Annual Report for Calendar Year 2010

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Samples of morphological diversity of the *Phaseolus* germplasm collection
(see cover story on page 3).

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EXECUTIVE SUMMARY AND HIGHLIGHTS

The Western Regional Plant Introduction Station (WRPIS) is one of the most extensive and well-established genetic resource management stations in the US National Plant Germplasm System (NPGS). WRPIS currently holds over 87,000 accessions and public and private sector researchers worldwide rely on a continual supply of germplasm to provide new genes for improving the existing crops and for developing new crops to ensure global food security. Activities at WRPIS focus on collecting, preserving, evaluating, documenting and distributing important plant species assigned to the station and conducting research related to its primary mission. This station includes nine SYs (Scientist Year) in six service programs (five curatorial and 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 Pullman Station; the 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 14% 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 and equipment operations for germplasm regeneration, seed increase and evaluation. We achieve our goals through close collaboration among sites and scientists in various disciplines such as agronomy, horticulture, plant pathology, entomology, genetics, plant physiology and botany. As part of a Regional Research Project (W-006), 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. In 2010, WRPIS continued to provide needed plant genetic resources and relevant information to the global crop plant research community. Our scientists published 12 research papers in peer-reviewed journals and made 24 oral or poster presentations at various international, national and regional conferences.

The following are the 2010 high-lights:

- As of December 31, 2010, there were 87,441 accessions belonging to 3,734 species (4,124 taxa) of 826 genera.
- We distributed 22,212 seed packets (15,434 accessions) to 739 requesters from 46 countries in 983 seed orders. Among them, 13,083 (59%) packets were sent to addresses in the USA and 9,129 (41%) packets to foreign countries.
- We entered 45,092 observation data points of 168 descriptors 20 crops on 9,876 accessions into the GRIN database in 2010.
- We acquired 3,524 new accessions including 1,353 *Phaseolus* from CIAT, 1,249 native plant accessions from the Seed of Success (SOS) project, and 211 *Brachypodium distachyon* from two US research labs and 174 *Lupinus* from Germany.
- We regenerated 2,908 inventories from a broad range of plant species and the seeds were packed and stored.

- Inventory quantities were determined on 10,673 inventories by weighing; Germination test was carried out on 2,362 inventories (989 in Pullman and 1,147 in Ft. Collins) for viability record.
- We shipped 2,392 seed inventories to the NCGRP, Fort Collins, Colorado and 4,706 inventories to the Svalbard Global Seed Vault, Longyearbyen, Svalbard for secured backup.
- Completed a study of assessing and mapping genetic variation in relation to climatic variables and developed seed zones for the Great Basin forb, tapertip onion. These seed zones will provide guidelines for restoring landscapes of the rangelands.
- Analyzed the genetic variation of supine bluegrass samples collections from 46 locations across the Italian Alps. Based on molecular marker variation and correlations with climatic variables, these samples can be divided into three broad genetic groups.
- Isolated white rot pathogen, *Sclerotium cepivorum*, from a garlic sample collected in Moscow, ID. This is the first report of this devastating disease for all *Allium* species including onions, garlic, leeks, chives and wild onions in eastern Washington and northern Idaho. We are implementing necessary precautions to prevent our fields from becoming infected since WRPIS maintain germplasm of garlic and wild onions.
- Made satisfactory progress in applying the high throughput GoldenGate Genotyping Assay to lettuce germplasm. In collaboration with UC Davis we designed an OPA (Oligo Pool Assay) targeting 384 SNP loci that is capable of disclosing adequate levels of polymorphism among lettuce cultivars and appropriate for assessment of genetic diversity and population structure of the whole lettuce germplasm collection.
- Completed a two-year study to quantify the extent of dry bulb mite infestation levels in the U.S. garlic germplasm collection at the Western Regional Plant Introduction Station. Collaborative fumigation trials with USDA-ARS scientists at Parlier, California to mitigate damaging mite infestations are in progress.

Cover: Samples of morphological diversity of the *Phaseolus* germplasm collection The US *Phaseolus* germplasm collection is managed by WRPIS. Currently, there are 17,106 accessions belonging to 30 species in the collection, which are important raw materials for researchers worldwide to improve bean productivity through breeding for food security of the rapidly rising world population. Here is what Dr. Molly Welsh, Curator of the *Phaseolus* germplasm collection says about the collection: "Variety?? BEANS have it all: flower colors ranging from reds through purples to pure white, leaf shape from lanceolate to triangulate, and almost any seed color & pattern one could imagine. Eating beans is good for your health and most important of all – they taste good too!" Picture composed by Molly Welsh.

REPORT

ADMINISTRATION

Ralph Cavalieri (Administrative Advisor)

Ann Marie Thro (CSREES Representative)

Michael Fitzner (CSREES Representative)

Peter Bretting (ARS National Program Staff)

Andrew Hammond (ARS, PWA Area Director)

Jinguo Hu (Research Leader and Station Coordinator)

Jannis Bacani (Program Support Assistant)

Personnel

There were some changes for the research and curatorial staff during 2010. One technician, John Connett, left the station and this vacancy was filled by Melissa Scholten, who had been working in the Agronomy research program for a few years. Research Entomologist Stephen Clement retired on December 31 after 33 years of service in ARS. The station, with the support from the Area office and National Program Staff, abolished this research position in order to use the resources on preservation of priority crop germplasm. Thirty-seven WSU students were hired as part time helpers for field, greenhouse and laboratory activities throughout the year due to the labor-intensive nature of our operation.

