

Minutes of the 2015 W-6 Technical Advisory Committee Meeting

W-6 Regional Meeting

June 24-25, 2015

Western Regional Plant Introduction Station, Pullman, WA

Officers: Shawn Mehlenbacker (chair), Joe Kuhl (vice-chair), and Carol Miles (secretary).

Administrators Present:

Jim Moyer, Administrative Advisor (WSU, Pullman, WA)
Peter Bretting, Senior National Program Leader (ARS ONP, Beltsville, MD) (call in)
Maureen Whalen, Associate Area Director (ARS PWA) (call in)
Jinguo Hu, Station Coordinator (Pullman, WA)

State Representatives Present:

CA Dan Parfitt
CO Mark Brick (call in)
ID Joe Kuhl
MT Jack Martin
OR Shawn Mehlenbacker
UT Kevin Jensen (call in)
WA Carol Miles

State Representatives Absent or Vacant:

NM Ian Ray (Absent but submitted a written report and Dave Stout presented)
AK (vacant)
AZ (vacant)
HI (vacant)
NV (not participating)
WY (vacant)

USDA Germplasm site Present:

Joseph Postman (Corvallis, OR)
James Oliphant (Corvallis, OR)
Roger Chetelat (Davis, CA) (call in)
John Preece (Davis, CA, Riverside, CA and Parlier, CA) (call in)
Harold Bockelman (Aberdeen, ID) (call in)
Gary Kinard (Beltsville, MD) (call in)
Stephanie Green (Fort Collins, CO) (call in)

USDA Germplasm site Absent:

Tracie Matsumoto Brower (Hilo, HI)

The meeting was called to order at 11:00 am by chair Shawn Mehlenbacker. A welcome was given by Jinguo Hu.

Jim Oliphant noted the URL for the website with information about State pest quarantines and restrictions, providing very useful summaries for each state: <http://nationalplantboard.org/laws-and-regulations/>.

Administrative Advisor's Report

Jim Moyer, W-6 administrative advisor (WSU)

The W-6 project is a multi-state project that receives off-the-top funding from Hatch. Funding is approved by Directors of Agricultural Experiment Stations in the Western Region, and until a few years ago was considered secure. Last year, station directors were close to not approving any funding for W-6, and only agreed to a 2-year proposal instead of the normal 5-year proposal. Many station directors are new and are not familiar with NPGS, and state representatives need to educate them as to its importance. It is important to document demand by stakeholders and development of business outputs; reports need to emphasize stakeholder use and value. Objectives of the new proposal need to be inclusive so that all projects fit within the regional proposal. The proposal needs to be output focused.

Report from National Program – Peter Bretting

Highlights of submitted report.

The germplasm collection continues to grow 1-2% per year, reaching over 550,000 NPGS accessions in 2014. Demand for NPGS information increased significantly from less than 500,000 hits for access in 2005 to a peak of 2,000,000 in 2008. Since then, annual page access has fluctuated in the range of 1,500,000 to 1,900,000 hits, with 2014 at approximately 1,700,000. The increase is due to the web, as search engines were permitted to index the GRIN database. Germplasm distribution in the same period increased gradually from about 140,000 to a high of 310,000 items in 2012, and decreased somewhat in 2013 (250,000 items) and 2014 (270,000 items).

The ARS national plant germplasm system budget declined sharply from its peak of \$47 million in 2010-2012 to \$42 million in 2013, though it has risen again in 2014 to \$44 million. However, in real budget dollars (adjusted to 2012) both 2013 and 2014 are at the lowest levels of budget support in the period 2005-2014.

The President's FY 2016 budget proposal for the USDA/ARS requests funding increases of about \$3.475 million for the National Plant Germplasm System. Under the Sustainable Small Farm Initiative, \$1.5 million has been requested, specifically the sub-initiative "Expand the National Plant Germplasm System" (\$1 million increase) and "Provide training/information to Native Americans on conserving/improving traditional crops" (\$500,000 increase). An additional \$1.5 million is asked to support the sub-initiative "Analyze genetic stocks/specialized populations using advanced genomics/genetic technologies." An additional \$475,000 is requested under Vertical Farming Initiative, specifically under the subinitiative "Develop high value horticultural varieties that are adapted for growth in greenhouses/urban environments."

Some key challenges that stretch the NPGS's budgetary resources are managing and expanding the NPGS operational capacity and infrastructure to meet the increased demand for germplasm and associated information, fulfilling the demand for additional germplasm evaluations, acquiring and conserving germplasm of crop wild relatives, managing genetic/genomic seed stocks, BMPs and procedures for managing accessions (and breeding stocks) with GE traits and the occurrence of adventitious presence (AP).

The Diversity Seek (DivSeek) initiative will enable breeders and researchers to mobilize a vast range of plant genetic variation to accelerate the rate of crop improvement and furnish food and agricultural products to the growing human population. Its partners currently include 58 public-sector agricultural research institutions from many nations, including Clemson, Cornell, Iowa State, UC-Davis, Georgia, Minnesota, Missouri, and USDA/ARS. The DivSeek Steering Committee (includes P. Bretting) met on 29 May 2015 in Rome to address specific details for the organization, function, and scope for the Initiative.

The ARS Big Data Initiative seeks \$25 million in FY 2015-2019 to establish a dedicated scientific research network for data computing, including a high performance computing system that incorporates local and cloud resources, capable of storing and efficiently processing ARS data. The virtual research support core will include experts to staff the new infrastructure and provide computational research support.

Richard C. Johnson, USDA-ARS Research Agronomist, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

Partnerships for native plant conservation and restoration (ARS, USFS, BLM) and Seeds of Success (SOS) were pursued through Interagency Seed Initiative, BLM seed zone policy, and by the acquisition, documentation, distribution of plant genetic resources. Ecological genetics or genecology included relating traits in common gardens to climate, general trends, and the implementation of seed zones.

The aim of research and management is to enhance successful utilization of native genetic resources on federal land. The BLM is the largest buyer of native seed in the Western Hemisphere. Seeds of Success, established in 2001, now is partnering with the NPGS to collect and conserve key native plant materials; in 2014 we added 1403 new native plant accessions to the SOS-NPGS collection, now totaling 10,515 accessions. The biggest problems to ongoing restoration of degraded areas (before and after fire and other disturbances) may be limited resources, complicated by tradition, policy, and political barriers.

Long-Xi Yu, USDA-ARS Research Geneticist, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA (works at Prosser, WA)

Highlights of submitted report.

Enhancing resistance to disease and abiotic stresses in alfalfa involves assessment of genomics and breeding to develop improved varieties with resistance to disease. A project priority is the identification of molecular markers associated with resistance to *Verticillium* wilt. In 2013 and 2014, 200 alfalfa accessions with potential drought tolerance were screened in Prosser field and greenhouse. Of these, 110 were from various locations in the U.S., and 90 from international sources, primarily Canada (64) and Afghanistan (12). So far 27 resistant lines have been identified. Other work included molecular and phylogenetic studies of wild and cultivated species of the genus *Medicago* from Kazakhstan, molecular and functional characterization of two drought-induce zinc finger proteins, ZmZnR1 and ZmZnF2 from maize kernels, and a study of germination rates under salt stress of transgenic and non-transgenic rice lines.

Frank Dugan, USDA-ARS Research Plant Pathologist, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA Highlights of submitted report.

