement of service and goods was completed in September, 2013, WRPIS was instructed to hold on the project due to the government shutdown in early October. The retrofit project began on December 18, 2013 and was completed on February 13, 2014. The work included replacing an obsolete compressor providing cool air to the seed storage area, insulating the ceiling of the seed storage space and replacing the lighting system with an energy-efficient LED lighting system. The cold weather in January 2014 helped greatly in minimizing the effect of the retrofit operation which turned off the cooling system for two weeks. This building holds more than 94,000 accessions of seed samples of diverse plant species being maintained at 4° C (or 39° F) with ~30% relative humidity. We thank Headquarters and PWA Area Office for contributing necessary funds for this project. Special thanks go to Adam Salvadalena and Fred Gifford of WBSC, Travis Frost of the Pullman Location Office for their help in completing the necessary paper work and David Stout for his extra effort in communicating and coordinating with the WBSC, contractors, and WSU during the entire period of the project.

There is a critical need for the facility expansion in Central Ferry Research Farm to host the National Temperate Forage Legume Germplasm Resources Unit, which will be relocated from Prosser, WA to Pullman, WA. The purpose for this relocation is to protect the U.S. alfalfa germplasm collection from possible contamination of transgenes. In January 2011, USDA granted the genetically-engineered Roundup Ready alfalfa (RRA) the non-regulated status. The research project led by Dr. Stephanie Greene, Geneticist and Alfalfa Germplasm Curator, and funded by a grant from the Biotechnology Risk Assessment Grants Program of the National Institute of Food and Agriculture, assessed the transgene flow and found both pollen-mediated and seed-mediated movement of the transgene from RRA to roadside feral populations and to conventional alfalfa fields. The alfalfa collection is at risk since Prosser is surrounded by alfalfa fields of both hay and seed production. Central Ferry is isolated and far away from alfalfa production. Relocation of the program requires a greenhouse and a simple building with areas for necessary activities such as soil preparation, plant drying, threshing and seed cleaning, and areas for storing the cage frames and covers.

Expanding the seed storage space is still a non-funded plan. Our germplasm holdings continue to grow, being driven by the demand of our stakeholders and customers. Currently, the total number of accessions has surpassed 95,000. We have reached nearly the full capacity of our 4 °C seed storage facility, which was built and put in use in the

early 1980s. There will not be enough space for the accessions currently being regenerated on our farm next year. And we won't be able to add any new needed genetic resources to our collection for the user community. We wish to add approximately 1,000 square feet of -20 °C seed storage space with moveable shelves. The RL has discussed the need with PWA Area Office and the NP 301 Leader who conceptually supported the project. We entered this project into the Capital Projects and Repair Plan (CPRP) of the ARS Pullman location.

GERMPLASM MANAGEMENT

The diverse crop species assigned to WRPIS by the National Plant Germplasm System (NPGS) can be divided into roughly ten groups: 1) forage and turf grasses; 2) cool season food legumes (pea, lentil, chickpea, faba bean, lupine, etc.); 3) temperate forage legume crops (alfalfa, lotus and clover); 4) beans; 5) lettuce; 6) safflower; 7) garlic; wild onion and onion relatives; 8) sugar beet; 9) selected ornamentals; and 10) medicinal plant species. These ten groups of plant species are managed by five curatorial programs at WRPIS. Figure 1 shows the number of accessions for major crop groups maintained at WRPIS. In terms of number of accessions managed, WRPIS became number one in 2013 among the 28 sites of NPGS for both seed and clonal germplasm repositories (<http://www.ars-grin.gov/npgs/stats/sitesummary.html>). Currently, WRPIS holds approximately 16.7% of the total NPGS holdings of 554,909 accessions. Most WRPIS accessions are maintained as seed, with a small proportion (garlic and its relatives, rhubarb, and some other vegetables and ornamentals) that is vegetatively-propagated.

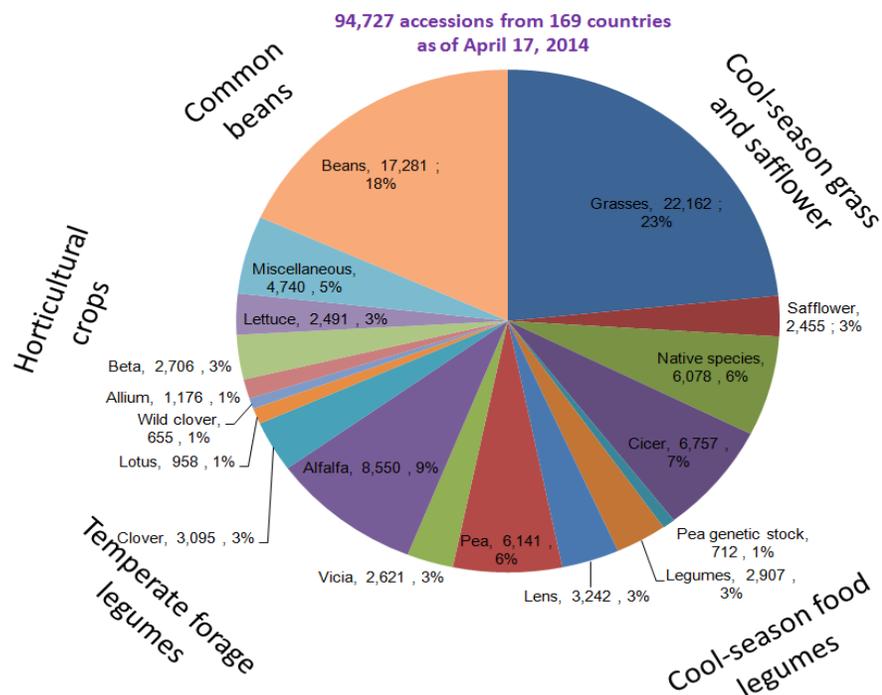


Figure 1. Number of accessions for major crop groups maintained by the five curatorial programs at WRPIS (as of April 17, 2014).

As of December 31, 2013, there were 94,642 accessions belonging to 1,308 genera, 4,802 species, and 5,397 taxa. The value of these collections continues to grow as international access to germplasm is increasingly limited by political and environmental factors. The Agronomy and Safflower Program (Vicki Bradley) manages 24,617 accessions of cool season turf and forage grasses, and safflower; the Cool Season Food Legume Program (Clarice Coyne) curates a total of 22,380 accessions of pea, chickpea, lentil, faba bean, and lupine; the *Phaseolus* Beans Program (Ted Kisha) manages a collection of 17,281 accessions, all belonging to the *Phaseolus* genus; the Temperate Forage Program (Stephanie Greene, located in Prosser, WA) manages the germplasm of alfalfa, clover, lotus, and wild clovers with a total of 13,258 accessions; and the Horticultural Crops Program (Barbara Hellier) takes care of 11,113 accessions of sugar beet, lettuce, garlic, and many miscellaneous species that have potential use for ornamental or medicinal purposes. In 2013, 1,304 new native plant accessions were added to the WRPIS collection, and brought the total native plant accession number to 6,078. Since 2006, nearly 3,300 seed distributions have been made for research projects including federal, state, U.S. commerce, and private cooperators for ecosystem restoration in the Great Basin. Distribution of native plant samples continued to increase in 2013 with substantially more orders from international and U.S. companies compared to previous years. These native species were generated or collected by the collaborative activities supported by grants from the BLM's Seeds of Success (SOS) project, the Great Basin Restoration Initiative, and the Forest Service to Richard Johnson (Research Agronomist). Many of these accessions are being transferred to existing NPGS curators for permanent management and distribution.

Germplasm Acquisition

During 2013 there were 1,556 new accessions added to our collection and most of the new accessions are native plant materials from the SOS project. At the end of the year the total number of accessions managed by WRPIS is 94,642 (Figure 2).

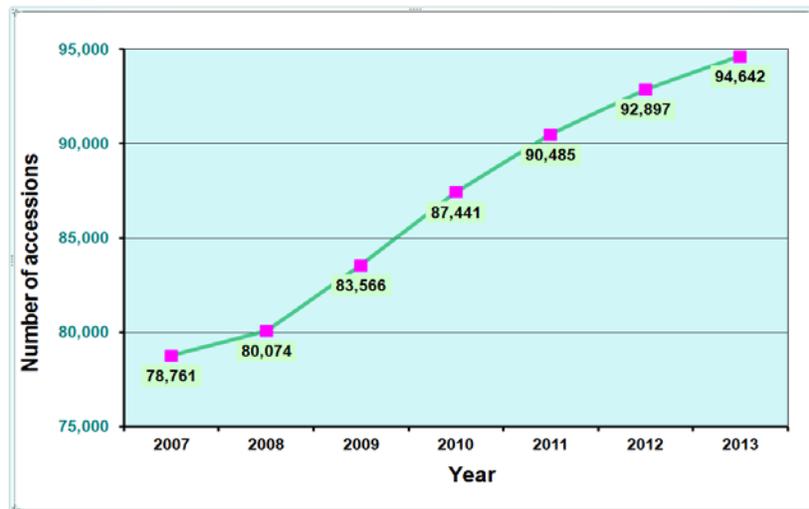


Figure 2. Changes of total number of accessions managed by WRPIS since 2007. The numbers were recorded at the end of each calendar year.

Germplasm conservation

In 2013, WRPIS curators regenerated 1,280 inventories by following our established, labor-intensive procedures and protocols for maintaining the genetic integrity and health of all germplasm collections. These included physical isolation, hand planting and transplanting, controlled hand and insect pollination, hand harvesting, cleaning and packaging for storage and distribution.

A total of 3,575 seed viability records were entered into the GRIN database. WRPIS tested 1,186 inventories, and NCGRP in Fort Collins, CO tested 2,389 inventories. Seed quantities of 20,124 inventories in our storage were updated by weighing and converting to number of seeds/inventory.

For security back-ups, we sent 2,174 inventories to NCGRP at Fort Collins, CO and 2,875 inventories to the Svalbard Global Seed Vault, Longyearbyen, Svalbard through the NCGRP during 2013.



Figure 3. Manually transplanting Lupin seedlings on the Pullman farm for seed increase or regeneration.

Germplasm evaluation and characterization

In 2013, a total of 25,969 observation data records were entered in GRIN on 12,618 accessions on 106 descriptors of 20 different crop species. Forty-eight percent of the data came from our cooperators, and fifty-two percent from WRPIS staff. Data records by crop in a descending order are as follows: 9,622 for *Phaseolus*, 4,297 for pea, 3,612 for chickpea, 2,716 for lettuce, 2,708 for lentil, 1,307 for sugar beet, 568 for alfalfa, 455 for

cool-season grasses, 4 for garlic, 177 for lupine, 163 for Vetch, 110 for safflower, 109 for medic, 59 for faba bean, 6 for *Lathyrus*, 4 for wild *Allium*, 3 for trefoil, 2 for pea genetic stocks, 1 for clover, and 46 for various W-6 miscellaneous species.

We have applied available DNA marker techniques to assess phylogenetic and genetic diversity of priority crop germplasm in our collection. Projects carried out in 2013 included target region amplification polymorphism (TRAP) genotyping *Lomatium suksdorfii*; *Eragrostis tef*, and several wild *lactuca* species. We also conducted an experiment of detecting the presence of virus in garlic by PCR.