Research Project

No change to report.

Funding

The FY 10 budget for WRPIS was $2,469,800 (Pullman, WA) and $271,000 (Prosser, WA) for a total ARS budget of $2,740,800. This allowed for $21,976 discretionary dollars per SY. In addition, we received $405,288 'in kind' support from a CSREES Multi-State Research Project W-6, through Washington State University. Projected discretionary funds per SY were $35,561 for FY11 and $31,829 for FY12.

Our staff scientists have received the following grant funds: 1) $150,000 of Reimbursable Agreement with Bureau of Land Management by Dr. Richard Johnson entitled "Maintenance Characterization, Storage and Distribution of Key Native Germplasm." This grant supports two temporary full time employees (a GS-11 supporting scientist and a GS-6 technician), other temporary help, supplies and travel; 2) $14,000 of Germplasm evaluation grant to Jinguo Hu for faba bean winter hardiness screening, 3) $13,000 of grant to Clarice Coyne for pea germplasm evaluation and 4) $10,500 of germplasm evaluation grant to Vicki Bradley and Ted Kisha for evaluation of *Eragrostis tef* accessions in the field.

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). A major maintenance/repair project was replacing the main air conditioning condensing unit for the Head House 109 Complex. The old unit was over 25 years old and started to malfunction in 2009. The new unit uses environment-friendly refrigerant and is more energy efficient. Other reportable purchases included new 2011 Ford pickup truck to replace a 1968 pickup for watering transplants and spray applications on the Pullman farm, an Unispec vegetation reflectance system for measuring differences leaf color, chlorophyll and other leaf factors potentially related to plant adaptation and a Partec CyFlow® Ploidy Analyzer for determining ploidy of germplasm accessions for taxonomic identification.

GERMPLASM MANAGEMENT

The crop species assigned to WRPIS by the National Plant Germplasm System (NPGS) can be roughly divided into 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. Figure 1 shows the number of accessions for major crop groups maintained at WRPIS. Currently, WRPIS ranks number three among the 31 sites of NPGS for both seed and clonal germplasm repositories in terms of number of accessions managed. As of May 4, 2011, WRPIS held approximately 16.3% of the total NPGS holding of 541,000 accessions. Most WRPIS accessions are maintained as seed, with a small proportion (garlic and its relatives and some ornamentals) that is vegetatively-propagated.

As of May 4, 2011, there were 88,702 accessions belonging to 4,296 species in 851 genera. These are managed by five curatorial programs: The Agronomy Program (Vicki Bradley) manages 23,180 accessions of grass and Safflower. The Cool Season Legume Program (Clarice Coyne) curates a total of 22,015 accessions of pea, chickpea, lentil, faba bean and lupine. The Beans Program (Molly Welsh) manages the *Phaseolus* germplasm of 17,106 accessions. The Temperate Forage Program (Stephanie Greene) manages the germplasm of alfalfa, clover, lotus and wild clovers with a total of 12,951 accessions. The Horticultural Program (Barbara Hellier) cares for 9,726 accessions of garlic, sugar beet, lettuce and many miscellaneous species that have potential use for ornamental or medicinal purposes. In addition, there are 3,724 accessions of native species generated by the research 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.