WRPIS has the largest non-commercial garlic collection in North America. Big “seeds” with all kinds of latent infections, too deep for eradication via fungicides. For future research, clean ground and clean “seed” are needed. The ground displaced by expansion of the regional airport will need to be replaced by clean ground elsewhere. Fortunately most land on the Palouse has not been previously cultivated to *Allium* or other bulb crops. Bulbils, or tissue culture, are sources of clean plant material. Other mission-oriented research has focused on characterizing germplasm of wild rye (*Leymus cinereus*) for resistance to stripe rust, examining *Lupinus albus* seeds for mycobiota, studying the taxonomy of microbial associates of germplasm, and monitoring NPGS crops and germplasm for new diseases.

Historically, monastic records and other sources demonstrate that when cereal crops failed and famine threatened, people survived on peas, lentils, and vetch. This topic was explored in the chapter on history of cereals, legumes, and their pathogens from Neolithic through pre-modern Europe, in *Hidden Histories and Ancient Mysteries of Witches, Plants, and Fungi* (APS Press, 2015).

Clarice Coyne, USDA-ARS Horticulturist, Cool Season Food Legume Germplasm Curator, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

Project objectives included curation of pea, chickpea, lentil, faba bean, grasspea, lupin, fenugreek, plus forage species of *Vicia* and *Lathyrus*. Focus of the collection is to increase crop wild relatives’ representation in the collection, mainly from *ex situ* collections. The target is to collect descriptor data on all accessions under regeneration. The evaluation project for powdery mildew on pea core was funded, and a genotype summary (mostly SNPs) is to follow.

Screening of chickpeas for cold tolerance (BARD project) was conducted with Shahal Abbo. A USAID Linkage project in Morocco involved traits for machine harvesting and stress tolerances for lentil. A review team for the Global Crop Diversity Trust ICRISAT gene bank review had a meeting and field tour in Hyderabad, India.

An abstract, "Grain legume genetic resources for allele mining," was presented at the annual meeting of the Crop Science Society of America, discussing larger scale genotyping of plant genetic resources. One challenge noted to sequencing the USDA grain legume collections of pea, chickpea and lentil core accessions is the amount of heterogeneity in the landrace accessions. This impediment to genotyping was addressed by establishing single-plant derived populations selected out of traditional core collections.

Ted Kisha, USDA-ARS Geneticist, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

Three greenhouses, two on the Pullman campus and one at Central Ferry, regenerate 300-400 accessions annually. Tepary bean (*Phaseolus acutifolius*) is being screened for heat and drought tolerance. The North American wild kidney bean (*Phaseolus polystachios*), native to habitats from Texas and Oklahoma eastward to the Atlantic coast, is being investigated as a possible source of true resistance to white mold. Historical locations of sources are herbariums in Ohio, Indiana, Kentucky, West Virginia, and Pennsylvania. Nuña beans (*Phaseolus vulgaris*), the Peruvian "Popping Bean" may have potential as a new and nutritious snack as well as its traditional uses. Compared to common dry bean varieties, Nuña beans are much higher in total antioxidant activity than 'Yankee Navy Pea' and 'Great Northern' cultivars, and most are comparable to the best of the common dry beans, with only the cultivars 'Pink Roza,' 'Speckled Cranberry,' and 'Black Magic' showing higher antioxidants than the Nuña bean accessions tested.

Nutrition studies (referenced) have shown the importance of beans in the diet for prevention of heart disease, diabetes and its complications, and reduction of risk for various cancers. Continuing research on nutrition includes factors such as centers of diversity (Mexican, Mesoamerican, Andean, Ecuadorean), market classes (white beans such as Great Northern and Navy, black, cranberry, pinto, kidney, etc.) and possibly country. For example, in Bulgaria almost all common varieties are white beans, while in Brazil black beans are preferred.

The United Nations has proclaimed 2016 as the "International Year of Pulses," associated with a Pulse Health Initiative proposing \$25 million per year for 5 years to support and enhance the significance of pulses for worldwide health.

Barbara Hellier, USDA-ARS Horticulturist, Horticultural Crops Germplasm Curator, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

The core collections for this program are *Beta*, *Lactuca*, and *Allium*, with the addition of miscellaneous species (minor legumes, herbs and medicinals, ornamentals, and others).

The *Beta* collection includes sugar beet, table beet, chard, leaf beet, sea beet and other wild *Beta* species. Total accessions are 2,713, total available accessions 1,684 with 2,013 backed up. Sugar beet are the majority of the accessions (1,420), followed by table beet (186), leaf beet (81), leaf and table (28), fodder (95), and biomass (5). New material was acquired from Morocco in 2010 and 2012 (*B. maritima*, *B. macrocarpa*, *P. patellaris*), Imperial Valley, CA in 2011 (*B. macrocarpa*), and San Francisco Bay and Delta in 2015 (*B. maritima*). Projects include a table beet evaluation in 2013 and an evaluation of the *Patellifolia* collection in 2015.

The *Lactuca* collection includes *L. sativa*, *L. serriola*, and other wild *Lactuca* species. Total accessions are 2,503, total available accessions 1,606 with 1,539 backed up. Butterhead types are the largest percentage of the collection (32%), followed by leaf at 27%, crisphead at 21%, cos (romaine) at 19%, and stem and oilseed varieties at 1%. Examples of disease resistance found in the *Lactuca* collection include resistance to Big Vein virus, to Lettuce Drop, to Verticillium Wilt race 1, to corky root, and resistance to Northern Root Knot Nematode. New accessions include 92 specimens of *L.*

serriola, 15 of *L. georgica*, 12 of *L. tartarica*, and several others for a total of 149, the accessions coming from Armenia (50), Georgia (34), Uzbekistan (24), Kyrgyzstan (22), and the Russian Federation (19).

The *Allium* collection includes *A. sativum*, *A. ampeloprasum*, *A. schoenoprasum*, *A. tuberosum*, *A. ramosum*, and wild *Allium* species. Total accessions are 1,186, total available accessions 739 with 318 backed up. The *Allium sativum* collection is primarily distributed to small and medium sized gourmet garlic growers.

The miscellaneous collection includes *Astragalus*, *Onobrychis*, *Anthyllis*, *Thymus*, *Aconitum*, *Lomatium*, *Salvia*, *Papaver*, *Erigonum*, *Taraxacum*, and others. The total number of genera is 275, the total accessions are 5,409, total available 3,552, with 3,326 backed up. *HiPal Astragalus cicer* (PI 630975) developed at U. of Minnesota was derived from 9 PI's (PI 362233, 362236, 362272, 362249, 362251, 362257, 362359, 362267, and 362269) provided by this collection.

Sanguisorba minor collection was screened for agronomic characterization and reported by Peel, Waldron and Mott (2008, Crop Science). The *Taraxacum kok-saghyz* collection was extensively used by the natural rubber community in product research and development:

Collins-Silva et al, 2012, Phytochemistry

Ponciano and Chen, 2014, American Journal of Plant Sciences

Hodgson-Kratky, 2015, University of Guelph

Moussavi, 2015, University of Guelph

Zhang et al, 2015, Industrial Crops and Products

Vickie Bradley USDA-ARS Agronomist, Cool Season Grass and Safflower Germplasm Curator, Plant Germplasm Introduction Testing and Research Unit and Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

As of April 17, 2015 the project covered 27% of the WRPIS project accessions. *Carthamus* spp. comprised 2,454 accessions, including 9 taxa from 57 countries, of which 2,370 were safflower (*C. tinctorius*); 142 accessions were planted for regeneration, 50 for rust ratings, and 11 for descriptors (data collection). Data and photos of plots and flowers were uploaded to GRIN. A safflower webpage, created in 2000, was maintained and updated with information and links useful to the safflower research community.