Germplasm distribution

The annual distributed number of seed packets in the past seven years is shown in Figure 4. During the year 38,022 packets of 22,924 (24.2% of our total collection) accessions were distributed. This is the record high number of distributed sample packets by WRPIS in one year. Among the distributed packets, 22,833 (60%) were sent to addresses in the USA and 15,189 (40%) were sent to 43 foreign countries. There were 1,506 orders filled by 1220 different requestors. The most requested plant groups were grasses (12,592 packets), *Phaseolus* bean (5,425 packets), alfalfa (3,246 packets), and lettuce (2,100 packets).

Requestors in the 13 Western states received 8,806 items from the Pullman station (approximately 38.5% of its domestic distribution). These materials were used for research and education in diverse scientific disciplines and contributed significantly to scholastic and economic activity in the Western region.

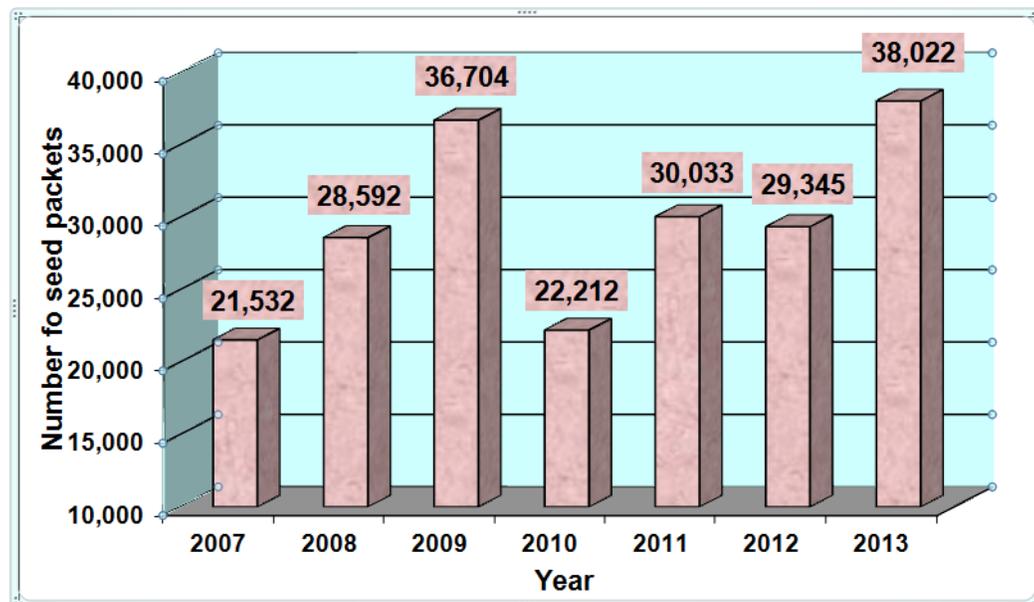


Figure 4. Number of seed packets distributed annually by WRPIS from Year 2007 to Year 2013.

Brief Summary of individual programs

1. Grasses and Safflower collections

A. We maintained 644 grass regeneration plots in the field including 336 planted in

- 2012 and 308 plots planted at Central Ferry and Pullman in 2013. Three hundred and thirty grass accessions were harvested from the first and second year grass nurseries in 2013. We acquired 142 new grass accessions this year, most of which were native species. Three hundred and eight images of *Eragrostis tef* were uploaded to GRIN and on-line research of the life form (annual/perennial) was completed for 123 grass taxa and uploaded to GRIN.
- B. We regenerated 18 at-risk safflower accessions that required special germination protocols and were transplanted into the field. One hundred and thirteen back-up samples of safflower were sent to the NCGRP. Forty eight images of *Carthamus oxyacanthus* were uploaded to GRIN, and an image gallery was started on the Safflower Genetic Resources Homepage that is managed by our unit.

2. Cool season food legumes

- A. Field regenerations of food legumes totaled 837 accessions and 18,166 characterization data on agronomic traits were collected and submitted on these accessions for entry into GRIN.
- B. The Cool Season Food Legume Curator cooperating with a team of French scientists on the genetic resistance to *Aphanomyces* root rot in pea resulted in publication of meta-QTL markers for use in marker-assisted breeding, allowing for precision in selecting lines with positive resistance alleles. The impact of these new tools will increase breeding efficiency for selecting superior progeny with improved resistance to the most damaging root rot disease of pea.
- C. The Cool Season Food Legume Curator cooperated with scientists at Washington State University, University of Saskatchewan, Cornell University and University of California to genotype the pea core, lentil core and mini-core collections using genic SNP markers. These populations will be useful for association mapping studies for important production traits as demonstrated in the chickpea core collection using TRAP markers where marker-trait associations were identified for quality traits.
- D. The Cool Season Food Legume Curator is cooperating with an international team of scientists on the investigation of the geographic distribution of alleles conferring resistance to pea seed-borne mosaic virus, which will assist in the curation of the pea germplasm. Also, this curator assisted in the development of user-friendly markers for Fusarium wilt race 1 resistance, providing pea breeders with new tools for more efficient cultivar selection.

3. Medicago, Trifolium and Lotus collections

- A. In 2013 we regenerated 52 Lotus, 116 Medicago and 82 Trifolium accessions. We received 200 new clover accessions from the International Livestock Research Center, Ethiopia. Noxious weed seed was identified in this germplasm and is currently being cleaned by hand at NGRU in Beltsville. We also received 50 new alfalfa landraces and crop wild relatives from Kazakhstan. This material was grown in the greenhouse and cuttings were taken during the winter to develop a set of clones that will be evaluated in the field in 2014.
- B. We scanned and uploaded into GRIN the images of flowers, stems and pods of 100 accessions. Most of our efforts in 2013 were focused on collecting data for our

Roundup Ready gene flow study and developing a seedling assay to quantify transgene presence.

- C. The Alfalfa Curator collaborated with an ARS breeder in Prosser, WA to identify and screen 200 accessions of potentially drought tolerant alfalfa accessions in the field and greenhouse. Two accessions appeared promising and evaluation data will be uploaded into GRIN. The Curator also collaborated with an ARS breeder in Madison, WI and with Pioneer Hybrid, and identified 200 old cultivars and landraces of alfalfa that had been collected in markets or donated by agricultural institutes in countries having a similar hardiness zone as Wisconsin. These accessions were evaluated at two locations and data will be placed in GRIN once evaluations are complete. Leaf sample surveys were conducted in alfalfa fields in May in Fresno Co, CA, Canyon Co, ID and tested to identify Round Up Ready (RRA) hay and seed fields. Working closely with seed companies and individual growers, we identified 64 RRA source and sink study fields that will allow us to test hypotheses regarding the movement of the transgene from RRA seed to conventional (CA) seed fields, RRA roadside plants to CA seed fields, and RRA hay fields to CA seed fields in our three study areas. Pollination surveys were conducted in June and seed samples were harvested from sink study fields in all three study areas.

4. Horticulture Crops Program and Greenhouse management

- A. In 2013 we regenerated/increased 398 accessions producing seed, cloves, and/or bulbs and 99 accessions were sent to NCGRP for back-up storage.
- B. We collaborated with Dr. Irwin Goldman on evaluating a major portion of the table beet collection. Descriptor data including images of plant and roots were collected in Madison, WI and Central Ferry, WA. These data will be loaded into GRIN.

5. Common beans

The *Phaseolus* Bean Germplasm Collection curator position was vacant since Dr. Welsh's retirement in September 2012 and was abolished when implementing the sequestration. The regular germplasm management activities such as regeneration, seed increase, characterization and distribution were carried out by an experienced Agricultural Technician with a minimal oversight by the research leader. A curator was reassigned to this position on October 1, 2013.

- A. During 2013, 396 accessions of *Phaseolus* beans were grown for regeneration in the greenhouses. Fourteen accessions were added to the collection. Fifteen thousand three hundred and twenty five (15,325) data points were uploaded into GRIN for the *Phaseolus* collection. The *Phaseolus* bean collection in WRPIS now has 17,291 accessions belonging to 58 taxa, collected from 110 countries. Approximately one-third of this large collection (5,425 accessions from 27 species/varieties) was distributed in 2013 to 17 different countries. The distribution number increased by 842 packets or 18% from the previous calendar year.
- B. A total of 10,365 plants from 216 accessions being regenerated in the greenhouse were tested for presence of the seed-borne Bean Common Mosaic Virus in 2013. Most of the accessions (211) were virus-free and the seeds harvested from them

were recorded as virus-free. For the remaining 5 virus-infected accessions, additional virus tests will be carried out in future regeneration cycles until sufficient numbers of virus-free plants are identified to produce virus-free seeds for each accession to preserve genetic diversity.

6. The DNA marker lab

The Plant Geneticist in charge of this lab was reassigned to be the *Phaseolus* Bean Germplasm Collection curator due to the abolishment of the vacant curator position. The job reassignment was approved in May and implemented on October 1, 2013.

- A. We characterized 384 *Lactuca* samples from the collection as well as those recently collected in Armenia to verify species classification and assess genetic diversity, using 50 TRAP marker loci.
- B. We began the trial screening for the presence of virus in garlic collection using polymerase chain reaction (PCR).
- C. We continued TRAP marker analysis (48 of 370 populations) of the *Eragrostis tef* collection using fixed primers designed against the genes coding for enzymes involved in the gibberellic acid (GA) pathway. Since GA affects plant height, the polymorphic markers generated would be potentially associated with lodging resistance, a desirable trait.
- D. We characterized 20 plants from each of 6 populations of *Lomatium suksdorfii* recently collected from the Columbia Gorge and added to the collection. Some fixed primers were designed against published sequences from the plants such as carrot in the Apiaceae family.

MISSION-RELATED RESEARCH

1. Agronomy

- A. The Research Agronomist continues to make good progress in improving the oil content and percentage of oleic fatty acids in winter hardy safflower to meet the need for the edible market. Segregating populations derived from crosses between high oil and high oleic acid lines and winter-type safflower germplasms were evaluated for cold tolerance under controlled conditions and in the field. Seed from this screening was increased and fall planted for overwinter field evaluation in 2013-14. Evaluation of winter safflower cooperative with Seed-Tec and Cal oils is ongoing along with cooperative work with Universidad Nacional del Sur, Bahia Blanca, Argentina. This project will identify useful new sources of cold tolerant safflower germplasm with desired fatty acid profile.
- B. The BLM Seeds of Success (SOS) project and the National Plant Germplasm System (NPGS) are partnering to collect, distribute, and evaluate key native plant materials needed for conservation and restoration. In 2013 more than 1500 new native plant accessions were added to the SOS-NPGS collection, which now totals more than 8,600 accessions. Since 2006, nearly 3,300 seed distributions have been made for research projects including federal, state, U.S. commerce, and private cooperators. Distributions continued to increase in 2013 with substantially more orders from international sources and U.S. commerce compared to the previous year.
- C. Genecological research was completed to assess genetic variation in potentially adaptive traits of Sandberg bluegrass (*Poa secunda* J. Presl.), a key restoration

grass in the intermountain western United States. Common garden experiments were established at two contrasting sites with two maternal parents from each of 130 wild collected populations along with nine cultivars used for restoration. Traits associated with plant size, phenology, leaf area, and leaf width varied considerably among populations and were correlated with seed sources climates. Populations from warmer, more arid source climates were smaller with earlier phenology and had relatively small, narrow leaves than those from climates with cooler summers, warmer winters, low seasonal temperature differentials, high precipitation, and lower aridity. As a group, cultivars generally did not differ in production capacity from wild collections. Genetic variation in growth and development traits across the landscape among native populations were linked with source climates indicating natural selection and adaptation that should be considered in choosing germplasm for restoration. The results were used to delineate seed transfer zones and population movement guidelines to ensure adapted, diverse plant materials for restoration projects.