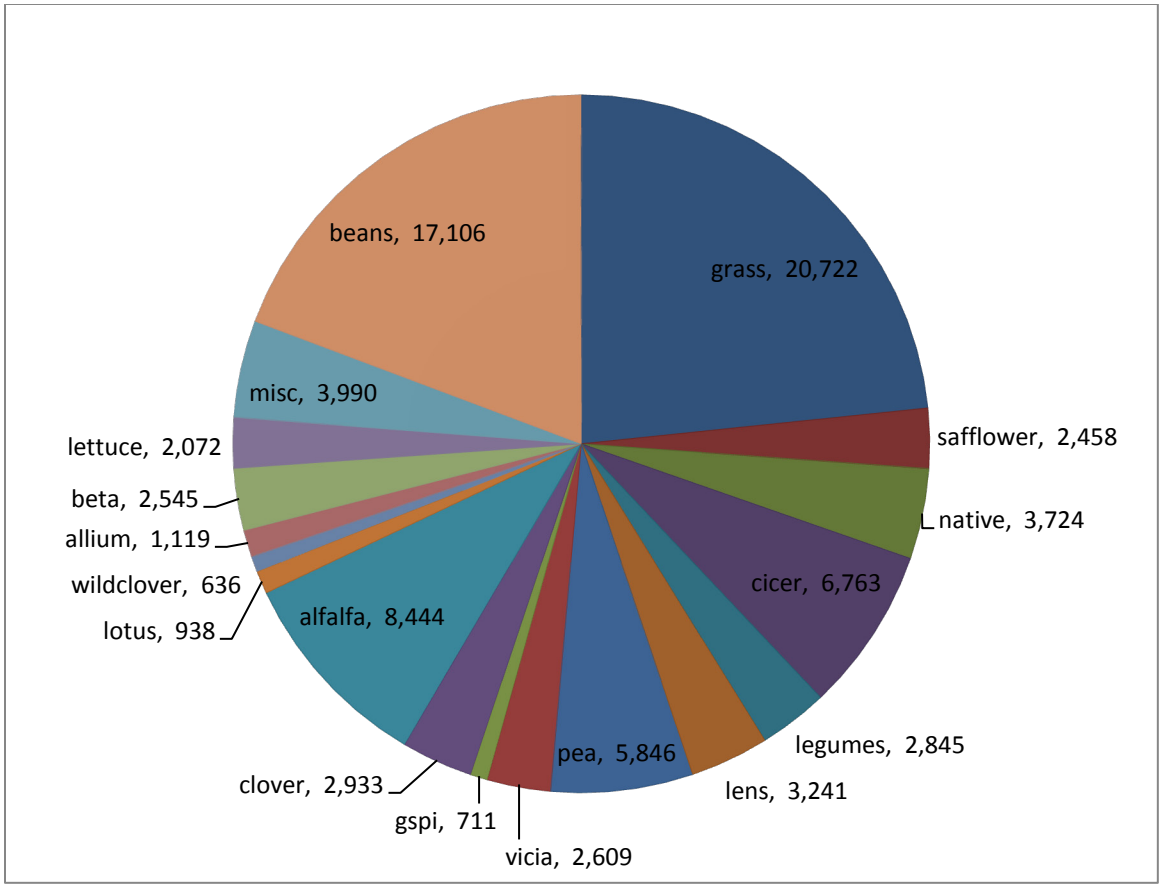

Figure 1. Number of accessions for major crop groups maintained at WRPIS, as of May 4, 2011, totaled at 88,702 (gspi=pea genetic stock collection).

Germplasm Acquisition

A successful international collection trip was carried out by WRPIS Horticultural Crops Curator Barbara Hellier. This trip was sponsored by the Plant Exchanging Office and took place from Jun 9 to 26. Barbara and Dr. Lee Panella, Research Leader for the Sugarbeet Research Unit in the ARS Crops Research Laboratory in Fort Collins, CO went to the southern Atlantic coast of Morocco and brought back 16 new accessions of *Beta vulgaris* ssp *maritima* and 15 of *Patellifolia patellaris* (previously *Beta patellaris*), which is part of the tertiary gene pool for sugar beet.

Domestic collection activities in 2010 include the following: 1). A trip to Florida conducted by WRPIS Phaseolus Germplasm Curator Molly Welsh and ARS Plant Exchange Office Karen Williams. They collected six *P. polystachios* accessions. Among these, five samples belong to *P. polystachios* subsp. *polystachios* and one sample is identified as *P. polystachios* subsp. *sinuatus*. This trip was supported by a plant exploration grant to Molly. 2). A few collection trips to Nevada, Oregon and Idaho by Research Agronomist Richard Johnson and Plant Biologist Michael Cashman for collecting native plants. A total of 1,249 accessions of native plant accessions were added to our collection. This native plant project is supported by a grant to Richard from BLM (Bureau of Land Management).

Other acquisition occurred through established collaborators of WRPIS scientists. Molly obtained 1,353 *Phaseolus* accessions from CIAT (International Center for Tropical Agriculture in Columbia and Cool Season Food Legume curator Clarice Coyne got 174 *Lupinus* accessions from Germany. The growth of WRPIS holdings (number of accessions) is shown in Figure 2.