The cool season grass collection comprised 22, 109 accessions, consisting of 122 genera, 1,076 taxa from 105 countries. For the first year nursery 301 out of 310 accessions germinated, and 24,500 plants were established in the field. Second year accessions were harvested, consisting of 243 accessions, 16,847 plants. In addition, two years of data on *Lolium multiflorum* was uploaded to GRIN, including 9 descriptors for 127 accessions, and uploading of *Eragrostis tef* photos to GRIN was completed. This included images of seeds (367), panicles (369) and plots (368), and data for 11 descriptors with reference images for head type and head color.

Current projects include a study of 156 clones of *Miscanthus sacchariflorus* collected in the Russian Federation, of interest for biofuel cellulosic ethanol production, and SOS Native Grass projects (1,048 accessions of 45 taxa) for which the inventory and organization of freezer packets was finished, regenerating accessions that are difficult to germinate, and reconciling passport data for accessions that came in after W6 numbers were assigned. New projects include a study of nutritive values for safflower as used for vegetable greens, and interest in 2 selections for use as ornamental grasses.

State Reports:

California Report by Dan Parfitt

Highlights of submitted report.

532 requests from California users in 2014, representing 515 different users, an increase of 18% over 2013, about average for recent years. Requests for feedback sent to recipient via e-mail; of 521 messages sent, 9% bounced back. 56 responses received, for a response rate of 10.7%, a substantial reduction from prior levels.

Distributed germplasm was used in a wide variety of applications, from basic research to home gardening. No single crop or crop group was especially requested. Much of the germplasm continues to be used for commercial breeding or research (University or USDA), but a significant number were for materials to be used in molecular/biochemical studies, but less than last year. Fewer respondents reported on clonal (fruit/nut) germplasm than in the past. Several members of the California Rare Fruit Growers requested materials for distribution to their members as in past years. Several respondents replied that they had not received any germplasm in 2014 although their requests were indicated on the inventory record.

The Viticulture Department at UC Davis continues to maintain grape collections for teaching and research. Several Plant Science fruit and nut germplasm collections continue to be maintained, but as noted previously there is no formal mechanism for ensuring their continued protection after the PIs that assembled and/or used them are retired, retiring soon, or have left the University.

Colorado Report by Mark Brick

Highlights of submitted report.

Orders for germplasm from the NPGS constituted delivery of accessions from both clonal repositories and Plant Introduction Stations. 3235 accessions were delivered that constituted 50 orders in Colorado during calendar year 2014, a slight increase in orders from the previous year. Orders were made from the following locations: COR, DAV, GEN, GSOR, MAY, NC7, NE9, NSGC, NTSL, SOY, S9, and W6.

- Dr. Lee Panella, USDA/ARS, Fort Collins, CO received 30 accessions of sugar beet to screen for beet curly top resistance; 29 additional accessions were screened for reaction to *Rhizoctonia*. The resistant lines were used in a breeding program to enhance disease resistance for commercial production of sugar beets.
- Joseph Saraceno, Biodome Industries Ltd., Wheatridge, CO received 6 *Fragaria* species. He reported that he received the material and is using the clones for crossing.
- Dr. Walter Messier, Walter Messier Evolutionary Genomics, Inc., Lafayette, CO received numerous accessions of *Glycine max* for research on a genomics project. We germinated and grew seedlings that were used for isolation of DNA and total RNA, then used these materials to identify genes that confer soybean cyst nematode resistance to cultivated soybean.
- Natalie Yoder, Colorado State University, received 18 barley and 13 wheat accessions for a variety trial.
- Jolanta Menert, Busch Agricultural Resources LLC, Fort Collins, Colorado received 14 barley wheat accession for crossing.
- Judy Harrington, Fort Collins, CO received 8 accession of *Brassica* spp.. She reported that she plans to use the germplasm to compare traits and genetics of wild lines to those of domesticated and weedy lines to understand domestication as well as the origin of escaped weedy/invasive lineages.
- Arlette Woodward, Twin Pines Farm, Penrose, CO received 1 *Allium* accession to see how it would grow under hoop house conditions. It did very well.
- Scott Root, Edible Planet, Pueblo, CO indicated that he did not receive the 12 *Prunus* accessions he ordered.
- Chris Smith, University of Colorado, Department of Ecology and Evolutionary Biology, Boulder, CO received 3 *Helianthus* accessions to study differences between wild and domesticated sunflower.
- Eric Johnson, Boulder, CO received 4 *Malus* accessions. He reported that he used the germplasm for educational purposes for long-term enrichment of apple gene pool in North America. He distributed about 30 seedlings of *M. sieversii* from seed received in 2013, and about 60 seedlings of *M. sieversii* from seed received in 2014. He also distributed about 5 *scions* of the seedlings of *M. sieversii* from seed received in 2013. Materials were distributed to the following states: AL, CO, MI, MS, SC, TN, VA, WI. The offer to send seedlings and/or scions was made on the North American Fruit Explorers Facebook page as well as via a local gardeners' listserv.
- Dana Blumenthal, USDA-ARS Northern Plains Area, Crops Research Laboratory, Fort Collins, CO received numerous species and accessions to study how climate of origin influences climate change responses in prairie and shrub steppe species (in collaboration with the BLM Seeds of Success program).
- Sara Kammlade, Colorado State University, Department of Horticulture and Landscape Architecture, Fort Collins, CO received 6 *Brassica* species for organic trial gardens.

- Brittany Barnett, USDA-ARS Soil-Plant-Nutrient Research Unit., Fort Collins, CO received one *M. trunculata* accession to examine root exudates and microbial DNA in the soil surrounding Medicago roots.
- Mark Brick, Soil and Crop Sciences, Colorado State University, Fort Collins received 128 accessions of *P. acutifolius* to phenotype for molecular studies. Unfortunately the entire plots were lost due to hail and an early freeze. The study will be repeated in 2015.

Idaho Report by Joseph C. Kuhl

Highlights of submitted report.

In 2014, 2,528 accessions representing 34 genera and 65 species were requested in Idaho from the NPGS; these numbers are similar to 2013 when 2,960 accessions were requested including 48 genera and 75 species. The top three genera requested were *Triticum* (1,478) followed by *Hordeum* (430) and *Avena* (1,66).

There were a total of 80 orders from Idaho in 2014, slightly higher than 67 orders placed in 2013 but similar to 83 orders in 2012. In 2014 orders were placed by 19 individuals, 33 orders from the public sector and 28 orders from commercial identities. Overall this represents a 19% increase in the total number of requests, compared to 2012, most of the increase due to individual requests. The total number of accessions requested in 2014, 2,528, was down a fourth year in the row compared to 2,960 in 2013, 4,221 in 2012 and 6,404 in 2011.

Major user groups (assessed by the number of accessions requested) in 2014 were USDA scientists (primarily based in Aberdeen, Idaho) (79% of total accessions) and private companies (13% of total accessions), together accounting for ~92% of the total accessions requested. University requests were significantly down with only 38 accessions requested in 2014 compared to 516 accessions requested in 2013. ProVita, Inc. (nursery stock grower) stands out among private companies with 161 accessions requested, or 51% of the accessions requested by private companies.