2. Genetics

- A. We formed a special collection of 298 lettuce (*Lactuca sativa*. L.) pure-lines. Each of these lines was derived from a single plant that had been identified as homozygote at all 322 EST-derived SNP loci. This pure line collection included 53 romaine, 63 crisphead, 53 leaf, 122 butterhead and 7 stem types. The result of a preliminary marker-trait association study was published, and the seeds were made available to the research community. Research at Washington State University screened part of this set for ability to germinate at a lower temperature, with the purpose of extending the season by sowing earlier in the spring. A lettuce breeder at University of Florida screened part of this collection for resistance to lettuce bacterial leaf spot (BLS), a devastating foliar disease caused by *Xanthomonas campestris* pv. *vitians*. He identified one genotype that had much higher level of resistance than cultivar, 'Little Gem', a previously reported BLS resistant source.
- B. Our winter hardy faba bean germplasm enhancement project progressed well. The replicated field experiment with the previously identified winter-hardy materials continued by a Ph.D. candidate Erik Landry. Data of percent survival, time to flower, branching, height and yield were compiled and analyzed for the 2012-2013 growing season at Central Ferry and Pullman. Our Chinese collaborators submitted first year data on winter survival of the U.S. faba bean accessions in Kunming, China. Some winter-hardy accessions identified in Qingdao, China during the 2012-13 winter season were planted in Bingzhou, China for evaluating winter survival. The resulting data will be entered into the NPGS' GRIN database, which is accessible to everyone in the global research community.
- C. L-DOPA (L-3,4-dihydroxy phenylalanine) is the major ingredient of several prescription drugs used to treat Parkinson's disease (PD), the second most common neurodegenerative disorder. PD is characterized by the loss of muscle control, which causes trembling of the limbs and head as well as impaired balance. L-DOPA can cross the blood-brain barrier, where it is converted to dopamine, a monoamine neurotransmitter. We continued the investigation on the variation of L-DOPA concentration in the leaf and flower tissues of six faba bean accessions

with common and rare flower colors in 2013, using an ACQUITY UPLC in line with a Synapt G2 HDMS quadrupole time-of-flight mass spectrometer. Our results confirmed a high level of variation in L-DOPA concentration for leaf and flower tissues among six faba bean lines studied in two consecutive years (Figure 5). The average L-DOPA concentration based on dry weight (DW) in flowers ranged from 27.8 to 63.5 mg/g and 18.2 to 48.7 mg/g for leaf tissues.

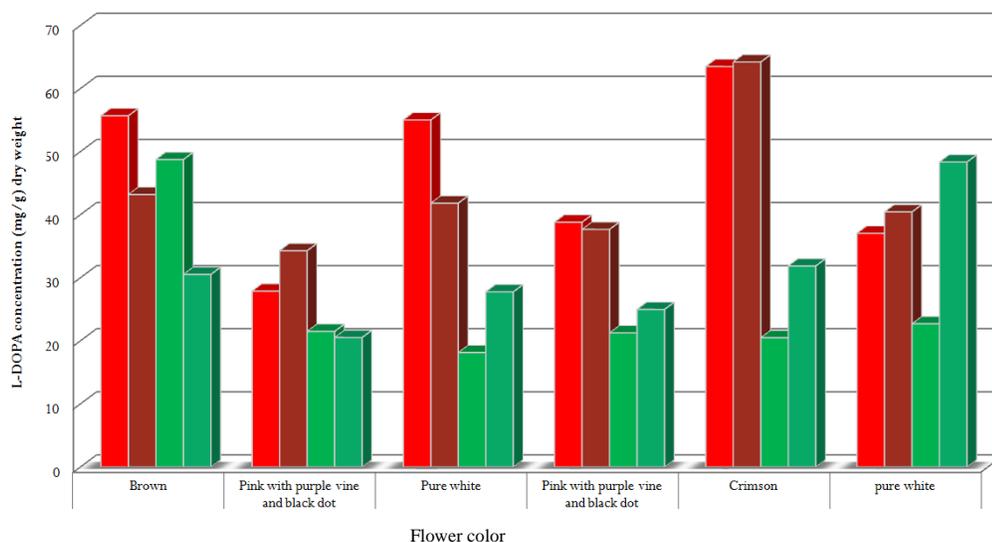


Figure 5. Variation of L-DOPA in the leaf and flower tissues of six faba bean accessions with different flower colors in two consecutive years (light red 2012 flower, dark red 2013 flower; light green 2012 leaf and dark green 2013 leaf).

There was no significant correlation between L-DOPA concentrations in flowers and leaves. The crimson flower line had the highest L-DOPA concentration (63.5 and 64.3 mg/g) in flowers for both years. The brown flower line had high average L-DOPA concentrations for flowers (55.7 mg/g) and leaves (48.7 mg/g) across both years compared to the other lines tested. It seems that the brown flower line is the most promising genetic resource for developing a functional food crop, as a potential natural remedy for improving the quality of life for the estimated seven to ten million PD patients worldwide.

3. Plant Pathology

- A. We completed experimental work for identification of four *Penicillium* species in series *Corymbifera* (*P. allii*, *P. hirsutum*, *P. tulipae* and *P. venetum*) plus *P. polonicum* and their pathogenicity and relative aggressiveness on crocus, daffodil, garlic, two varieties of table onion, one ornamental onion, gladiolus, grass lily, iris, and tulip. A manuscript is constructed. An analogous sequel is initiated for multiple *Penicillium* species outside series *Corymbifera* but also causing blue mold on ornamental or edible bulb crops. Abstracts for the former project and a related diagnostic project are published. The work on *Penicillium* is the most current for taxonomy and nomenclature of blue-mold fungi on bulbs in North America.

- B. We garnered the third consecutive year of data for relative susceptibility of numerous germplines of Great Basin wild rye to stripe rust (*Puccinia striiformis*). Pertinent germplasm is conserved and a manuscript is now accepted for publication.
- C. New host-fungus records were published for mycobiota of lupin, coreopsis, and oatgrass, and a new species of *Alternaria* described. We initiated a survey of seed-borne fungi in representative WRPIS accessions of safflower.

COMMITTEES, PRESENTATIONS AND RECOGNITIONS

During 2013 WRPIS scientists and curators served as committee members or chairs of the respective national Crop Germplasm Committees (CGC) and other academic or social organizations. Research Plant Pathologist **Frank Dugan** is adjunct faculty with WSU Department of Plant Pathology, and with College of Natural Resources, University of Idaho, is a member of the American Phytopathological Society (APS), a Senior Editor for APS Press, Past Chair of the APS Mycology Committee, a member of the APS Collections and Germplasm Committee, a member of the Mycological Society of America, the North American Mycological Association, and the Western Society of Weed Science. He also served as an Associate Editor for the journal North American Fungi. Research Agronomist **Richard Johnson** is Member of the Technical Advisory Committee for the Special Grant, Grass Seed Cropping Systems for Sustainable Agriculture, and active Ex-officio member of the Forage and Turf grass CGC. He also serves as a member of a graduate student committee of the Department of Crop and Soil Sciences, Washington State University and advised a MS student on a research project. Richard also worked with Art Weisker of Seed-Tec, CalOils, on selection of winter type safflower using our Central Ferry site over the 2011-12 winter and tested the breeding material resulted from crosses by Weisker using WRPIS winter type germplasm. Richard has year-round ongoing cooperative interactions with Luciano Pecetti, CRA (Center for Research and Production of Forage and Dairy), Lodi, Italy, concerning forage grass collection, research, and utilization, and with Clara Franchini, Luis Hernández and Ivone Lindström, University of the South, Argentina, on adaptation of safflower to Argentina, and sunflower seed development research. Supervisory Research Geneticist and Research Leader **Jinguo Hu** continued to serve as an Associate Editor for Crop Science. He serves as a member of a graduate student committee of the Department of Crop and Soil Sciences, Washington State University and is the technical advisor of a PhD student working on a cool season legume research project. Agronomy Curator **Vicki Bradley** is the Chair of the International Safflower Germplasm Committee, an Ex-officio member of Forage and Turf Grass CGC and New Crops CGC. She is also an Adjunct scientist with the Department of Crop and Soil Science at WSU, and serves as a member on one MS graduate student committee for the department. Vicki is a member of the Plant Germplasm Operations Committee, serving on the *in situ* and the Crop Wild Relatives subcommittees. She is a member of the ARS Pullman Location EEO and Outreach Committee, and is the editor for the Safflower Genetic Resources Homepage. She is a member of the Association for the Advancement of Industrial Crops and the American Society for Horticultural Science. Cool Season Food Legumes Curator **Clarice Coyne** is an Ex-officio member of the Food Legume CGC, Pea CGC, Clover and Special Purpose CGC, a member of the Plant Germplasm Operations Committee, and Molecular Marker PGO sub-committee. She serves on the Board of Directors for the North American

Pulse Improvement Association as Secretary. She also served as Leader of the Bioinformatics Committee of the Agronomy Society of America. Clare is adjunct faculty with WSU Department of Crop and Soil Sciences and is very active in supervising students and post doctoral associates. Temperate Forage Legume Curator **Stephanie Greene** is the Chair and Ex-officio of the Alfalfa CGC, and Ex-officio of the Clover and Special Purpose Legume CGC and a member of the Desert Legume Program (DELEP) Advisory Committee, Tucson, AZ, and the WSU Legume Variety Release Committee. She was invited to participate as a technical expert in the Technical Workshop “Towards the Establishment of a Global Network for *In Situ* Conservation and On-farm Management of Plant Genetic Resources for Food and Agriculture” at the FAO headquarters in Rome, Italy. She was also commissioned by the Global Crop Diversity Trust to lead an external review of the International Livestock Research Center Forage Gene bank. Horticulture Curator **Barbara Hellier** is an Ex-officio member of six CGCs (Root and Bulb, Leafy Vegetable, the Herbaceous Ornamental, New Crops, the Clover and Special Purpose Legume, and sugar beet) and a member of two PGOC subcommittees (Medicinal Plant and *In Situ* Conservation). *Phaseolus* Curator **Theodore Kisha** is a member of the American Society for Horticultural Science and a member of the "Center for Research on Invasive Species and Small Populations (CRISSP)" at the University of Idaho. He also serves as a volunteer in the Moscow Parks and Recreation Commission. By participating in the regular meetings and other activities of these organizations we effectively outreach and interact with our stakeholders, customers and general public.

WRPIS scientists and curators were actively engaged in conducting mission-related research and in serving the scientific community. They made a total of 24 oral or poster presentations at either scientific or general public meetings, contributed two book chapters, and published 22 peer reviewed scientific journal papers in 2013. They were invited to review research manuscripts by editors of the following scientific journals: Theoretical & Applied Genetics, BMC Genomics, Crop Science, Crop and Pasture Science, Ecological Restoration, European Journal of Plant Pathology, Genome, Industrial Oil Crops, Journal of Sugar Beet Research, Molecular Breeding, Phytopathology, Plant Breeding, Journal of Plant Registrations, Euphytica, Canadian Journal of Plant Science, Botanical Journal of the Linnean Society, Plant Genetic Resources, and African Journal of Agricultural Research.