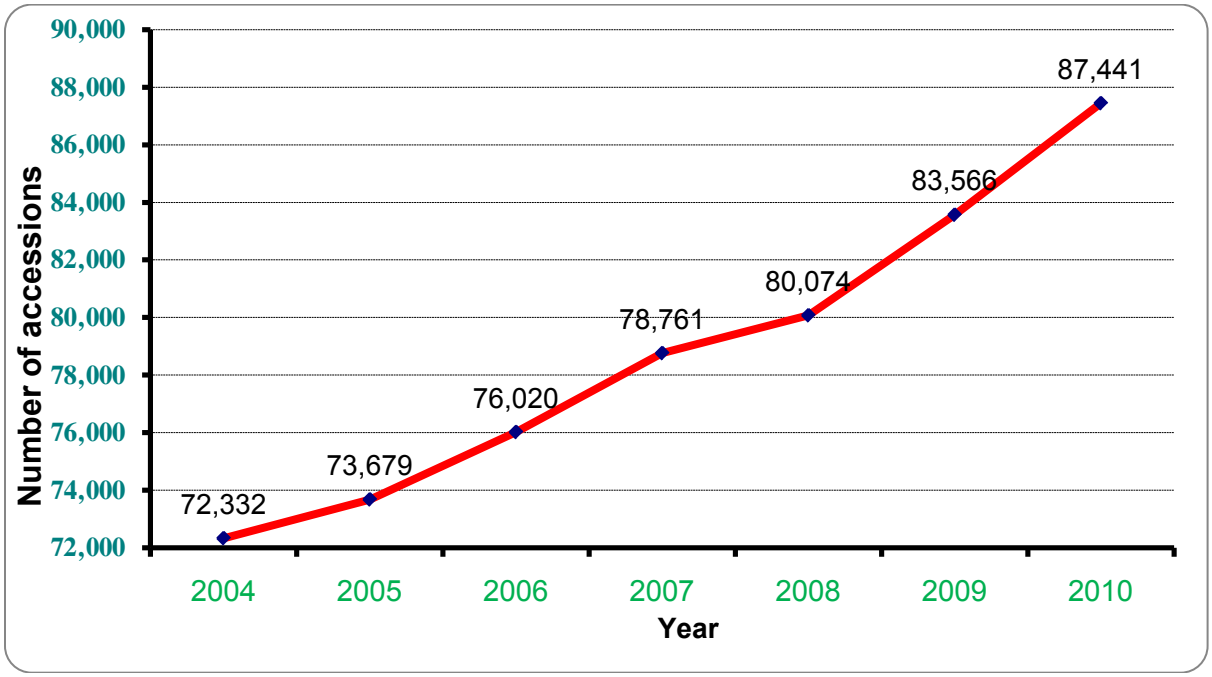

Figure 2. Changes of total number of accessions managed by WRPIS since 2004. The numbers were recorded at the end (December 31) of each calendar year.

Germplasm Curation

In 2010, we regenerated 2,908 inventories from a broad range of plant species and the seeds were packed and stored. Inventory quantities were determined on 10,673 inventories by weighing. Germination test was carried out on 2,362 inventories (989 in Pullman and 1,147 in Ft. Collins) for viability record.

We shipped 2,392 seed inventories to the NCGRP, Fort Collins, Colorado and 4,706 inventories to the Svalbard Global Seed Vault, Longyearbyen, Svalbard for secured backup. The followings are brief summaries of the five individual curatorial programs:

Medicago, *Trifolium* and *Lotus* collections

In 2010, 282 accessions were regenerated, including 120 new acquisitions collected in Ukraine and Armenia in 2008 and 2009 respectively. 100 new alfalfa wild relatives collected throughout Russia and CIS countries were obtained from the Vavilov Institute, Russia. Distribution included 411 Lotus, 1972 *Medicago*, 199 alfalfa standard checks and 440 *Trifolium* seed packets. An analysis was carried out to assess the global ex situ status and in situ conservation of *Medicago* species in Eastern Europe and Central Asia. Gaps for wild relative species of alfalfa outside of the *Medicago* sativa complex were identified, as well as a geographic gap in Siberia. Seven protected areas were identified that could

serve as in situ reserves for 89% of the *Medicago* species native to the region studied. This analysis will be used to guide acquisition in the US collection and in situ efforts in Russia, the Caucasus region, Ukraine and Central Asia. We have finished increasing seed of 53 inbred lines of the *Medicago truncatula* core collection developed in cooperation with the Noble Foundation. Due to concerns that the MT core subset included species other then MT, we grew out all 323 accessions of *Medicago truncatula* in the greenhouse during the winter to verify taxonomy. We found that 15 accessions were species other then MT, and 10 accessions were species mixtures. 6 out of 64 accessions in the core were not MT. The core is now being refined by the Noble Foundation.

Phaseolus collection

In 2010, we regenerated and increased 401Phaseolus accessions and were able to see return on many wild and hard to increase species. The new lights in GH 109 have allowed increased seed to be of greater number and better quality than in the past.

Cool Season Food Legume collection

In 2010, 1,550 accessions were regenerated, including 1170 single-plant-derived lines. 48 accessions were backed up at NCGRP. 24 new accessions were donated/collected to the collection. 174 new *Lupinus* accessions are being accessioned (assigned W6 designation) from Germany. An additional 466 plots of faba bean accessions were grown for observation data and experimental seed regeneration.

Grasses and Safflower collections

In 2010, we planted 450 grass accessions for regeneration, the majority of which will be harvested in 2011. Two hundred grass accessions and 208 safflower accessions were harvested in 2010.

Horticulture Crops collections

In 2010, we had 622 field plots for increase/regeneration: 47 accessions of miscellaneous broadleaf taxa, 33 accessions of Great Basin *Allium acuminatum*, 33 accessions of *Lomatium disscetum*, 20 accessions of *Taraxacum kok-sagyz*, 62 accessions *Lactuca sativa*, 18 accessions of *Beta nana* for seed increase(and morphologic data collection), 3 accessions of *Beta vulgaris*, 328 plots of *Allium* for bulb regeneration, 16 *Allium sativum* accessions for cryopreservation, 8 *Allium sativum* accessions for Pathology Program research, and 54 accessions of *Rheum* as back-up for the Palmer, AK station. We also increased/regenerated 27 accessions of *Beta* and 9 accessions of *Lactuca sativa* and 20 accessions of *Lactuca serriola* in the greenhouse.

Germplasm evaluation and characterization

In 2010, a total of 45,092 observation data records were entered in GRIN on 9,876 accessions on 168 descriptors of 20 different crops. Six per cent of the data came from cooperators and the other 94% came from personnel at our station. Data records by crop are as following: 418 for alfalfa, one for wild *Allium*, 6 for *Astragalus*, 4,558 for chickpea, 455 for clover, 9,295 for faba bean, 1,043 for cool-season grasses, 12 for *Lathyrus*, 474 for lentil, 1.013 for lettuce, 595 for lupine, 474 for medicinal plants, 10,448 for pea, 14,009 for *Phaseolus*, 1,803 for safflower, 4 for sugar beet, 311 for trefoil, 2 for trigonella, 66 for vetch and 15 W-6 miscellaneous species.