- University of Idaho research programs once again utilized NPGS germplasm. Dr. Alex Karasev requested 1 *Phaseolus vulgaris* accession in 2014 for biological typing of Bean Common Mosaic Virus.
- In *Beta vulgaris* research, 10 sugar beet accessions were requested in 2014 by the University of Idaho nematologist Dr. Saad Hafez for use as differential lines in evaluation for BCN resistance.
- Dr. Nilsa Bosque-Perez's entomology program requested one *Hordeum vulgare* accession for barley yellow dwarf virus related research.
- Lorie Ewing in the nuclear seed potato lab requested 9 *Solanum* accessions in 2014 for Irish Eyes Garden Seed, a private seed potato company in Washington State.

Montana Report by Jack Martin

Highlights of submitted report.

Montana received 3,542 plant germplasm accessions in 2014, distributed to 23 individuals. Nine recipients were from state agencies, one was a commercial company, and 13 were private individuals. Most of the accessions (3,368 or 95%) were *Triticum* species.

Selected highlights of use:

- Ten *Triticum aestivum* accessions were historical varieties to be used in a study to examine changes in winter wheat characteristics over time.
- Seven *Triticum aestivum* accessions were Puroindaline isolines for naturally occurring mutations in the variety 'Alpowa,' used as checks to compare with EMS-derived Puroindaline mutations.
- Hexaploid and tetraploid accessions of *Triticum aestivum* (3,368 accessions) were scored for stem solidness and a subset for sawfly cutting. The best lines were selected for re-screening in 2015, and crosses were also made with the best lines to generate mapping populations.
- One *Oryza sativa* accession will serve as a control genotype for studies focused on the role of leaf starch in plant productivity. Unfortunately, the study is not designed for and has not identified any specific characteristics or adaptations that would be generally useful. However, one paper describes results using this genotype and transgenic derivatives.

- Twelve *Solanum* accessions, representing 5 different species, are being used in a project to study variation of amylose content in potato. The accessions were planted in the greenhouse, and leaves/tubers were screened for starch or amino acid profile for comparison with commercial potato varieties.
- Extension agents are evaluating apple varieties for their adaptation to different Montana regions; 25 *Malus* accessions representing 3 different species were received and placed at 10 research sites. Older cultivars from the germplasm collection are compared with more recent introductions, e.g. 'Honeycrisp,' 'Frostbite,' etc. The goal is to release a fruit tree growers guide with preliminarily cultivar evaluations this winter that will be updated every 5 years. They also have a Heritage Orchard Program that was started 3 years ago. They are now getting DNA from the trees in these 100 plus year old orchards. This data will supplement the Fruit Tree Growers Guide.
- Brian Wilkins, Butte, MT received 3 *Humulus lupulus* accessions. The goal is to evaluate these hops varieties in the in the high elevation, short growing season in Butte, MT.

New Mexico Report by Ian Ray and Dave M. Stout

Highlights of submitted report.

In 2014, 27 individuals from New Mexico placed 38 orders to request 569 accessions from the NPGS. Joseph Syncox of the Rare Vegetable Seed Consortium ordered the most accessions; his orders totaled 282 accessions representing various genera and species, primarily *Brassica*, *Cucumis*, *Helianthus*, *Zea*, and other genera. This represents 50% of the accessions ordered from NM in 2014. Information provided on the *Brassica* accessions indicated that they will be used in studies of world plant resources.

In other projects, 17 *Brassica* accessions will be used in a research trial to analyze seed mass in U.S. vs. foreign/native accessions and evaluate response; two manuscripts are underway from this work. *Pisum* and *Cucurbita* accessions were grown in Navajo demonstration gardens to identify accessions that are adapted to small garden plots in hot dry southwest environments. The larger goal of this project is to identify vegetables readily accepted by Native Americans that can be easily grown in home gardens to enrich the diet of diabetics within various tribal groups. *Malus* accessions were grafted with 85% success rate to various rootstocks suitable to the mountainous regions of northern NM. Evaluations will include winter injury and bloom date to identify materials that will flower after spring frost danger is past.

Oregon Report by Shawn A. Mehlenbacher

Highlights of submitted report.

Oregonians continue to use the PI system extensively. Users include state and federal researchers as well as private seed companies and private individuals. Oregon's requests from 135 users for plant germplasm through GRIN in 2014 make it a major user in the western region along with California and Washington. Selected highlights of use:

- In cooperation with Tom Molnar (Rutgers University), tests identified more than 100 Hazelnut accessions with a very high level of resistance to eastern filbert blight. Recent tests detected resistance in 15 selections from seeds collected in Turkey; high levels of resistance have also been detected in 12 selections of diverse origin.
- Hazelnut incompatibility testing using fluorescence microscopy over a 17-year project span was summarized in a paper published in the Journal of the American Society for Horticultural Science in March 2014.
- New hazelnut simple sequence repeat markers (113) were developed by B.P. Colburn from transcriptome sequences and characterized using 50 diverse hazelnut accessions.
- *Hordeum vulgare* 'Golden Promise' (PI 467829) was used by J. Leonard (Oregon State University) to create a physical map of the barley genome using radiation hybrids. This is a pilot project to develop preliminary data for future research in the barley genome.
- A key outcome of research by A. Liston (Oregon State University) on the genome of cultivated strawberry is the first complete resolution of its genome pregenitors. A longstanding, difficult question due to the complex octoploidy of the cultivated strawberry, the practical value of this information is that it will allow for the classification of particular gene sequences by their genome of origin. Anyone working to improve the strawberry, or other crops with polyploidy genomes, can make use of the method developed as part of this project to greatly simplify the analysis of genetic variation.

- Drs J. Lorang and T. Wolpert (Oregon State University) received accessions of *Oryzia*, *Sorghum*, and *Zea* in 2014 which they used to map genes for fungal toxin sensitivity. They noted “the service that the U.S. National Plant Germplasm System provides is crucial for our continued research efforts to fight plant disease.”

Utah Report by Kevin B. Jensen

Highlights of submitted report.

Fourteen germplasm users reported various uses of the materials received from NPGS:

- **The requested strawberry germplasm was used for a school project. Eagle Mountain, UT;**
- **An ARS scientist used NPGS *Poa* species in analyzing polyploid levels. USDA-ARS, Logan, UT;**
- **Both soybean and maize germplasm requested in 2014 were used to support our studies of plant-herbivore interactions in University of Utah, Salt Lake City, UT;**
- **Different wild sunflower species were tested for winter survival at Saratoga Springs, UT;**
- **Some apple germplasm accessions were used to test the feasibility of fruit production using polyculture versus the normal monoculture normally practiced in most production systems in Salt Lake City, UT;**
- **Two *Prunus cerasus* from the U.S. National Plant Germplasm System were grafted into an existing North Star cherry. Grafts were successful and survived the winter of 2014-2015 at Utah State Univ., Panguitch, UT;**
- **All of the germplasm that we requested in 2014 was used for observation and crossing for disease resistance studies at Utah State Univ., Logan, UT;**
- **An amateur planted seeds of *Corylus*, *Fragaria*, *Humulus*, *Lonicera*, *Pyrus*, *Ribes*, and *Rubus* species “in same conditions and exposed to various types of music playing my goal was to discover if music had any effect on the growth of the plants as well as to discover if these plants could thrive in the Utah climate with minimal attention” at Brigham City, UT;**
- **A research requested historically important pea mutations. These plants were grown and displayed as educational materials (outreach). Univ. of Utah, Salt Lake City, UT;**
- **An ARS research scientist requested NPGS material to fill the need to continue development of plant materials adapted to increased temperature, drought, and soil salinity for rangeland restoration to be successful in the western U.S. USDA-ARS, Logan, UT.**

Washington Report by Carol Miles

Highlights of submitted report.