SCIENTIFIC PAPERS PUBLISHED IN 2013

Peer reviewed journal articles (22):

- Alomran, M.M., S.L. Lupien, C.J. Coyne, and F.M. Dugan. 2013. Mycobiota of *Lupinus albus* seeds from a public germplasm collection. *North American Fungi* 8(4): 1-15.
- Borrelli, K., R.T. Koenig, B.M. Jaeckel, C.A. Miles. 2013. Yield of leafy greens in high tunnel winter production in the northwest United States. *HortSci.* 48:183-188.
- Buller, S. D. Inglis and C. Miles. 2013. Plant growth, fruit yield and quality, and tolerance to *Verticillium* wilt of grafted watermelon and tomato in field production in the Pacific Northwest. *HortSci.* 48:1003-1009.
- Dugan, F.M. 2013. *Golovinomyces spadiceus* causing powdery mildew on *Coreopsis* hybrid 'Full Moon' (Heliantheae, Asteraceae) in Washington State. *North American Fungi* 8(1): 1-3. doi:10.2509/naf2013.008.001.
- Dugan, F.M. 2013. Yeasts: What's in a name? A brief reconnaissance and sampling of literature. *FUNGI Magazine* 6(4): 45-46.
- Gao, J., M.M. Radwan, F. Leon, O.R. Dale, A.S. Husni, Y. Wu, S. Lupien, X. Wang, S.P. Manly, R.A. Hill, F.M. Dugan, H.G. Cutler, and S.J. Cutler. 2013. *Neocosmospora* sp.-derived resorcylic acid lactones with in vitro binding affinity for human opioid receptors and cannabinoid receptors. *Journal of Natural Products.* 76: 824-828.
- Gallinato, S., and C. Miles. 2013. Economic profitability of growing lettuce and tomato in western Washington under high tunnel and open-field production systems. *HortTech.* 23:453-461.
- Hamon, C., C.J. Coyne, R.J. McGee, A. Lesné, R. Esnault, P. Mangin, M. Hervé, I. Le Goff, G. Deniot, M. Roux-Duparque, G. Morin, K.E. McPhee, R. Delourme, A. Baranger, M.-L. Pilet-Nayel. 2013. QTL meta-analysis provides a comprehensive view of the moderately low diversity of loci controlling partial resistance to *Aphanomyces euteiches* in four pea sources of resistance. *BMC Plant Biology* 13(1):45.
- Johnson, R.C. and M. Evans. 2013. Comparative growth and development of hexaploid and tetraploid Reed Canarygrass. *Crop Science.* doi: 10.2135/cropsci2013.07.0430.
- Johnson, R.C., B.C. Hellier, and K. W. Vance-Borland. 2013. Genecology and seed zones for tapertip onion in the US Great Basin. *Botany.* 91:686-694.
- Johnson, S., D.A. Inglis, and C. Miles. 2013. Grafting effects on eggplant growth, yield and verticillium wilt incidence. *Intl. J. Veg. Sci.* doi:10.1080/1915269.2012.751473.
- Johnson, S., C. Miles, and D.A. Inglis. 2013. First report of *Verticillium* wilt caused by *V. dahliae* on grafted *Solanum aethiopicum* in Washington. *Plant Dis.* 97:840.
- Khoury, C., S.L. Greene, J.H. Wiersema, N. Maxted, A. Jarvis, P.C. Struik. 2013. An inventory of crop wild relatives of the United States. *Crop Science.* 53:1496-1508.
- Kwon, S.J., I. Simko, B. Hellier, B.Q. Mou, J. Hu. 2013. Genome-wide association of 10 horticultural traits with expressed sequence tag-derived SNP markers in a collection of lettuce lines. *The Crop Journal.* 1:25-33.

- Kwon, S.J., P. Smykal, J. Hu, M. Wang, S.J. Kim, R.J. McGee, K. McPhee and C.J. Coyne. 2013. User-friendly markers linked to fusarium wilt race 1 resistance gene in pea for marker assisted selection. *Plant Breeding*. 132:642–648.
- Lawrence, D.J., P.B. Gannibal, F.M. Dugan, and B.M. Pryor. 2013. Characterization of *Alternaria* isolates from the infectoria species-group and a new taxon from *Arrhenatherum*, *Pseudoalternaria arrhenatheria* sp. nov. *Mycological Progress* published online 22 June DOI 10.1007/s11557-013-0910-x.
- Lupien, S.L., B.C. Hellier, F.M. Dugan, L.G. Skoglund, and K.F. Ward. 2013. White rot of garlic and onion (causal agent, *Sclerotium cepivorum*): A status report from the Pacific Northwest. *Plant Health Progress* doi:10.1094/PHP-2013-0619-01-RV.
- Ma, Y., S.Y. Bao, T. Yang¹, J. Hu, J.P. Guan, Y.H. He, X.J. Wang, Y.L. Wan, X.L. Sun, J.Y. Jiang, C.X. Gong, X.X. Zong. 2013. Genetic linkage map of Chinese native variety faba bean (*Vicia faba* L.) based on simple sequence repeat markers. *Plant Breeding*. 132: 397–400.
- Powell, M., Gundersen, B., Miles, C., Coats, K., and Inglis, D. A. 2013. First report of *Verticillium* wilt on lettuce (*Lactuca sativa* L.) in Washington caused by *V. tricorpus* I. *Plant Dis*. 97:996. doi.org/10.1094/PDIS-12-12-1166-PDN.
- Richardson, K. L., B.H. Hellier, (2013) Wild/weed Beta populations in the Imperial Valley, California. *Journal of Sugar Beet Research*. 50:55-56.
- Sen Gupta, D., D. Thavarajah, P. Knutson, P. Thavarajah, R. McGee, C. Coyne, S. Kumar. 2013. Lentils (*Lens culinaris* L.), a rich source of folates. *Journal of Agricultural and Food Chemistry*. 61:7794–7799.
- St. Clair, J. Bradley, F. F. Kilkenny, R. C. Johnson, N. L. Shaw, and G. Weaver. 2013. Genetic variation in adaptive traits and seed transfer zones for *Pseudoroegneria spicata* (bluebunch wheatgrass) in the northwestern United States. *Evolutionary Applications* 6:933-948.

Book chapters (2):

- Coyne C.J., R.J. McGee. 2013. Lentil, Chapter 7. In: M. Singh and I.S. Bisht, editors, “Genetic and Genomic Resources for Grain Legume Improvement.” Elsevier Insights, London. Pp. 157-180.
- Smykal, P., C.J. Coyne, R. Redden, N. Maxted. 2013. Peas. Chapter 3. In: M. Singh and I.S. Bisht, editors, “Genetic and Genomic Resources for Grain Legume Improvement.” Elsevier Insights, London. Pp. 41-80.

Appendix 1

Western Regional Plant Introduction Station Current Staffing List as of December 31, 2013

Position	Name	Federal or State	Position type
Pullman			
Research Leader/Station Coordinator	Jinguo Hu	Fed	PFT
Program Support Assistant	Carla Miles	Fed	PFT
IT Specialist	Gwen Pentecost	Fed	PFT
Biological Science Technician	Lisa Taylor	Fed	PFT
Seed Manager/Computer Specialist	Dave Stout	Fed	PFT
Plant Technician	Paula Moore	Sta	PFT
Farm Manager, Pullman	Wayne Olson	Sta	PFT
Plant Technician	Saber Jewell	Sta	PFT
Plant Technician	Sean Vail	Sta	PFT
Farm Manager, Central Ferry	Kurt Tetrick	Fed	PFT
Plant Technician	Kyall Hagemeyer	Sta	PFT
Research Plant Pathologist	Frank Dugan	Fed	PFT
Biological Science Technician	Shari Lupien	Fed	PFT
Research Agronomist	Richard Johnson	Fed	PFT
Biological Science Technician	Melissa Scholten	Fed	TFT
Plant Biologist	Michael Cashman	Fed	TFT
Agronomy Curator	Vicki Bradley	Fed	PFT
Biological Science Technician	Bob Guenther	Fed	PFT
Cool Season Food Legume Curator	Clarice Coyne	Fed	PFT
Biological Science Technician	Landon Charlo	Fed	PFT
Horticultural Crops Curator	Barbara Hellier	Fed	PFT
Biological Science Technician	William Luna	Fed	PFT
Biological Science Technician	Alex Cornwall	Fed	TFT
Biological Science Technician	Marie Pavelka	Fed	PFT
Phaseolus Curator	Theodore Kisha	Fed	PFT
Plant Technician	Julie Thayer	Sta	PFT
Prosser			
Forage Legume Curator	Stephanie Greene	Fed	PFT
Biological Science Technician	Martha Cervantes	Fed	PFT
Biological Science Technician	Jesus Prieto	Fed	TPT

Appendix 2

Research, Service and Outreach Activities

- January 3, Barbara Hellier provided information to a stakeholder regarding the leek collection and Allium tissue culture.
- January 9, 2013, Ted Kisha attended seminar by Dr. John Vogel: "Developing and using the genus *Brachypodium* as a model for the grasses: genomics, phenomics and beyond."
- January 9, Barbara Hellier completed FY 2013 USDA Information Security Awareness training.
- January 11, Ted Kisha attended seminar by Dr. Liming Xiong: "Genetic and genomic analysis of plant drought tolerance."
- January 12 – July 31, Vicki Bradley hosted a visiting scholar from Mexico- Ms. Xochilt Ochoa.
- January 12-16, Clare Coyne co-organized Genomics of Genebanks Workshop at the 2013 International Plant and Animal Genome meeting.
- January 12-16, Jinguo Hu participated in the 2013 International Plant and Animal Genome Conference and co-organized the Plant Molecular Breeding Workshop, and presented a poster entitled "Genome-wide marker-trait association among ten horticultural traits and 322 SNP markers in a special collection of 298 homozygous cultivated lettuce lines", San Diego, CA.
- January 14, Barbara Hellier attended WSU Land Use committee meeting.
- January 15, William Luna conducted Dramm sprayer training for PI employees.
- January 16, Ted Kisha represented WRPIS at the quarterly meeting of the Location Environmental Management System.
- January 16, William Luna attended a USDA-ARS Health and Safety Committee meeting.
- January 17, William Luna attended Wilbur Ellis Professional Markets Technical Seminar, Spokane, WA.
- January 18, Ted Kisha attended seminar by Dr. Thorsten Knappenberger: "R" a Programming and Statistical Analysis Tool."
- January 23, Frank Dugan met with USDA-APHIS inspector, George Bruno, for close-out on PPQ permits.
- January 28, Marie Pavelka completed USDA Information Security Awareness Training.
- January 28, Stephanie Greene gave an invited talk entitled "Safeguarding Our Seed: From Gene Banks to the Doomsday Seed Vault" at the 2013 Winter Seed School, Western Alfalfa Seed Growers Conference, Reno, NV.
- January 29, Frank Dugan attended Technology Transfer (USDA-ARS) presentation, Pullman WA.
- January 29, Ted Kisha and Vicki Bradley participated in webinar "Technology Transfer Training, The ARS Technology Transfer Program."
- January 30, Alex Cornwall completed USDA information Security Awareness Training.
- January 31, Clare Coyne presentation to the USA Dry Pea and Lentil Council Research Review committee.
- January 31, Vicki Bradley talked to Victoria Chadwick, Master's student at Regent's College in London regarding a marketing plan for the export of *Eragrostis tef* from Ethiopia to Europe.

February 2, Frank Dugan presented the WRPIS Plant Pathology Activities to WRPIS Food & Fact Fest, Pullman WA.