Using spatial and temporal genetic variation to conserve a vulnerable narrow endemic legume, *Trifolium thomsonii*

Four populations of Thompson clover representing the geographic range of the species were sampled in 1995, 2004 and 2009. AFLP markers were used to examine genetic variation and population structure. Nei's genetic diversity, % polymorphic loci, # of unique alleles, genetic distance and differentiation were estimated. Variation was partitioned using AMOVA and isolation by distance was tested using Mantel tests. Population structure was assessed by Bayesian analysis using Structure 2.3. We found that the smallest and most isolated population was the most genetically diverse, and that diversity had significantly declined over time. There was no significant change in diversity over time for the other 3 populations, although there were changes in allele frequency. A hierarchical analysis partitioned 0 % among years, 11 % among populations and 89 % of the molecular variance within populations. All four populations had significant but low levels of differentiation and significant correlation between genetic and geographic distance suggesting isolation by distance. However, the presence of admixture and significant linkage disequilibrium among all population suggested a small level of gene flow occurs. We determined that 3 out of four of the populations need to be protected to conserve unique alleles and 99% of the diversity in the species. At the present time only one population is protected, although all four populations are conserved ex situ.

Cool Season Fool Legume Curator Clarice Coyne obtained a grant for pea germplasm evaluation. In 2010 more than18,000 descriptor data points and images were collected and entered or submitted for entry into GRIN. These include additional 1,911 digital images of flowers, pods and plants on *Cicer, Lens, Pisum, Vicia, Lupinus*, and *Lathyrus* were taken and all entered into GRIN for the CSFL program crops grown in 2010. Field and greenhouse collection of descriptor data activity focused on the accessions under regeneration at Pullman farms. Completed for pea germplasm, evaluating Aphanomyces disease resistance in replicated field trial in 2 locations (MN & OR); and fusarium wilt evaluation of germplasm in one location.

Funded by a germplasm evaluation grant to Agronomy Grasses and Safflower Curator Vicki Bradley, we evaluated 367 *Eragrostis tef* accessions on the Central Ferry Farm. Plot and head images were taken and 11 descriptors were recorded. The images and data will be uploaded to GRIN in 2011. In addition, Leaf tissue samples from individual accessions were collected for DNA extraction and genotyping to assess genetic diversity at the molecular level.

Germplasm distribution

After unusual high numbers of distributed seed packets in the previous two years, the WRPIS distribution returned to its normal level in 2010 (Figure 3). During 2011, 22,212 packets were distributed to 739 requesters in 46 countries. Among these, 15,434 (59%) went to requesters with mailing addresses from 49 US States and 9,129 (41%) packets to foreign countries. Comparing to the previous year, there was a 53% drop in foreign distribution, which resulted in a 40% drop in our total distribution. On the other hand, domestic distribution only doped approximately 10% (from 17,114 to 15,434 packets).

Grasses are the most requested category with over 5,000 packets distributed in 2010. The number of distributed packets for *Phaseolus*, *Medicago*, *Cicer* and *Pisum* ranged between 1,000 to 3,000.

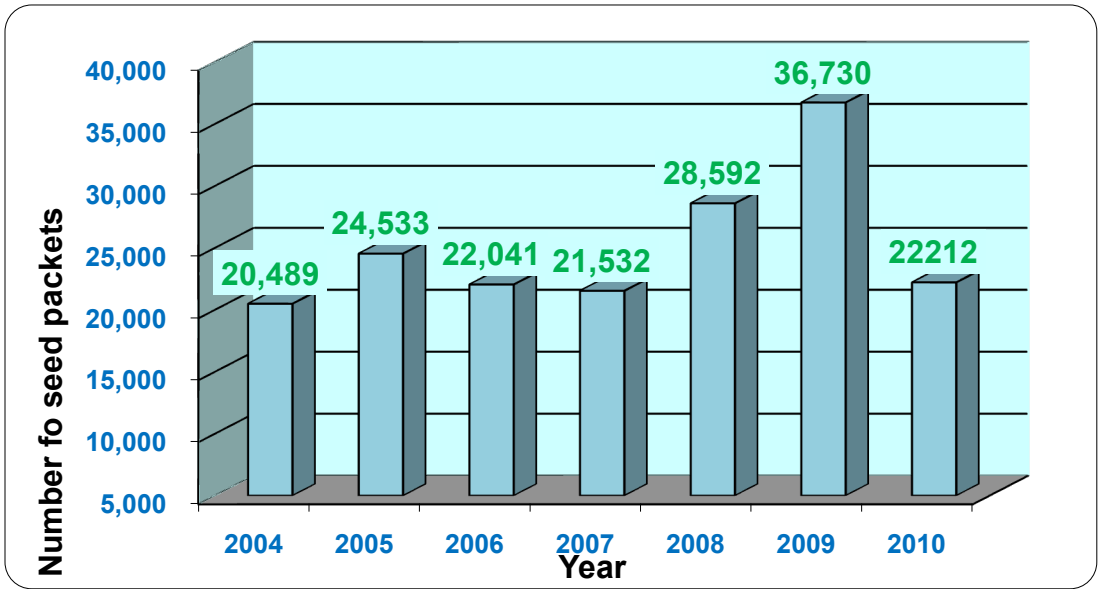

Figure 3. Number of seed packets distributed annually by WRPIS from Year 2004 to Year 2010.