In 2014, 174 Washington State residents requested and received 328 orders: 5,320 samples, 650 taxa, 258 species and subspecies, and 72 genera. Most common samples requested: *Triticum*, *Pisum*, *Solanum*, *Trifolium*, *Thinopyrum*, *Lactuca*, and *Malus*.

Of recipients, 52 were at universities (47 at WSU), 16 at USDA/WSDA, 35 with commercial firms, seed companies and nurseries, 20 with private research groups, 11 with non-profit organizations, 4 with schools and school gardens, and 36 were individuals for their own use. Response rate: 62 (40%) in 2015, 16% (38) in 2014, 33% in 2013 and 2012, 29% in 2011, and 22% in 2010. This is the first year we sent a followup reminder 2 weeks prior to the reporting deadline, which likely accounts for the high rate of response.

Usage:

- Adaptability testing of apples, pears and other various fruit at different locations (J. Baker, C. Blakey, F. DeFreytas, W. Howell, C. Polance, E. Simpson, J. White).
- Research on the adaptation of autumn-sown faba bean germplasm to southeastern Washington (E. Landry).
- Screening of *Pisum* lines for resistance to fusarium wilt and powdery mildew (C. Coyne).
- Germplasm evaluation for Verticillium wilt resistance in potential rootstocks for grafted watermelon (C. Miles, J. Wimer).
- Development of wheat breeding lines (C. Curwin-McAdams).
- Screening *Lactuca* accessions for germination under cold temperatures (C. Grahn, C. Miles).
- Acquisition of plant material for commercial nursery propagation and distribution (Cameron Nursery, Chickadee Nursery, Cummins Nursery, Raintree Nursery).

- Acquisition of native plants to illustrate the history of wild crops (J. Betz).
- Evaluation of plants for use in abandoned irrigation canals (C. Parker).
- Establishing a 4-H community garden and cooking club (S. Young).
- Conducting a study of *Trifolium pratense* for a winter cover crop (S. Hulbert).

Several recipients stressed the importance of the NPGS service, and noted in particular the increasing difficulty of obtaining germplasm for breeding uses from private sources, so that the NPGS is globally important for the development of new breeding programs.

Alaska Report by Dave Stout and Meg Gollnick, USDA-ARS-WRPIS, Pullman, WA

Highlights of submitted report.

In 2014, germplasm of plant species from the NPGS was requested and used by various Alaska State agencies, farmers, nurseries, hobbyists, and researchers in disciplines such as genetics, horticulture, botany, plant pathology, and agronomy. A total of 21 taxa were requested, and 41 different accessions were received. An email was sent out to the groups that requested germplasm, asking for information on the performance of the material received, but no responses were received to this request.

Arizona Report by Dave Stout and Meg Gollnick, USDA-ARS-WRPIS, Pullman, WA

Highlights of submitted report.

In 2014, germplasm of plant species from the NPGS was requested and used by various State agencies, farmers, nurseries, hobbyists, and researchers in disciplines such as genetics, horticulture, botany, plant pathology, and agronomy. In 2014, 54 groups in Arizona requested germplasm, and received 196 different accessions. An email was sent out to the groups that requested germplasm, asking for information on the performance of the material received, and 13 responses were received to this request.

Utilization of samples included evaluation of rubber content, viability studies in desert climates, propagation of adapted varieties, field and greenhouse trials, alternative growing areas for potato, climate studies and edible urban forests, establishment of local/regional cider production, gene regulatory networks regulating early endosperm/kernel development, hands-on outdoor learning for science education, genetic transformation studies for aflatoxin, and PTSD therapy.

Hawaii Report by Dave Stout and Meg Gollnick, USDA-ARS-WRPIS, Pullman, WA

Highlights of submitted report.

In 2014, germplasm of plant species from the NPGS was requested and used by various State agencies, farmers, nurseries, hobbyists, and researchers in disciplines such as genetics, horticulture, botany, plant pathology, and agronomy. In 2014, 24 groups in Hawaii requested germplasm, and received 103 different accessions. An email was sent out to the groups that requested germplasm, asking for information on the performance of the material received, and 10 responses were received to this request.

Utilization of samples included research of fractionation patterns of stable carbon isotopes in C4 plant biomass grown under elevated CO₂ conditions, using germplasm material as a fill/border seed in trials and increases, backup for Miami germplasm selection, propagation, breeding, and test marketing of fruit production, and setup of a Cacao family farm. Material arrived in good condition and germinated well in most cases. *Vaccinium reticulatum* seed failed to germinate in 2 attempts, and on the third attempt about 15 seeds germinated. There was also an issue with *Theobroma cacao*; the requestor stated that material he received was not properly selected and that the scions had no buds initiated.

Nevada Report by Dave Stout and Meg Gollnick, USDA-ARS-WRPIS, Pullman, WA

Highlights of submitted report.

In 2014, germplasm of plant species from the NPGS was requested and used by various State agencies, farmers, nurseries, hobbyists, and researchers in disciplines such as genetics, horticulture, botany, plant pathology, and agronomy. In 2014, 4 groups in Nevada requested germplasm, and received 98 different accessions. An email was sent

out to the groups that requested germplasm, asking for information on the performance of the material received, but only one response was received to this request.

Samples were utilized by R. Anderson (University of Nevada, Reno) in a grant funded by the National Science Foundation to quantify varying levels of root phenotypic plasticity in seedling perennial grasses. Project goals were to determine if there is a significant connection between seedling response to stress and geographic range size, determine the role of plasticity in transition between succession stages, and to offer land managers better knowledge about the establishment process for desired perennial grasses.

Wyoming Report by Dave Stout and Meg Gollnick, USDA-ARS-WRPIS, Pullman, WA

Highlights of submitted report.

In 2014, germplasm of plant species from the NPGS was requested and used by various State agencies, farmers, nurseries, hobbyists, and researchers in disciplines such as genetics, horticulture, botany, plant pathology, and agronomy. In 2014, 8 groups in Wyoming requested germplasm, and received 49 different accessions. An email was sent out to the groups that requested germplasm, asking for information on the performance of the material received, and 3 responses were received to this request.

Utilization of samples included physiological, anatomical, and genetic analyses, and plant tissue cultures in grapevine improvement studies to produce transgenic plants. Material was received in good condition and germinated well, with the exception of *Corylus* accession due to contamination from herbicide at the growing site. There was also a question regarding the NPGS's confidence in species assignments and if any genetic analysis is used to confirm species designations (R.L. Baker, University of Wyoming).

Site Reports:

Harold E. Bockelman, Curator, National Small Grains Collection, Aberdeen, Idaho

Highlights of submitted report.