February 5, Stephanie Greene presented a talk at the Washington Alfalfa Seed Growers Meeting, Prosser, WA.

February 6, William Luna attended the Spokane Ag Expo. Spokane, WA.

February 7, Barbara Hellier provided a stakeholder with information regarding the rhubarb collection.

February 7-9, Jinguo Hu attended the Organicology Conference, Portland, OR.

February 12, Ted Kisha prepared seed of *Lomatium suksdorfii* collected in 2012 for stratification and germination.

February 13, William Luna attended a USDA-ARS Health and Safety Committee meeting.

February 14, William Luna attended a job recruitment fair at Moscow High School. Moscow, ID.

February 21, The Unit's annual Food and Fact Fest was held and a representative from each program presented a summary of the year's work and future plans.

February 22, Stephanie Greene gave an invited talk entitled "GMOs... to eat or not to eat?" for the Food for Thought Series, Northwest Regional Food Hub, Richland WA.

February 25 & 26, Bob Guenther attended pesticide license recertification classes.

February 25, Barbara Hellier met with Dr Andy Sander, UC Riverside Herbarium director. Discussed proposed collecting trip for Beta in California. Riverside, CA.

February 25, Vicki Bradley advised a farmer in California how to get *Eragrostis tef* seed inspected at the APHIS PPQ National Plant Germplasm Inspection Station.

February 25-26, William Luna attended Washington State Department of Ag. Pesticide license re-certification training. Pullman, WA.

February 26, Barbara Hellier attended ARS Program Review/industry listening session for sugarbeet. Anaheim, CA.

February 27, Barbara Hellier attended the Sugarbeet CGC meeting and gave a Beta collection status report. Anaheim, CA.

February 27, Jinguo Hu attended the Sugarbeet CGC meeting and the American Sugarbeet Technologist Biennial Meeting. Anaheim, CA.

February 28, Ted Kisha attended a seminar by Karen Trebitz: "Camas: The Plant That Fed Nations – A study of the historical use and cultural value of camas to Inland Northwest Indians, its destruction by settlers, and some efforts in restoration", and discussed possible collaborative research with members of the Nez Perce Tribe.

March 1-2, Frank Dugan participated in the APS Press Editorial Board (American Phytopathological Society), APS Headquarters, Minneapolis MN.

March 4, Barbara Hellier attended WSU Land Use committee meeting.

March 5 William Luna attended a WSU Safety Committee meeting.

March 5, Barbara Hellier provided information to a stakeholder regarding the rhubarb collection.

March 7, Stephanie Greene judged at the Mid- Columbia Science Fair, Kennewick, WA.

March 8, Ted Kisha screened applicants for the 2013 Research Experience for Undergraduates (REU) program in conjunction with the University of Idaho Center for Research on Invasive Species and Small Populations (CRISSP).

March 14, Ted Kisha gave a presentation at Big Bend Community College on research at Washington State University and the ARS to potential applicants for the Washington “Upward Bound” summer internship program.

March 19, Frank Dugan participated in the Pacific West Area Research Leader/Center Director Telephone Conference (Frank via Pullman connection).

March 19, Jinguo Hu attended the California Leafy Greens Research Annual Meeting in Coalinga, CA.

March 20, Jinguo Hu visited Professors Dan Parfitt and Roger Chetelat at UC Davis.

March 20, Vicki Bradley participated in a PGOOC webinar.

March 21, Frank Dugan attended the Washington State University Department of Plant Pathology Faculty Meeting.

March 24, Barbara Hellier completed Ethics:Government Purchase Card, Sustainable Acquisition and AbilityOne Program training.

March 25, Ted Kisha participated in the graduate committee meeting for Ph.D. student Susanne Canwell, Dissertation on *Phalaris arundinacea*.

March 26, RC Johnson presented "Ecological genetics and seed zones: home on the range," Intermountain Native Plant Summit, Boise, ID.

March 26, Ted Kisha attended the annual Women's Recognition and Symposium at Washington State University.

March 28, Vicki Bradley, Jinguo Hu, Ted Kisha, Gwen Pentecost, and Melissa Scholten were judges at the Jefferson Elementary Science and Technology Fair in Pullman, Washington.

March 29, Ted Kisha attended the Washington State University Academic Showcase.

April 9, William Luna attended a WSU Safety Committee meeting.

April 10, RC Johnson served on panel for workshop "Restoration practitioner tools" at the National Native Seed Conference, Santa Fe, NM.

April 11, RC Johnson presented “Genecology for seed zones: Problems and solutions”, at the National Native Seed Conference in Santa Fe, New Mexico.

April 15, RC Johnson advised Jason Stettler, Utah Division of Wildlife, on developing Indian ricegrass populations using our seed zones.

April 23, Ted Kisha represented WRPIS at the quarterly meeting of the Location Environmental Management System.

April 29, RC Johnson advised Alberto Boldt, Universidade Federal de Viçosa (UFV), Brazil, concerning Safflower evaluation data in GRIN.

May 2, RC Johnson interviewed by Virginia Gewin, reporter working on wild crop relatives and SOS collection.

May 05 - 10, Stephanie Greene surveyed Fresno County for Round Up ready hay and seed fields.

May 5, RC Johnson advised Lou Armentano concerning use of high oleic safflower for dairy feeding trials.

May 6-7, Jinguo Hu visited the French Agricultural research Station in Dijon, France.

May 7, William Luna attended a WSU Safety Committee meeting.

May 8-9, Jinguo Hu attended the First Legume Society Conference and presented a poster entitled “US-China collaboration on evaluation of pea and faba bean germplasm.” Novi Sad, Serbia.

May 13-July 12, Clare Coyne hosted visiting scientist Debiyoti Sen Gupta from North Dakota State University.

May 14, Ted Kisha met with Cort Anderson of the University of Idaho to discuss analysis of the rare species *Lepidium papilliferum* collected in Southern Idaho.

May 14, William Luna attended a USDA-ARS Health and Safety Committee meeting.

May 16, Ted Kisha attended the Inland Northwest Genomics Symposium at the University of Idaho.

May 19 - 23, Stephanie Greene surveyed Canyon for Round Up ready hay and seed fields.

May 21, Ted Kisha met with representatives of the Upward Bound program and the summer interns for orientation and a tour of the genetics lab.

May 22, Ted Kisha attended a webinar on JMP Genomics software.

May 30, Ted Kisha participated in a teleconference hosted by Oregon State University on the future of Plant Breeding and Genetics.

June 2- 29, Ted Kisha and Sumiko Maristany, a REU student working in WRPIS during the summer, collected leaf tissue from populations of *Lomatium suksdorfii* in the Columbia Gorge for molecular diversity analysis.

June 7, RC Johnson book reviewed for Economic Botany “Safflower in California: The Paulden F. Knowles personal history of plant exploration and research on evolution, genetic, and breeding.

June 7, Vicki Bradley provided requirements for importing *Phalaris aundinacea* seed for RC Johnson’s exploration proposal.

June 10 - August 9, Ted Kisha mentored a REU Intern sponsored by an NSF grant with the CRISSP Program of the University of Idaho.

June 14, Stephanie Greene presented an oral progress report at the NIFA BRAG Project Director Meeting, Riverdale, MD.

June 17, Stephanie Greene attended Crop Wild Relative meeting with Ned Garvey, Karen Williams, John Wiersema (USDA NGRL), Colin Khoury (CIAT) and Ken Strietch (US Forest Service), Beltsville, MD.

June 18, Frank Dugan participated in the W6 Teleconference (Frank via Pullman connection).

June 18, Jinguo Hu organized and participated in the W6 Teleconference via Pullman connection.

June 18, Ted Kisha attended the W6 TAC annual teleconference.

June 19, Stephanie Greene attended the Washington Alfalfa Seed Growers Annual Field Day, and identified collaborators for NIFA BRAG project, Touche, Washington

June 19, Vicki Bradley and Ted Kisha participated in a PGOE webinar.

June 20, RC Johnson review for Crop Science “The history of reed canarygrass in North America: Persistence of natives among invading Eurasian populations” 2013.

June 20, Vicki Bradley provided grass head samples to Qian Zhou, a WSU graduate student studying grass pollen as an air pollutant.

June 20-July 19, Clare Coyne hosted visiting scientist Dr. Faruk Toklu, Cukurova University, Turkey.

June 25, Barbara Hellier gave Dr. Chris Crammer, onion breeder New Mexico State University, a tour of WRPIS facilities and nurseries.

June 26, Barbara Hellier gave information regarding the *Taraxacum kok-saghyz* collecting mission to a stakeholder.

July 9, Vicki Bradley completed GRIN Global pre-training.

July 9, Vicki Bradley wrote a crop curator statement for Dr. Patrick McGuire, UC Davis, to collect wild wheatgrass relatives in France and Italy.

July 10, 17, 24, 31, Vicki Bradley complete sessions of Grin Global training webinars.

July 10, Barbara Hellier completed USDA travel card training.

July 11, Frank Dugan met with visiting students from Eastern Washington University, guests of Washington State University Department of Plant Pathology.

July 11, RC Johnson hosted visit of Paul Krabacker, BLM National Seed Coordinator, Boise ID, concerning program activates and developing native seed sources.

July 11-July 18, Clare Coyne participated in a breeding for disease resistance in legumes workshop, invited to present, Urumqi, China.

July 11-July 18, Jinguo Hu was invited to participate in a breeding for disease resistance in legumes workshop, Beijing and Urumqi, China.

July 12, Barbara Hellier attended by phone the Herbaceous Ornamental CGC meeting.

July 13, William Luna conducted Washington State Worker Protection Safety training class for 6 time-slip employees.

July 14, RC Johnson Germplasm collection for reciprocal transplant study with Bluebunch Wheatgrass for USFS Researchers Brad St.Clair and Francis Kilkinney.

July 17, Frank Dugan hosted lunch for Tom Gordon, guest of Washington State University Department of Plant Pathology.

July 17, Ted Kisha represented WRPIS at the quarterly meeting of the Location Environmental Management System.

July 21-24, Barbara Hellier attended the American Society for Horticultural Science conference. Palm Desert, CA.

July 21-24, Jinguo Hu participated in the American Society for Horticultural Science conference, and presented an oral presentation entitled “Horticultural trait-SNP marker association study in a collection of lettuce (*Lactuca sativa* L.) lines”; He also attended the Leafy Vegetable CGC meeting and the Root and Bulb CGC meeting. Palm Desert, CA.

July 22, Barbara Hellier attended the Leafy Vegetable CGC meeting and presented a collection status report. Palm Desert, CA.

July 23, Ted Kisha participated in a conference call with the Samuel Noble Foundation regarding the analysis of the Medicago germplasm from the Former Soviet Union.

July 24, Barbara Hellier attended the Root and Bulb CGC meeting and presented a collection status report. Palm Desert, CA.

July 24, Clare Coyne hosted visiting scientist Professor Shahal Abbo, The Hebrew University of Jerusalem, Israel.

July 24, Frank Dugan met with Shahal Abbo, of Faculty of Agriculture, Food and Environment, Hebrew University of Jerusalem, visiting Washington State University Department of Plant Pathology.

July 30, Barbara Hellier provided a stakeholder with information regarding garlic storage and cleaning.

August 1 Vicki Bradley met with Dr. Michael Neff, Department of Crop and Soil Sciences, WSU, and his technician Pushpa Sharma Koirala to discuss using our *Poa pratensis* collection to identify differences in germination times of accessions for use in a breeding program.