MISSION-RELATED RESEARCH

Agronomy

Development of seed zones for the Great Basin forb, tapertip onion

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. Yet this has been hampered by a lack of seed transfer guidelines ensuring that plant materials used are both suited to local environments and not overly restrictive. A study was conducted to assess and map genetic variation in relation to climatic variables and develop seed zones for the Great Basin forb, tapertip onion (*Allium acuminatum*). Bulbs from 53 Great Basin locations grown at Central Ferry and Pullman, WA, sites were evaluated for morphological, phenological, and production traits in replicated common gardens. There were strong differences among plant traits at both common gardens indicating genetic variation across the Great Basin. In most cases temperature and precipitation variables at source locations correlated with important developmental and production traits such as bolting date and seeds per plant. Plants from cooler, wetter locations had generally later bolting and more seed production. Statistical models fitting plant traits to climatic variables were developed resulting in nine basic seed zones for the Great Basin (see figure below). Since these zones are expected to contain populations that vary genetically, we also recommend that whenever possible numerous populations be utilized within zones as composite populations. This approach will promote sustainable restoration and genetic diversity for natural selection into the future.

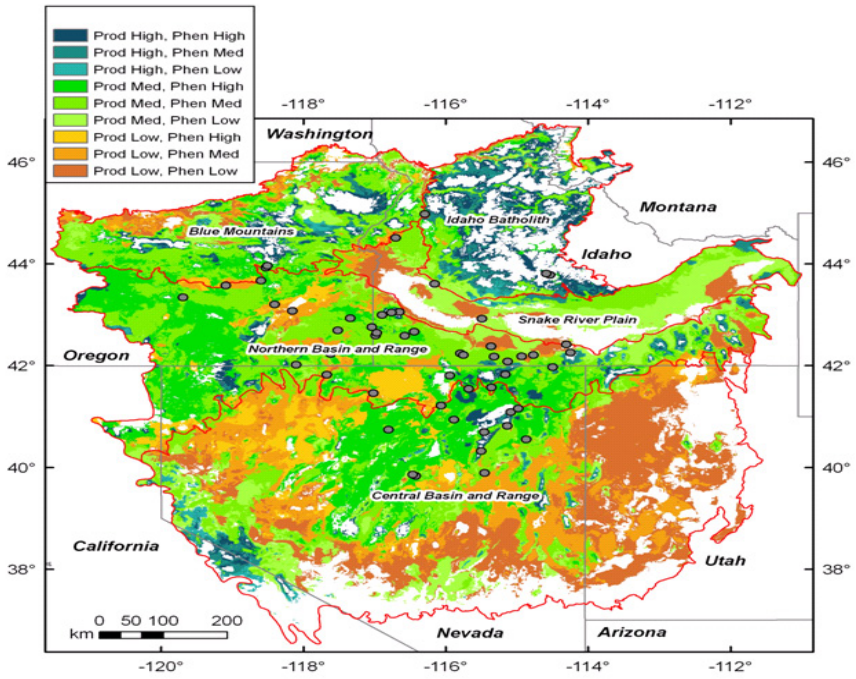

Figure 4. Proposed seed zones for *Allium acuminatum* over level III Omernik ecoregions based on overlays of regression models of principal component (PC) analysis of phenology and production with climate variables. The circles show collection locations. The range of PC 1 scores for phenology and production traits were divided by thirds into high, middle and low categories and overlain to give nine seed zones. Mapping was confined to the range of observed PCs scores with unmapped areas shown in white. The contours were a ± P=0.05 confidence interval based on the regression model error.

Analysis of genetic variation of supine bluegrass

Supina bluegrass (*Poa supina* Schrad.) has potential for expanded use as a turf grass, yet an understanding of its genetic variation using DNA markers is limited. Research was carried out to characterize molecular marker variation and determine correlations with climatic variables on leaf collections from 46 locations across the Italian Alps. This study has shown considerable molecular genetic variation among supina bluegrass collected in the Italian Alps. The collections differentiated into three broad genetic groups, with the majority of the variation residing within groups (see figure below). There was frequent correlation of certain dimensions of the data with climatic variables at collection locations leading us to hypothesize that differences in plant phenotypes will also vary with climate. An evaluation of plant traits and an expanded study of marker data is needed to determine if and to what extent markers can be used to associate differences in plant traits with climatic variation or to desirable agronomic and turf traits. Small quantities of seed from many vegetative collections have been produced with cooperators in Italy. Along with the *in situ* seed collections, these are now being increased at the

WRPIS to make as many collections as possible available for continued research on supina bluegrass.