The National Small Grains Collection (NSGC) presently holds 142,069 accessions of the small grains (wheat, barley, oat, rye, triticale, rice, and related wild species). NSGC distributed more than 50,000 accession samples in 831 separate requests in the past 12 months. Thirty percent of the distributions were to foreign scientists.

We 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 nearly all of the more than 28,000 landrace wheat accessions. We are continuing our efforts to capture voucher images of spikes, panicles, and seeds. The images and characterization data provides valuable information to both the germplasm user and for NSGC curation. During the past year kernel images of the cultivated oat collection (more than 10,000 accessions) were added to GRIN. Work is now proceeding on kernel images in the cultivated barleys.

Evaluations of NSGC wheat landrace accessions are continuing for reaction to the Ug99 stem rust race in Kenya. We 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 3,100 entries from U.S. public and private breeders and researchers.

Kim Hummer, National Clonal Germplasm Repository, Corvallis, OR

Highlights of submitted report.

Our federally-supported scientific permanent federal staff is now 10 permanent FTE. In addition we have 2.1 FTE part time federally funded staff. We received a programmatic increase in spring 2014 that helped reduce the effect of cuts in FY 2013. Four permanent employees retired recently; two positions are presently under recruitment and we will begin seeking a new scientist in fiscal 2016.

Stakeholder/Service Accomplishments

- 12,070 accessions, 65 genera and 748 taxa of 653 species of temperate fruit, nut, and specialty crops were conserved.

- Obtained a total of 103 new accessions and 203 new inventory items in CY 2014.
- Received a record number of 1,108 order requests and shipped 7,727 items in CY 2014.
- Improved the management and maintenance of 3200 accessions in the pear, hazelnut, quince and related tree field collections.
- Collaborated with NCGRP, Ft. Collins, CO, on cryopreservation protocols of dormant blueberry, hazelnut, pear, and currant.
- Served as advisory panel member for SCRI Research and Ext. Planning Project Seattle.
- Advised *Citrus* and *Malus* community on development of Global Conservation Strategies working with the Global Crop Diversity Trust.
- Participated on Governing Board for USDA National Clean Plant Network.
- Member of the organizing committee and editor of the proceedings for the ISHS IHC Symposium on Plant Genetic Resources.
- Provided tissue culture assistance to hop breeders for a hop mutation breeding project.
- Trained visiting scientist Dr. Larry Alice, Western KY State University, for 6 months in molecular marker techniques.
- Mentored an OSU Horticulture Department intern in tissue culture techniques for 9 months.
- Hosted two top industry technicians to work with hops tissue culture and cryopreservation.
- Meristemmed heat treated pear and hazelnut accessions for virus elimination.

Research Accomplishments

- Published the first high throughput 90K genotyping platform in strawberry an octoploid crop.
- Obtained samples of the threatened *Rubus bartonianus* from Eastern Oregon.
- Determined that *Vaccinium myrtillus* has tetraploid and hexaploid cytotypes in Oregon.
- Determined that *Rubus* species in Subgenus *Micranthobatus* have very small sized genomes.
- Reported on improved microsatellite markers for quince and analyzed genetic fingerprints of more than 100 *Cydonia* and *Pseudocydonia* germplasm accessions.
- Reported on successful development of microsatellite markers to assess genetic diversity and phylogenetic relationships of medlar (*Mespilus* sp.) accessions.
- Harmonized SSR profiles of pear cultivars with those from the Brogdale collection in England.
- Determined ploidy levels for *Rubus* species and related genera using flow cytometry.
- Completed pear rootstock *in vitro* rooting study for the pear industry.
- Completed *in vitro* raspberry mineral nutrition studies and produced improved growth media.
- Determined initial *in vitro* nutrient requirements for blueberry.

More than 463 visitors came through the Repository in 2014, including educational tours, a blueberry open house, and a tour by 28 summer students. International visitors, graduate students, and visiting scholars came from Argentina, Australia, Canada, China, Colombia, Ecuador, India, Japan, New Zealand, Spain, Turkey, and Thailand.

Tissue Culture and Cryopreservation (Barbara Reed and Jeanine DeNoma)

The in-vitro collection contains 1,241 accessions in culture as of December 2014, most of which were in cold storage. The 10-year collaboration with Dr. Irina Kovalchuk (Kazakhstan) is nearing completion. Micropropagation of apricot was improved and apricot seeds were successfully cryopreserved for the first time. Rooting protocols were improved for *in vitro* pear selections. An improved *Corylus* culture medium was developed. Sukalya Poothong completed her Ph.D. using surface response design to improve the response of raspberry cultivars to mineral nutrients. A metabolomics study was used to investigate the effects of meso components of mineral nutrition on plant metabolism and in collaboration with Fall Creek Nursery, we are evaluating *in vitro* growth medium for blueberry cultivars.

Molecular Genetics (Nahla V. Bassil)

M.S. student Natalia Salinas continued her work on strawberry, validating markers associated with remontancy; validating a marker associated with high soluble solids content; and using genotyping by sequencing (GBS) in octoploid strawberry. Dr. Lawrence Alice, Western Kentucky University, spent a sabbatical at NCGR implementing a new genomic sequence-based technique for phylogenetic analyses in *Rubus*. Projects in progress in 2014 included developing genomic tools for blueberry, testing markers associated with remontancy and high soluble solids content in strawberry, and black raspberry genomic resource development.

Tree Collections (Joseph Postman)

Pears: As of January 1, 2015, the NCGR *Pyrus* collection included 2232 clonal pear accessions and 335 seedlots representing 36 *Pyrus* taxa from 59 countries. Perry pears continue to be some of the most requested accessions, reflecting the surge of interest in hard cider in the U.S.

Hazelnuts: The *Corylus* collection consists of 860 living trees including 53 cultivars/selections and 407 wild species trees, representing 20 taxa from 36 countries. Several Eastern Filbert Blight (*Anisogramma anomala*) strikes were found in early 2015, making annual prophylactic fungicide sprays and pruning to remove infections essential. Propagation efforts continue in support of the establishment of field rows dedicated to *C. americana* and *C. heterophylla*, and to the re-location of various tree-hazel species to a separate plot. We are propagating the core collection (177 accessions) as self-rooted trees to replace the remote backup collection at the USDA genebank in Parlier, California. 8

Quince: The Corvallis genebank maintains 172 clonal accessions and 25 seedlots of *Cydonia* and the closely related genera *Docynia*, *Pseudocydonia*, *Pyronia*, and *Chaenomeles*. The various species of quince are represented by 9 taxa from more than 21 countries. SSR fingerprints generated using microsatellite markers developed at NCGR identified a number of identical accessions (either synonyms or misidentified trees). More than a dozen duplicate trees were removed from the *Cydonia* field plot, opening up vacant spaces for new, unique genotypes.

Distribution (Kim Hummer and Missy Fix)

Pears and strawberries topped the list of crops distributed in 2014; 7,739 items were shipped, including seeds, cuttings, runners, scionwood, rooted plants, tissue cultures, DNA and leaf samples, and informational material. More than 823 orders were shipped, while 856 new orders were received for small fruit and 179 new orders for scion or budwood. Domestic individuals, state agencies and universities, and ARS researchers received the most germplasm from Corvallis in 2014.

John Preece and Malli Aradhya, National Clonal Germplasm Repository, Davis, CA

Highlights of submitted report.