August 4 - 10, Stephanie Greene harvested alfalfa seed in Fresno County, CA.

August 8, Barbara Hellier attended GRIN-Global webinar training.

August 8, RC Johnson provided statistical design advise for Paula Moore’s master research project concerning germplasm protocol for native grasses.

August 9, RC Johnson reviewed “Notice of release of Antelope Creek and Pleasant Valley Germplasm of Bottlebrush Squirreltail” and “A nomenclatural guide and simplified key to the squirreltail taxa”.

August 12, Ted Kisha completed the GRIN Global pre-training.

August 13, 15, 21, 22, 27, 29, Ted Kisha completed sessions of GRIN Global training.

August 13, Stephanie Greene received 50 new accessions of alfalfa crop wild relatives from the Kazakhstan Agricultural University, Alma Aty, Kazakhstan.

August 15, Barbara Hellier attended GRIN-Global webinar training.

August 19-21, Jinguo Hu participated in the International Functional Food Conference and presented an oral presentation entitled “L-DOPA concentration variation in the leaf and flower tissues of six faba bean lines with common and rare flower colors,” Los Angeles, CA.

August 22, Barbara Hellier attended GRIN-Global webinar training.

August 23, Barbara Hellier provided a stakeholder information regarding garlic pollen storage and shipping.

August 27, Ted Kisha presented a seminar, “The U.S. National Plant Germplasm System and the Pullman Gene Bank: Preserving Plant Biodiversity for Today and Tomorrow” for the Hort 480 Plant Genomics and Biotechnology class at Washington State University.

August 29, Barbara Hellier attended GRIN-Global webinar training.

September 3, Ted Kisha met with Dr. Kevin Murphy of WSU to discuss research on *Eragrostis tef* and the pursuit of funding for continued research.

September 4, 5, 10, 12, 17, Ted Kisha completed sessions of GRIN Global training.

September 9 - 10, Stephanie Greene harvested alfalfa seed in Canyon Co, Idaho.

September 11, Barbara Hellier attended GRIN-Global webinar training.

September 13, Ted Kisha collected leaf samples from the table beet collection growing at Central Ferry.

September 20, Stephanie Greene presented an invited report on the external review of International Livestock Research Institute Gene Bank, CGIAR All Genebank Meeting, Ames, IA.

September 25, Ted Kisha gave presentation on “Molecular Characterization of Germplasm” to a group of visitors from the Shanghai Agrobiological Gene Center, Shanghai, China.

September 25, Vicki Bradley presented “The Agronomy Regeneration Program at the Western Regional Plant Introduction Station” to five Chinese visiting scientists.

September 26, Barbara Hellier provided a stakeholder with information regarding Papaver researchers.

September 22-27, WRPIS hosted seven Chinese visiting scientists, five from Shanghai, one from Shijiazhuang, and one from Beijing, China. All of them are working with plant germplasm management.

September 26, Barbara Hellier participated in providing 2 visitors from China a tour of WRPIS facilities.

October 15, RC Johnson assisted Andrea Kramer, Conservation Scientist Chicago Botanical Garden, in use of our Indian Ricegrass seed zones for future research projects, including supplying germplasm.

October 28 – November 1, Ted Kisha attended the Bean Improvement Cooperative/North American Pulse Improvement Association (BIC/NAPIA) meetings in Portland Oregon.

October 28, Vicki Bradley submitted the Cool-Season Grass annual report to the Chair of the Forage and Turfgrass CGC.

October 29, Barbara Hellier provided information to a stakeholder regarding cages, pollinators used for controlled pollination for guayule and related species.

October 30, Vicki Bradley sent information regarding repatriation of W6 accessions of *Cicer*, *Phaseolus*, and *Eragrostis tef* to Harry Harlan, the son of Jack Harlan, who donated many accessions to the NPGS.

October 31-November 1, Clare Coyne participated in a Pisum Crop Wild Relatives workshop, invited to present, Norwich, United Kingdom.

October 31-November 1, Jinguo Hu participated in the North American Pulse Improvement Association Biennial Meeting and made an oral presentation entitled “HPLC Analysis of ethanol soluble sugars in the dry seeds of 37 faba bean (*Vicia faba* L.) lines,” Portland, OR.

October 31-November 1, Clare Coyne co-organized the North American Pulse Improvement Association Biannual meeting.

November 11, Barbara Hellier provided peer review for the NPGS PEO for 10 plant germplasm collecting proposals.

November 11-21, Jinguo Hu visited the Germplasm Department, Institute of Vegetables & Flowers (IVF) of the Chinese Academy of Agricultural Sciences (CAAS), Beijing, and the Shanghai Agrobiological Gene Center in Shanghai, China.

November 12, Ted Kisha represented WRPIS at the quarterly meeting of the Location Environmental Management System.

November 13, RC Johnson reviewed “Effect of geographic origin and ex-situ growing site on morphology and seed yield of yarrow (*Achillea millefolium* L.) germplasm from the Rhaetian Alps, Italy” for Restoration Ecology.

November 14, Ted Kisha and Julie Thayer visited Alex Karasev in his laboratory at the University of Idaho to discuss virus testing in beans.

November 18, Frank Dugan attended the Washington State University Department of Plant Pathology faculty meeting.

November 18, Vicki Bradley submitted the New Crops CGC safflower report to Dr. Candice Gardiner.

November 22, Vicki Bradley sent Dr. Cal Qualset information on all repatriations from the NPGS since 1988.

November 26, Barbara Hellier provided information to a stakeholder regarding garlic planting.

November 4, Barbara Hellier attended WSU Land Use committee meeting.

November 4-6, Clare Coyne made a presentation at the ASA-CSSA-SSSA annual meeting, Tampa, Florida.

November 7, RC Johnson requested to meet with Walter de Boef and Karin Lion from the Gates Foundation, Devra Jarvis from Biodiversity International, and staff at the WSU’s Office of International Development concerning partnerships to better utilize genetic resources in developing countries.

November 7, Vicki Bradley, Carla Miles, and Lisa Taylor helped organize the location Veterans Day celebration.

November 8, Frank Dugan attended a thesis defense by student of Washington State University Department of Plant Pathology (Frank was on graduate committee).

December 2, Alex Cornwall completed USDA EEOC Age Discrimination, 2013 Diversity-EEO, and 2013 Anti-Harassment Policy training.

December 2-12, RC Johnson advised Fevzi Balli on selecting high oleic safflower germplasm for testing in Turkey.

December 6 - Alex Karasev visited the USDA Phaseolus greenhouse to observe and take leaf samples for virus testing.

December 9-10, Clare Coyne was invited to serve on the External Advisory Board and participated a meeting discussing the INRA project, Dijon, France.

December 12-13, Clare Coyne was invited to attend the collaboration workshop on root rots of legumes, Rennes, France.

December 13, Frank Dugan attended a graduate committee meeting for Washington State University Department of Plant Pathology (Frank is on the committee).

December 19, Frank Dugan participated in the North American Fungi Editorial Board telephone conference (Frank via Pullman connection).

December 19, Ted Kisha participated in the planning conference for the 2014 CRISSP REU program.

December 20, Barbara Hellier participated in a team teleconference regarding ARS policy regarding transgenes in breeding programs and genebanks.

December 20, Frank Dugan attended meeting of Washington State University Department of Plant Pathology with James Moyer, Director of the WSU Agricultural Research Center.

Appendix 3

Minutes of the 2013–W6 Technical Advisory Committee Meeting (pending approval at 2014 meeting).

W-6 Regional meeting – June 18th, 2013 Meeting started at 9:09 am (PDT)

Members present in Pullman:

James Moyer – Administrative Advisor, Washington State Univ.
Michael Kahn – Administrative Advisor, Washington State Univ.
Jinguo Hu, W6, Pullman
Dave Stout, W6, Pullman
Gwen Pentecost, W6, Pullman
Frank Dugan, W6, Pullman
Theodore Kisha, W6, Pullman
Joe Kuhl, Idaho state rep., Secretary

Connected by phone:

Peter Bretting – NPS, Washington, DC
Ann Marie Thro – NIFA, Washington, DC
Maureen Whalen – USDA, ARS – Western Region
Harold Bockelman – National Small grains collection
Gary Kinard, – NGRL, Beltsville
Kim Hummer – NCGR, Corvallis
Joseph Postman – NCGR Corvallis
Dave Dierig, – NCGR, Ft. Collins
Francis Zee – NCGR, Hilo
Gabriela Romano – NCGR, Parlier
Richard Lee – NCGR, Riverside
John Preece – NCGR, Davis
Dan Parfitt, CA
Mark Brick, CO
Jack Martin, MT
Ian Ray, NM
Shawn Mehlenbacher, OR
Carol Miles, WA

Committee members absent:

Kevin Jensen – Utah
Roger Chetelat – California

States without representation

Alaska
Hawaii
Wyoming

Opening remarks to the 2013 meeting – Mark Brick

After a brief delay due to connection issues Mark Brick thanked the Pullman group for making the meeting arrangements.

Director's Report and Budget – James Moyer

Dr. James Moyer joined Washington State University May 1, 2013, coming from North Carolina State University where he was department chair of Plant Pathology. He is working with Michael Kahn to get up to speed. WSU is committed to plant germplasm, plant breeding and plant genetics. WSU is supportive of USDA, ARS, specifically W6.

Report from National Program – Peter Bretting

The recent retirement of Molly Welsh, the *Phaseolus* curator, was mentioned along with the contribution she has made to the germplasm community.

Dr. Bretting mentioned the untimely death of Mark Boening and interim plans to cover the activities that he was responsible for. Also note the significant contributions that Mark made to the germplasm community.

ARS has implemented the Consolidated and Further Continuing Appropriations Act, 2013 (FY 2013 appropriations) which includes rescissions and other reductions to the ARS's budget due to sequestration. The President's FY 2014 budget proposal, presented on 10 April 2013, would increase ARS's funding by about 2.7% above the FY 2012 appropriated funding level, and specifically would increase the NPGS's budget by \$581,000. The House Agriculture Appropriations Subcommittee "mark-up" the FY 2014 budget would provide a 5.6% increase above the enacted FY 2013 operating level, which translates to a total that is 2% lower than the FY 2012 appropriated funding level.

A standardize template was discussed for crop vulnerability statements (CVS), see report pages 5-7. A standardized format will help compare vulnerabilities across crops and provide structure for discussing changes over time, as well as provide a record of those changes over time.

Kim Hummer asked if CVS would be published within a single publication. Peter Bretting suggested that at least two publications would be required, one for horticultural crops and one for crop science crops. Dan Parfitt expressed interesting in seeing all CVS brought together. It was mentioned that this might cause delays in publication.

Report from NIFA – Ann Marie Thro

As with other programs, germplasm programs need to focus on outputs, outcomes and impacts. In particular, positive impacts need to be highlighted and recognized. She asked that any significant impacts be passed on to her.

A new code has been added to the new CRIS forms for Breeding, 1081. Researchers should, when appropriate, be sure to include this code as part of their reports.

Dan Parfitt asked if impacts from prior years and/or long-term impacts should they be reported. It was agreed that they should be reported.