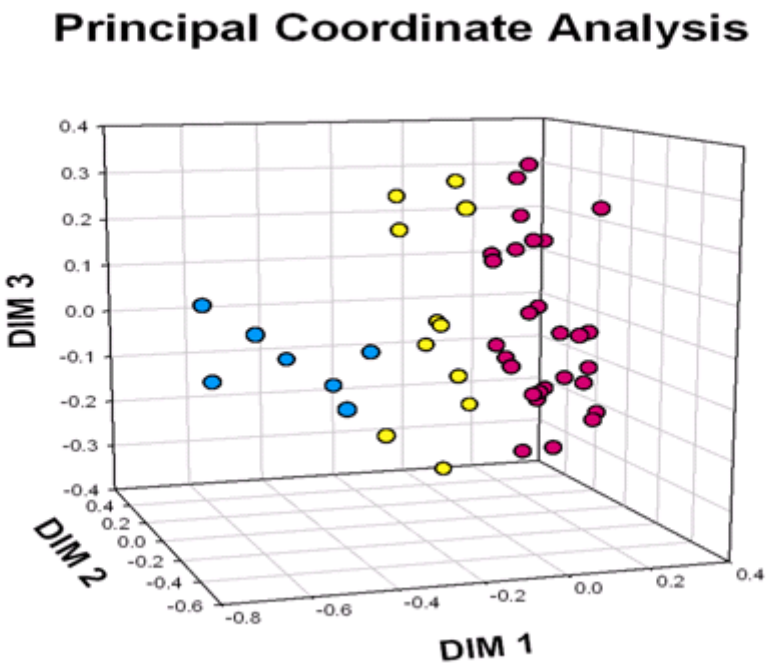

Figure 5. Principal coordinate scores for Dimensions (Dims) 1, 2, and 3 showing the three genetic groups differentiated as revealed with the STRUCTURE program. Genetic group 1 is shown in blue, group 2 in yellow, and group 3 in red.

Entomology

A non-toxic *Neotyphodium* endophyte strain

A non-toxic *Neotyphodium* endophyte strain was discovered in a wild timothy (*Phleum alpinum*) accession from Argentina. Its non-toxic, novel status was established after AgResearch-New Zealand scientists requested and received seed and plant material from Dr. Steve Clement. The New Zealand scientists characterized the alkaloid profile of the symbiotum. In a series of experiments, this symbiotum constitutively expressed antibiosis resistance to the bird cherry-oat aphid, but not to cereal leaf beetle.

Quantifying the extent of dry bulb mite infestation levels in the U.S. garlic germplasm collection

Dr. Clement completed a two-year study to quantify the extent of dry bulb mite infestation levels in the U.S. garlic germplasm collection at the Western Regional Plant Introduction Station. In addition, he set-up and conducted collaborative fumigation trials with USDA-ARS scientists at Parlier, California to provide a possible method to control damaging mite infestations. This is cooperative work with Barbara Hellier, Horticulture Curator.

Genetics

Lettuce germplasm characterization and evaluation: We initiated a collaborative project with UC Davis Genome Center to fingerprinting out lettuce collection with the high throughput platform, GoldenGate assay, which can simultaneously genotype 384 SNP

(single nucleotide polymorphism) loci in one reaction. Initial results indicated that the newly designed OPA (oligo pool assay) for 384 SNPs, LSGermOPA, is capable of disclosing adequate levels of polymorphism among lettuce cultivars and is appropriate to be used for assessment of genetic diversity and population structure of the lettuce germplasm collection. Results from 148 accessions were presented at the 3rd International conference of plant molecular breeding in October 2010. We also grew out 1,200 accessions in Salinas for field evaluation and five breeders from the private industry were invited to take note on the plots.

Faba bean germplasm evaluation and enhancement: Funded partially by a germplasm evaluation grant to Research Leader Jinguo Hu, fifteen faba bean accessions with good cold tolerance were tested for the third year. These accessions survived in Central Ferry while killed in Pullman during the second year trial. Seeds harvested and were planted in both locations in October 2010. We also conducted a field evaluation study on 466 faba bean accessions in Pullman, WA. All accessions germinated and grew very well through the season. We took photos and collected descriptor data on all the accessions. We observed a high level of diversity for many agronomic traits in the collection. A total of over 9,000 data points including days to first flower, number of pods per node, number of pods per plant and number of seed per pod (average of 5 pods) were entered into the NPGS' GRIN (Germplasm Resources Information Network) database.

One of the most significant findings was the presence of plants with pure white flowers in our collection. There are two accessions that consisted of only white flowered plants and 11 accessions that segregating for white and regular colored flowers. Faba bean has high-protein content (20 to 35%) for human and animal nutrition. However, the presence of condensed tannins in faba bean negatively affects protein digestibility. Two recessive genes, zt-1 and zt-2, control the absence of tannins in faba bean seeds and also determine the white flower character on the plant. These available white flowered germplasm will be useful for developing white flowered cultivars with low or zero tannins content and improved nutrition value for both animal and human. An international collaborative project to investigate the allelism of the zero-tannin genes among the US, Chinese and French germplasm collections is under way.

We harvested the seeds with a combine and the bulked seeds were planted in October-November, 2010 at four locations (Garfield, Dayton, Pullman and Central Ferry) in the Palouse region for screening winter hardiness. Pullman is the coldest location and the survival rate is the lowest as observed in April 2011. The survived plants on Pullman farm will be transplanted into an insect-proof cage and crossed to each other to further improve winter hardiness.