NCGR

Distributions of NCGR germplasm are primarily winter collected, dormant cuttings or scionwood; leaves, summer cuttings, pollen, fruit and other plant parts distributed as requested. Each item shipped is 3-5 cuttings/item (accession). The number of items shipped has shown a steady increase since 2002, relating to increasing order size. Most distributions (98.7%) are to domestic customers (Fig. 2). Of those domestic orders, 78.5% were to individuals, with the remainder shipped to federal and state agencies, colleges and universities, nonprofits, and commercial companies.

The 2015 orders are at an all-time high and have tripled since 2011. This overextended the resources of the NCGR and State of California phytosanitary inspectors, resulting in the last orders being delivered in June, rather than March. A new policy was adopted: we will ship to research and education entities when genetic diversity or genetic standards are a requirement. However, to not-for-profit horticultural groups such as the California Rare Fruit Growers, we will ship one large order each, which will shift the burden of paperwork and order sorting to these groups. We expect this to reduce our orders and shipping costs by up to 90%.

For the second time this year, *Vitis vinifera* accessions that were propagated from virus indexed plants from the UC Davis Foundation Plant Services (FPS), and grown under protection in a micromesh screen house were distributed. We have no plant pathologist on staff, so do not advertise these 200 accessions as virus indexed. This is a silent upgrade to our distributions. With ancient clonal crops, viruses are often present in the propagules being distributed.

NALPGRU

The NALPGRU distributed 94 orders in 2014 and 42 so far during 2015. The NCGR hosted 4 tasting events and The International Symposium on Energy and Protein Metabolism and Nutrition who had lunch at Wolfskill and a tour. Tours of the NCGR were provided to domestic and international individuals and groups.

General

Subtropical and temperate fruit and nut germplasm, with emphasis on walnut and wild grape, were collected in the Republic of Georgia during 2014, a total of 153 accessions. This year the NCGR received 232 new *Prunus*, representing

213 cultivars and 19 seedling families; 33 were from international sources through APHIS, and the rest from northern California sources. The NALPGRU has 25 new accessions in FY 2014.

During the past year, we budded 796 accessions, resulting in 3064 grafted rootstocks. Most of the rootstocks were clonal and donated to the NCGR by Duarte Nursery. Included in this was the re-propagation of the entire apricot collection. The University of California, Davis pulled out its peach cultivar block, which contained many valuable genotypes that were not in the collection, so we propagated 64 accessions, representing 8 species.

In a study designed to “mine” the collection for beneficial phenotypes, crosses were made with almond crop wild relatives (CWR) resulting in 190 hybrid genotypes from a set of peach x wild almond species and plum crosses. The goal is to develop disease resistant or tolerant rootstocks. The focus is on testing for susceptibility to crown gall and *Phytophthora* root rot followed by genotyping using the genotyping-by-sequencing (GBS) approach. A field trial was planted in May, 2014 looking at 4 NCGR accessions for their potential as dwarfing rootstocks for olive. Dwarfing rootstocks are needed for high density planting.

A plum/almond hybrid has established well in vitro and is being used to study the effects of refrigerated storage on health and survival of the microshoot cultures. The overall goal is to begin backing up the collections using in vitro and cold storage methods.

John E. Preece, Robert Krueger, and Manjunath Keremane, National Clonal Germplasm Repository for Citrus and Dates, Riverside, CA

Highlights of submitted report.

Inventory did not increase much in the period 2013 – 2014. Most propagations were made to replace trees already in inventory. NCGRCD acquired 22 new citrus accessions in the period 2013 – 2014, 10 of which established. A number of accessions were received from India. These were potentially HLB-resistant pummelos growing in southern India and collected by Dr M Keremane during a trip to that country. Unfortunately, the budwood collected was in poor condition and did not establish. However, several seedlings were established. In addition to two pathogen-tested accession received from CCPP, NCGRCD released 35 accessions from quarantine after in-house processing. These were also incorporated into the protected, pathogen-tested collection. Selected accessions will be planted in the field by CVC personnel for evaluation.

During the period 2013 – 2014, NCGRCD revised its quarantine/sanitation processing procedure. Formerly, biological indexing as required for quarantine release was performed after therapy and limited post-therapy testing. This has been revised so all required lab tests are performed before the release indexing. This should reduce the number of positives discovered during indexing and thus increase the overall efficiency of the process since the biological indexing is the most time and resource intensive step. Using this protocol, 19 inventory items were screened with lab tests and 16 that tested negative in all lab tests were selected for the 2015 release index. NCGRCD currently holds an additional 126 accessions in quarantine, and seeks commentary regarding prioritization of these accessions for sanitation.

In the period 2013 – 2014, NCGRCD distributed 1200 order items to 227 requestors. In terms of requestors, State personnel accounted for the largest group (24% of total requestors), with ARS personnel accounting for 19%, and international non-profit requestors accounting for 20%. In terms of order items, international non-profits accounted for 37% of the total order items distributed, whereas ARS accounted for 30% and State personnel for 15%. During the period 2013 – 2014, domestic requests accounted for approximately 2/3 of the total. This has been true for several years and is the opposite of previous patterns. Domestic private individual (UIND) category orders accounted for 18% of the total requests and 7% of the order items sent. This category is basically hobbyists. NCGRCD has historically tried to accommodate these types of requests but this may change depending upon NPGS actions and possible increased workloads.

In 2013 there were a total of 239 propagations of 194 different cultivars, and in 2014 there were a total of 449 trees of 186 different cultivars propagated. Most were screenhouse replacement trees (213), Citrus Variety Collection replacement (59), and CVC backup trees (123).

A mission critical need is additional screenhouse space. The screenhouse was scheduled to be rescreened in late 2013. Upon completion of re-screening of half of the structure, it was discovered there was a flaw in the screen used and it did not meet the APHIS standards. In addition, the screen manufacturer would not stand behind the product so additional expense was incurred. Even more critically, the Federal screenhouse space is inadequate. There is very little room for additional expansion of the protected, pathogen-tested collection. It is absolutely imperative that this structure be expanded in the next few years as new accessions are cleaned, tested and released.

Stephanie Green, National Center for Genetic Resources Preservation, Fort Collins, CO

Highlights of submitted report.

NPGS security backup status: 424,924 accessions, 82% seed collections and 15% clonal collections. Activities: conducted 7,494 germination tests on incoming seed, cryopreserved 145 clonal accessions, sent out 114 orders, shipped 19,340 accessions to Svalbard, Norway, and provided site tours for ~ 1000 people. Non-NPGS backup totaled 315,393; seed voucher samples were provided to Plant Variety Protection (7,944) and Journal of Plant Registration (1,737). Black-box storage was provided for CGIAR crop collections (with ICRISAT new for 2015), U.S. Forest Service, Center for Plant Conservation (rare and endangered native species), Botanical Gardens, American Indian tribes (*Fraxinus* sp.), and special collections. Approximately 76% of the W6 collection was backed up in 2014. By crop, *Eragrostis* accessions were 98% backed up, safflower 95%, orchardgrass 90%, and alfalfa, annual medic, Bromus, fescue, lentil, and ryegrass backed up 80-90%.

Emphasis is shifting on security duplication to ensure security backup for the remaining 12% through “critical backup” samples. About 25% of the base collection was last monitor tested 10-20 years ago and 24,863 samples have not been monitored in over 20 years. The goal for 2015 is 3,000 high priority monitor tests, with emphasis on short-longevity species. Wild species require more time and resources to process and test; we are amassing a knowledge base on large numbers of native taxa.