Administration Update: ARS Regional Office – Maureen Whalen

Maureen Whalen, Associate Area Director, thanked the state representatives for their participation in the meeting. The 2013 budget for the Pacific West Area was down 7.8% compared 2012, which continued a trend of declining budget over several years. In 2013 there was a base budget of 2013, but it should be recognized that significant outside, intermural sources contributed to operations. David Ramming, Parlier grape breeder (now retired), was provided as an example of an innovative researcher, developing a new grape variety where grapes dry into raisins on the vine and can be mechanically harvested. Pacific West Area, 7 of 20 sites curate germplasm, and those seven hold a significantly percentage of the national germplasm. Aberdeen and Pullman are the top two sites for requests. There are approximately 1,000 users of germplasm in the thirteen western states.

Kim Hummer asked for advice for how curator managers should respond to declining budgets and limited labor to accomplish required activities. Maureen Whalen recommended matching needs with available resources. Peter Bretting suggested that PGOs should discuss options and that four priorities in order of importance were: maintenance, distribution, characterization/evaluation, and enhancement. It was discussed that if budget cuts continued whether germplasm should be reduced. To help with these decisions Crop Germplasm Committees (CGC) should be approached with such concerns. Michael Kahn raised the issue of an ongoing need for improved/expanded facilities as related to increases in the number of accessions. It was brought up that the President's budget included funding for a poultry facility in Athens, however this was not included in the House budget. Budgets are required to set aside money for repair and maintenance; however it frequently is insufficient to meet the needs, especially in the case of unexpected events. There is a limited amount of money at the Area for high priority needs. Jinguo Hu mentioned efforts to address the need for stabilized humidity in the Pullman seed storage facility. Coordination with the Area office was under way to find a solution. Dave Stout mentioned that the Pullman facility was at capacity, and additional accessions would need other arrangements.

Approval of 2013 meeting Agenda

Dan Parfitt suggested that approval of the 2012 meeting minutes should be postponed until after lunch so that people could review them. It was generally agreed this was a good idea. Dan moved that the 2013 meeting agenda be approved, moving approval of the 2012 minutes to after lunch. The motion was seconded by Ian Ray. The motion passed unanimously.

Meeting break – 10:05am to 10:20am.

Mark Brick reconvened the meeting and began site reports.

Harold Bockelman – Aberdeen

Highlights of submitted report

- The National Small Grains Collection (NSGC) presently holds 140,487 accessions
- NSGC distributed more than 61,000 accession samples in >800 separate requests in the past 12 months. Approximately one-third of the distributions were to foreign scientists.
- They have an ongoing effort to identify ploidy levels of tens-of-thousands of the wheat, barley, and oat accessions using the Partec Cyflow™ which counts chromosomes by flow cytometry. To date we have completed analyses on more than 13,000 landrace wheat accessions. A common mixture when observed is 4x and 6x lines in field plots.
- They continue to coordinate the assembly of the Stem Rust Nursery in Kenya in cooperation with the Kenya Agricultural Research Institute, CIMMYT, and wheat and barley breeders in public and private programs throughout the U.S. The latest shipment in April included 6000 entries from more than 50 public and private breeders and researchers.
- The wheat and barley core subsets are being extensively phenotyped and genotyped as part of the new NIFA-funded Triticeae CAP.
- They are continuing our efforts to capture voucher images of spikes, panicles, and seeds. One of the goals of our new 5 year project plans is to fill in the gaps in the characterization data. The images and characterization data provides valuable information to both the germplasm user and for NSGC curation.

Gary Kinard – Beltsville, National Germplasm Resources Laboratory

Highlights of submitted report

- The Plant Exploration and Exchange program (PEO) supports the collection of germplasm for the NPGS through the management of a Plant Exploration and Exchange Grant Program. The deadline for submitting proposals for explorations or exchanges to be conducted in fiscal year 2014 is July 26, 2013.
- In late 2008 a project to provide thorough coverage in GRIN-Taxonomy to wild relatives of all major and minor crops was initiated. Initial work is completed on 96 crops, and an interface to query these data in various ways has been developed (<http://www.ars-grin.gov/~sbmljw/cgi-bin/taxcrop.pl>). Feedback is invited from NPGS curators and CGC members for those crop wild relative classifications already developed.
- We were saddened by the unexpected death of Mark Bohning from NGRL-DBMU on May 13, 2013. He had 33 years of service to USDA, almost all of it in NGRL.
- Although the exact date for the switch over from GRIN to GRIN-Global has not yet been determined, it will occur during fiscal year 2013, most likely in September. At the time of the switch the public website will change.

The question was raised by Dan Parfitt as to whether additional collection trips should be funded if resources are not available to curate the collected materials. Proposal calls for

collection proposals might be postponed with priority on maintaining existing collections emphasized. Collecting contributes to a small/steady increase in accessions, a great demand was related to web based information associated with germplasm. Funding for collections in 2014 will be ~\$70,000, compared to 1898 when ~\$20,000 was spent on collecting.

Kim Hummer – Corvallis

Highlights of submitted report

- Maintain more than 12,000 accessions of temperate fruit, nut, and specialty crops were conserved.
- Obtained new accessions of *Fragaria* (42), *Rubus* (18) and *Vaccinium* (73) from Oregon and from subtropical locations through plant exchange with Canada.
- Obtained a total of 279 new accessions and 2447 new inventory items in 2012. This included inventory repatriated from Palmer, AK, when it closed.
- Received 659 new plant requests and shipped 6631 items in 2012.
- Received a number of outside grants, including SCRI and others
- Implemented a new technique, ‘microsatellite allele dosage configuration establishment (MADCE), to fingerprint 947 strawberries with two SSR markers.
- The number of federally supported personnel in Corvallis has continued a decline started in 2006, and reached 2002 levels.
- The number of accessions maintained and distributed have continued a trend to increase, see graphs page 4 of submitted report.

Joseph Postman – Corvallis

Highlights of submitted report

- Of the more than 12,000 accessions maintained ~2/3 are clonal and ~1/3 seed.
- Barbara Reed and Nahla Bassil maintain very productive research programs.
- Significant efforts have been made to use genotyping to reduce redundancy in the collection.
- Nahla Bassil has completed research on fingerprinting in fruit and nuts, leading to an identification system based on genotype that is useful for managing collections.
- Two offsite studies were mentioned, one in Alaska prior to closure, and another in Minnesota with a collaborator.

Roger Chetelat - Davis

Roger was not able to attend, but submitted a written report, Dan Parfitt summarized highlights of submitted report:

- The TGRC regenerated in 2012 a number of wild species accessions which had been stored in the seed vault but had never been grown for seed increase.
- Six new accessions of cultivated tomato were acquired from Muriel Quinet at the Univ. Catholique de Louvain, in Belgium. These stocks should be useful for genetic studies of meristem, flower and inflorescence development.

Dave Dierig – Ft. Collins report

Highlights of submitted report

- NGCRP has 420,121 unique accessions and 574,614 backed-up.
- 80% of NPGS is backed-up.
- January-June 2013, ~60,000 samples processed.
- On average ~70% of Pullman collections are backed-up, ~100% of Aberdeen and Davis.
- Making progress with clonally propagated material.
- Seeds of Success, BLM native plant program, is coordinated with Pullman, backed-up at Fort Collins.
 - o 7,501 accessions at NCGRP
 - o 2,600 unique taxon
 - o Many species are difficult to germinate

Dan Parfitt asked about accessions in liquid nitrogen, David Dierig replied that grains do well in nitrogen storage.

Francis Zee – Hilo report

Highlights of submitted report:

- Five year project plan was approved in March 2013.
- Hilo maintains a backup collection of 29 selected cacao, *Theobroma cacao*, accessions from Miami and Puerto Rico.
- Continued quarantine transfer of NPGS avocado germplasm from Miami to Hilo through Fort Detrick. Twenty three (23) avocado accessions showed no visible laurel wilt symptoms and tested free for Avocado Sunblotch viroid (ASBVd) during the one year quarantine period in Hilo.
- The Avocado CGC consultant established a core collection of about 150 accessions to represent the genetic diversity of the current 400 NPGS accessions.
- Nine accessions of papaya relatives including *Horovitzia*, *Vasconcellea*, *Jacaratia* & *Jarilla* were received from various cooperators nationally and internationally.
- Regenerated 13 non-transgenic papaya accessions in an isolated location; field planted 2 selected 'Kapoho' papaya lines in a commercial field for evaluation.
- Provided pineapple tissue cultures and seeds of *Vasconcellea* spp. to NPGS scientists for cryopreservation and molecular studies.

Gabriela Romano – Parlier

Highlights of submitted report:

- A new biological technician was hired and will be working on germination tests.
- Distribution of germplasm of site-specific collections:
 - o Parthenium had the largest number of requests, 78 domestic, 41 international, 119 total.
 - o Prickly pear (*Opuntia/Cereus/Hylocereus*) 96 domestic requests.
- The *Bassia*, *Proboscidea* and *Atriplex* collections have been destined for decommissioning. After fulfilling the final requests for *Atriplex*, the remaining

seed will also be sent to NCGRP including the new accessions donated by Seeds of Success.

Jinguo Hu – W-6 Pullman

Highlights of submitted report:

- On December 31, 2012, there were 92,897 plant accessions belonging to 1,277 genera, 4,604 species and 5,143 taxa in the WRPIS collection.
- Acquired 2,723 new accessions including 1,942 native plant accessions from the SOS (Seeds of Success) project, 270 pea from China by way of Australia, 62 lettuce from the Netherlands and 44 clover from Norm Taylor's collection.
- Distributed a total of 29,345 packets of seed samples to 1,259 requestors with addresses in each of the 50 domestic states and 53 foreign countries.
- Conducted laboratory studies of five bulb-rotting species of *Penicillium* for clarifying species identity and host range. They continued to acquire isolates and conducted pathogenicity tests on six edible and ornamental bulbs (onion, garlic, tulip, narcissus, crocus, iris, etc.).
- Entered 100,230 observation data points into the GRIN (Germplasm Resources Information Network) database in 2012.
- Entered 5,067 seed viability records into GRIN in 2012. Pullman location tested 1,545 and National Center for Genetic Resources Preservation (NCGRP), Fort Collins, Colorado tested 3,436 accessions.
- Evaluated segregating populations derived from crosses between high oil and high oleic acid lines and winter-type safflower germplasms for cold tolerance under controlled conditions and in the field.
- In collaboration with Washington State University, conducted a preliminary study to examine the variation of L-DOPA concentration in the leaf and flower tissues of seven faba bean accessions with various flower colors.
- Initiated a collaborative project to evaluate cool season grain legume germplasm under a non-funded collaborative agreement between US and China. In October 2012, our collaborators planted 1,294 pea and 286 faba bean accessions for winter survival in Qingdao, China.
- The FY 13 budget for WRPIS was \$2,453,972 (Pullman, WA) and \$281,394 (Prosser, WA) for a total ARS budget of \$2,735,366. This could allow for \$28,381 discretionary dollars per SY. However, the implementation of sequestration reduced total budget to \$2,529,920 (\$2,255,598 for Pullman and \$274,322 for Prosser). The discretionary dollar per SY dropped to only \$6,238. This situation forced them to reduce the work force by abolishing two vacant positions. Molly Welsh, the *Phaseolus* curator, retired leaving behind ~17,000 accessions.

Dan Parfitt raised discussion/approval of the W6 FY2014 budget and it was agreed that discussion and approval would take place during open discussion. James Moyer mentioned that the FY2013 funding situation was not completely resolved.