Emphasis is also shifting for the Clonal Base collection, with work proceeding on monocots (sugarcane, banana, pineapple), addressing CWR needs (*Solanum*, *Fragaria*), and using dormant buds as the main material for temperate trees and shrubs.

Jinguo Hu, Western Region Plant Introduction Station, Pullman, WA

Highlights of submitted report.

Managing the genetic resources in 5 curatorial programs in 2014: agronomy and grasses (Vicki Bradley), beans (Ted Kisha), cool season food legumes (Clare Coyne), temperate forage legumes (at Prosser, vacant), and horticultural/miscellaneous crops (Barbara Hellier). Conducting mission-related research were 4 research programs: agronomy (Richard Johnson), plant pathology (Frank Dugan), genetics (Jinguo Hu), and genetics at Prosser (Long-Xi Yu).

Alfalfa is the fourth most valuable crop in the United States; in a pedigree analysis of 500 U.S. alfalfa varieties, 69% had one or more parents that could be traced to a PI accession.

The approximate 9,000 accessions of alfalfa germplasm continue to provide needed genes for genetic improvement of this crop. A total of 14,353 packets of samples were distributed in the past five years.

Lettuce is one of the most popular fresh vegetables consumed in the U.S. with an annual farm-gate value over 2 billion since 2007. Public researchers and private breeders are relying on the genetic resources maintained by the W6 project to continue improving the lettuce crop to meet future challenges. During the past five years, we distributed a total of 9,492 packets of seed samples to researchers and breeders worldwide.

Seed zones were developed for guiding seed transfer of various native plant species. Restoration of U.S. deserts is increasingly needed as overgrazing, uncharacteristically frequent fires, and invasive weeds degrade rangelands. Using locally adapted genetic resources gives the highest probability of restoring landscapes to pre-disturbance conditions.

- On December 31, 2014, there were 95,636 plant accessions belonging to 1,101 genera, 4,804 species and 5,450 taxa in the WRPIS collection.
- Acquired 1,698 new accessions including 1,403 native plant accessions from the SOS (Seeds of Success) project, 43 accessions from the Republic of Georgia, and 85 accessions of *Miscanthus sacchriflorus* (Amur silver grass) as live plants.
- Distributed 33,536 packets of seed samples to 1,269 requestors in each of the 50 domestic states and 45 foreign countries; 57% (19,089 packets) distributed to the U.S, and 43% (14,447 packets) distributed to foreign countries. Approximately 36% (6,914) of the domestic distribution went to the 13 western states.
- Uploaded into GRIN database 65,164 observation data points on 24,816 accessions, for 157 established descriptors of 18 different crop species; collaborators contributed 18% and WRPIS staff collected 82% of the data.
- Entered 2,529 seed viability records into GRIN in 2014; Pullman tested 145 and NCGRP Fort Collins, CO tested 2,394 accessions.
- Packed and stored 2,775 newly regenerated/harvested inventories of a broad range of plant species; determined seed quantities of 15,043 inventories.
- Shipped 3,020 seed inventories to NCGRP, Fort Collins, Colorado and 451 inventories to Svalbard Global Seed Vault, Svalbard, Norway for secured backup.
- In collaboration with researchers at DuPont Pioneer and Alforex Seeds companies, identified single nucleotide polymorphism (SNP) markers associated with resistance to Verticillium wilt in two alfalfa populations using the high resolution melting technique. These identified markers are useful in marker-assisted breeding for improving resistance of alfalfa to Verticillium wilt.
- Collaborative activities supported by grants from BLM Seeds of Success project, Great Basin Restoration Initiative, and Forest Service have substantially advanced native plant collections needed for research and development of plant materials. Research with key native species has provided evaluation data, linked genetic variation with climate, and resulted in adaptation-driven seed zones to guide germplasm selection after fire and other disturbances.
- Our Research Plant Pathologist continued to demonstrate useful information on blue mold of garlic and other bulb crops. We assessed experimentally their pathogenicity on garlic and two varieties of table onion. This is the third in a series of studies addressing the identification and host range of agents of blue mold on bulb crops.
- The faba bean germplasm enhancement research progressed satisfactorily. Several enhanced faba bean germplasms and advanced breeding lines are currently being processed for public release.

New Proposal

New proposal needs to be written in such a way that state representatives can participate. Use broader and more general objectives that had been used previously (see 2009-2014 proposal) and revise as needed to be current and forward thinking. Jinguo will write the new proposal with the assistance of his staff by November, and state representatives will review by February.

Approval of 2014 minutes

Dan Parfitt moved that the 2014 minutes be approved, motion was seconded by Carol Miles, the motion passed unanimously.

Nomination of Officers

Jack Martin agreed to serve as Secretary starting at the 2016 meeting.

Open Discussion

For states where there is no W6 TAC representative, it was suggested that the provision of travel funds might provide the needed incentive to attend the annual meeting. It was also suggested to look at the list of germplasm recipients in

each state that is missing representation, and ask a university recipient in each state if they would like to serve as the state representative on the TAC.

Future Meeting Location

A motion was made by Carol Miles and seconded by Dan Parfitt to hold the 2016 meeting in June in Fort Collins, CO. The motion was passed unanimously.

Resolutions:

1. The W-6 TAC thanks Dr. Jinguo Hu, Ms. Carla Miles and Ms. Gwen Pentecost, for organizing, hosting and providing IT and AV support, and the field tour for the 2015 W-6 meeting in Pullman, WA.
2. The W-6 TAC supports the efforts of Jinguo Hu and James Moyer to replace potential lost seed production land due to the future airport expansion with appropriate land resources.
3. The W-6 Technical Advisory Committee thanks Roger Chetelat for his excellent presentation about the role and function of the Tomato Genetic Stock Collection at Davis, CA.
4. The W-6 TAC thanks RC Johnson, Long-Xi Yu, Frank Dugan, Clarice Coyne, Ted Kisha, Barbara Hellier and Vicki Bradley for their insightful presentations on the use of WRPIS collections and associated research.
5. The W-6 TAC appreciates the efforts of Dave Stout and Meg Gollnick to collect germplasm reports from non-reporting states –AZ, AK, HI, NV and WY.
6. The W-6 Technical Advisory Committee thanks Mr. Wayne Olson for his many years of service as the Farm Manager of WRPIS in Pullman, WA and wish him well in retirement.
7. Be it resolved that the W-6 TAC urges PGOC to address the issue of NPGS genebanks awareness of and compliance with state quarantine regulations.

Motions were made by Carol Miles and seconded by Joe Kuhl to accept the resolutions as written. The motions passed unanimously.

FY 2015 Budget

The W-6 FY2015 budget proposal is \$415,204, which is 0.025% increase as compared to 2015, and does not provide adequate inflation (2.5%). There is strong concern that the project was only approved for 2 years instead of the standard 5 years. The new project proposal will be written for 5 years, commensurate with other regions, and it must be compelling and stress stakeholder impact as well as scientific discovery and resource conservation. There is a need for each state representative to communicate the NPGS mission and outputs to their station directors. Dan Parfitt moved to endorse the budget at \$415,204, Joe Kuhl seconded. The motion passed unanimously.

Adjourn

At 3 pm, a motion was made by Dan Parfitt to adjourn, seconded by Joe Kuhl, and passed unanimously.