Richard Lee- Riverside

Highlights of submitted report:

- A total of 861 distributions were made in CY2012, these were mostly Citrus or citrus relatives with the majority of distributions being made domestically to citrus breeders, research scientists, and certification programs.
- The NCGRCD has been in an Asian Citrus Psyllid Quarantine area for all of CY2012; psyllid screening and exclusion steps were completed early in the year, and the facilities were certified in February 2012, and the Repository was then able to ship distributions upon request.
- In 2009 in cooperation with USDA ARS, Fort Pierce, FL, a field trial was established which included over 100 accessions of citrus and citrus relatives (eight replicates of each accession; a total of 800 trees) originating from NCGRCD. The trial was exposed to HLB and Asian citrus psyllid (ACP) under field conditions, and evaluated twice a year for presence of HLB and tested for Las by qPCR. In the fall 2012, they were able to classify the reaction of the accessions into 8 categories based on their susceptibility/tolerance to HLB spread under natural conditions.
- Many genotypes of citron (*Citrus medica* L.) are cultivated in southwestern China, an important center of origin for the species; along with local wild citrons, they exhibit considerable phenotypic diversity. Using SSRs and SNPs three clusters were identified: 1) mostly fingered citrons from China 2) non-fingered citrons from China and 3) citrons from other parts of the world.
- Accessions are being backed-up at Ft. Collins using cryopreservation. Another technique, called cryo-therapy, is being used to clean-up material contaminated by bacteria.
- A detection kit has been developed to detect HLB for use by the general public, \$1.50 per sample.

John Preece - Davis

Highlights of submitted report:

- During the past three years, they have sent out the following to our domestic plus international clientele as cuttings, leaves, pollen, fruit, etc.: 2011, 11,535 items from 356 orders, and 2012, 10,726 items from 337 orders. 2013 (to date), 5,022 items from 521 orders, and for Summer 2013, 51 orders are pending. For 2014, there are already 433 new orders.
- The switch to all online orders has helped increased requests.
- David Ramming is retiring. He helped develop 38 peach cultivars.
- The entire peach collection is being re-propagated. Virus-indexed peach rootstock is being donated. Next year apricot rootstock will be donated.
- The fig collection is being propagated, providing tasting for ~150 people.
- Malli Aradhya and Craig Ledbetter collected cuttings and seeds of fruit and nut species in Azerbaijan and Kyrgyzstan during July-August, 2012. Sixty-eight accessions were added to the collections.
- Grants focused on the collections at the NCGR-Davis: Almond Board, \$41,000 (Almond Rootstock Development, 2012-2013); NIFA-SCRI, \$1.1 million (Walnut Rootstock Development, 2013-2014); CDFA-SCRI, \$129,000 (Olive

Knot Evaluation, 2013-2014); California Fig Institute, \$7,000 (Fig Cultivar Trial, 2013).

- Research: 1) increased disease resistance in almond, 2) NIFA-SCRI grant focused on walnut genetics and disease resistance, 3) CDFA-SCRI to propagate the entire olive collection and screen for disease resistance, and 4) Evaluate the fig collection for “new” cultivars, ultimately to expand the fig cultivars used by industry.

2012 Minutes - approved

Discussion occurred related to the 2012 minutes. Washington was removed from states without representation, and Carol Miles (WA) added under members absent. The spelling of John Preece’s name was corrected. “Start report” was corrected to “state report”. Under Washington’s state report: Carol Miles was listed as absent, and submitted a written report, while Dave Stout made a brief presentation. Ian Ray moved to accept the 2012 minutes, Joe Kuhl seconded. The motion passed unanimously.

State Reports

California – Dan Parfitt

(See state report for more detailed information)

- Requests have been relatively flat since 2009, around 400.
- Responses were also similar to previous years, about 18 to 20%, ~12% email addresses bounce back.
- Seven publications in 2012 are listed.
- UC-Davis update, Plant Science department merge, 5 new FTE including director of the plant breeding center. It was noted that industry is concerned about the training of plant breeders in the U.S.
- Annual reports from the UC Davis Seed Biotechnology program may be accessed online.
- Support for grape and nut collections is strong. Stonefruit research has limited support and funding. Major interest in nuts is focused on walnut, almond and pistachio.

Colorado – Mark Brick

(See state report for more detailed information)

- Written report has not yet been submitted, in progress.
- Number of accession requested in Colorado is down from 2011, continuing a trend from 2010.
- Cargill made major requests for wheat accessions. Biofuels represent a significant reason for requests.

Idaho – Joe Kuhl

(See state report for more detailed information)

- In 2012, 4,221 accessions representing 33 genera and 81 species/subspecies were requested in Idaho from the National Plant Germplasm System. This is a decrease in number of accessions from 2011 (6,404), but a significant increase in the number of species requested, with 22 species requested in 2011.
- The major user groups in 2012 were ARS scientists (all based in Aberdeen, Idaho) (74% of total accessions) and University of Idaho scientists (15% of total accessions), accounting for over ~89% of the total accessions requested. The remaining accessions were requested by companies and private individuals.
- Four articles were published in 2012 utilizing germplasm from NPGS.

Montana – Jack Martin

(See state report for more detailed information)

- Montana received 462 germplasm accessions during 2012. Of those accessions 384 (75%) were *Triticum* species. Of the seventeen individuals receiving germplasm in 2012, eight were associated with Montana State University, one with University of Montana, three were from commercial businesses or non-profit organizations, and five were private individuals.
- Luther Talbert and Nancy Blake MSU-Bozeman as received 191 *Triticum aestivum* (bread wheat) and 154 *Triticum turgidum* (durum wheat) accessions as part of the multi-state TCAP project. The TCAP project has an extensive system for reporting both phenotypic and molecular data into the germplasm system.
- Mike Giroux, MSU Bozeman, received 2 *Zea Mays* accessions and 1 *Oriza sativa* accession. The rice accession was requested to determine whether that variety (Kitaake) would grow better under greenhouse conditions than the variety currently being transformed, Nipponbare. Kitaake actually looks a bit worse than Nipponbare.
- Norm Weeden, MSU-Bozeman received 1 *Pisum sativum* accession (JI 2739). The genotype was requested in order to do complementation tests on a dehiscent pod mutation that showed up in his work. Unfortunately, he did not see any evidence for the mutation in JI 2739 when it was grown out.
- Five articles were published in 2012 utilizing germplasm from NPGS.

New Mexico – Ian Ray

(See state report for more detailed information)

- Nineteen individuals from New Mexico placed 29 orders to request 595 accessions from the NPGS in 2012.
- Apples (82 *Malus* accessions requested) in New Mexico have been damaged by heavy frosts in recent years, causing interest in identifying frost tolerant varieties that grow well in New Mexico.
- Peanuts (72 *Arachis* accessions requested) are being investigated for high oleic acid levels.
- It was observed that most people do not specify intended use when ordering germplasm and researchers don't follow-up when publications come out.

Oregon – Shawn Mehlenbacher

(See state report for more detailed information)

- A release notice for 'Dorris' hazelnut was published in HortScience. It has a very high level of resistance to eastern filbert blight (EFB) caused by *Anisogramma anomala*, and large kernels of excellent quality.
- Fluorescence microscopy tests on hazelnut over the past 15 years have identified the S-alleles in many cultivars.
- Potato accessions, identified as haploid inducers, will be incorporated into the OSU potato breeding program. The main aim is to incorporate haploid production and use of doubled haploids. Sagar Sathuvalli is the new potato breeder stationed in Hermiston, OR.
- Pat Hayes received two sets of accessions from the National Small Grains Collection in 2011: the World Core (~ 2,000) and the World Core winter subset (~400). Both were assessed as part of OSU's role in the USDA-NIFA Triticeae CAP project. He assessed the World Core in Corvallis for resistance to stripe rust and scald, plant height, and heading date.
- Aaron Liston used accessions of *Fragaria* were in ongoing phylogenetic analyses of the genus.
- Galen Williams is evaluating apple scion (*Malus domestica*) accessions for potential for hard cider production in the Willamette Valley and surrounding areas.
- Twelve articles were published in 2012 utilizing germplasm from NPGS.

Carol Miles expressed interested in research on apple scions for use in hard cider production.

Utah – Kevin Jensen (absent)

Written report submitted but no presentation made.

Washington – Carol Miles

(See state report for more detailed information)

- In 2012, 134 Washington State residents (73% were public and 27% were private) placed 254 requests and received 4,807 germplasm samples (492 taxa in the form of seeds and cuttings; 135 genera; 305 species and subspecies) from 16 NPGS repositories/stations.
- Most samples requested were in the genus *Triticum*, followed by *Zea*, *Solanum*, *Pisum*, *Malus*, and *Hordeum*.
- Feedback was provided by 41 (33%) recipients, and germplasm was used in diverse scientific disciplines such as agronomy, horticulture, genetics, botany, and plant pathology.
- Several recipients noted that germplasm did not arrive in good condition:
 - o one case of PI miss-numbering
 - o one order of three envelopes leaked seeds
 - o several samples arrived too late for planting in 2012
 - o several reported problems of germination.

- Four publications were reported.

Open Discussion

FY2014 Budget:

The W6 FY2014 budget was discussed. The proposed FY2014 would be the same as FY2012, \$405,288. Some concern was expressed related to FY2013, and that a shortfall might occur. Shawn Mehlenbacher moved to endorse the FY2014 budget at \$405,288, Jack Martin seconded. The motion passed unanimously.

Dan Parfitt moved to endorse FY2015 at 2.5% increase over FY2014, and FY2016 2.5% increase over FY2015, while noting that FY2014 included no increase. The motion was not seconded and died.

Shwan Mehlenbacher moved to endorse FY2015 with a 2.5% increase and FY2016 with 2.5% increase, Dan Parfitt seconded. The motion passed unanimously.

Packing list and use statements:

Mark Brick commented that he appreciated the text file sent by Dave Stout including information about individual orders. Dave Stout indicated that he might not be able to generate an identical file next year using GRIN-Global. However, the packing list should be available to send out. Access to the use statement is less certain.

Future Meeting Locations:

The 2014 meeting is to be held in Davis, CA. This was voted on and passed during the 2012 meeting in Corvallis. Joe Kuhl moved that the 2015 meeting be a teleconference based in Pullman, WA, and the 2016 meeting be a site visit in Pullman, WA. Shawn Mehlenbacher seconded, and the motion passed unanimously.

Officers:

Joe Kuhl nominated Carol Miles as secretary starting in 2014. Shawn and/or Dan seconded. Carol accepted the position.

Resolutions:

Resolution 1. The W-6 Technical Advisory Committee thanks Dr. Jinguo Hu, Gwen Pentecost and the staff of the USDA ARS WRPIS in Pullman WA for their efforts in organizing and hosting the W-6 teleconference/meeting for 2013.

Resolution 2. The W-6 Technical Advisory Committee thanks Dr. Robin Goose for his many years of service as a member and officer for the W-6 Regional Technical Advisory Committee.

Resolution 3. The W-6 Technical Advisory Committee thanks Dr. Molly Welch for her many years of service as curator of the *Phaseolus* collection at the WRIP, Pullman WA.

A motion (Dan Parfitt) was made and seconded (Shawn Mehlenbacher) to accept the resolutions as written.

The motion passed unanimously.

States without representation:

A brief discussion occurred that someone should solicit states that currently do not have representatives, i.e. AK, HI, WY and AZ (it was noted that this does not include NV).

Motion to adjourn:

Moved – Shawn Mehlenbacher

Seconded – Joe Kuhl

Passed unanimously

Meeting adjourned at 3:45 pm