Plant Pathology

Molecular and morphological characterization and host ranges of fungi attacking edible and/or ornamental bulbs

We have expanded work with *Fusarium* and *Pencillium* species (attacking onion and garlic) to other fungal pathogens (including *Sclerotium cepivorum* and the black *Aspergillus* species) attacking bulbs of ornamental and garden plants. In collaboration with scientists from Cornell and Washington State University, we are examining molecular, metabolic and morphological characters, plus host ranges, of various fungi

attacking garlic, onion, tulip and other bulb-forming plants. A research paper on resistance to *Penicillium allii* in National Plant Germplasm System *Allium* accessions was published.

Discovered white rot pathogen (*Sclerotium cepivorum*) from a garlic sample from Moscow, ID

From a garlic sample from Moscow, ID, we isolated *Sclerotium cepivorum*, the causal agent of white rot. White rot is the most devastating disease for all *Allium* species including onions, garlic, leeks, chives and wild onions. This soil borne pathogen can form sclerotia which can survive in the soil for decades. It had not been reported in eastern Washington and northern Idaho before. This finding is very important since WRPIS maintain germplasm of garlic and wild onions and the contaminated area is only miles away. Precautions are necessary to prevent our fields from becoming infected.

New host-fungus records pertinent to WRPIS crops and/or their weedy associates

We are currently generating more experimental data on environmental tolerances and preferences of *Clonostachys rhizophaga*, recently documented as a pathogen of chickpea here in North America as well as in Syria. A manuscript on new reports of powdery mildews of regional plants (a weed, an ornamental plant, and a garden plant) has been published.

COMMITTEES, PRESENTATIONS AND RECOGNITIONS

During 2010 WRPIS scientists and curators effectively outreached and interacted with our stakeholders, customers and general public by actively serving as committee members or chairs of the respective national Crop Germplasm Committees (CGC) and other academic or social organizations. Research Agronomist **Richard Johnson** continued to be the Chair of the International Safflower Germplasm Committee, a member of the Committee for seed zones development, Great Basin Restoration Project, a member of the Program Committee for Western Forest Genetics Association Meeting and active Ex-officio member of the Forage and Turf grass CGC. He also serves as a member of the graduate student committee of the Department of Crop and Soil Sciences, Washington State University and advised a MS student on research project. Research Entomologist **Steve Clement** is a member of the International Affairs Committee, Entomological Society of America. He also serves as a member of one PhD graduate student committee, Department of Entomology, Washington State University and hooded the student at graduation. Research Geneticist and Research Leader **Jinguo Hu** was the co-organizer of the Use of Molecular Markers in Plant Breeding Workshop of the International Plant and Animal Genome Conference, Member of International Organizing Committee and the co-Chair of the Program Committee of the 3rd International Conference of Plant Molecular Breeding which took place in October 2010 in Beijing, China. He continued to serve as an Associate Editor for Crop Science. Research Plant Pathologist **Frank Dugan** is a member of the American Phytopathological Society APS), the Canadian Phytopathological Society**,** the Mycological Society of America, the North American Mycological Association, the Western Society of Weed Science and the Northwest Scientific Association. He is a member of the Collections and Germplasm Committee of the APS. He also serves as an Associate Editor for the journal of North

American Fungi and as of 2011 serves on the Editorial Board of APS Press. He holds adjunct faculty positions at both Washington State University with Department of Plant Pathology (having one graduate student and serving on graduate student committees) and University of Idaho with Forest Resources (serving on graduate student committee). Geneticist **Theodore Kisha** is an adjunct scientist of Department of Crop and Soil Science, Washington State University, a member of American Society of Horticultural Science and a collaborator of the Center for Research on Invasive Species and Small Populations (CRISSP, University of Idaho). Horticulture Curator **Barbara Hellier** is the 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). She serves as the Board member of the Potlatch Growers Group Organizing committee, a member of the WSU Land Use Committee and a member the WSU Arboretum Committee. Agronomy Curator **Vicki Bradley** is the Ex-officio member of Forage and Turf Grass CGC (Descriptor Subcommittee) and New Crops CGC. She manages the Turfgrass Breeders Association's PVP Standards Program. She served as the Vice Chair of the International Safflower Germplasm Committee. She is also an Adjunct scientist with the Department of Crop and Soil Science at WSU. Vick also served as a member of the Plant Germplasm Operations Committee (in situ subcommittee) and a member of the ARS Pullman Location EEO and Outreach Committee. Cool Season Food Legumes Curator **Clarice Coyne** is on the Board of Directors of the North American Pulse Improvement Association, and is an Associate Editor for BMC Genomics Journal, a member of the NPGS 3rd Curator Meeting Program Committee, Ex-officio member of the Food Legume CGC, Pea CGC, Clover and Special Purpose CGC, and a member of the Plant Germplasm Operations Committee and Molecular Marker sub-committee. She served on Washington State University graduate student research committee's: two PhD and one MS graduate student committees and served as host and mentor for Washington State University visiting scientist, Yogesh Kumar, from India. Clare judged Future Farmer's America Conference state-wide competition in "Rituals" for the 2010 Washington State Finals and organized and delivered ARS local People's Garden initiative vegetables for Pullman Location EEO Committee. 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. She is a member, of International Union for the Conservation of Nature, Crop Wild Relative Specialist Working Group and a founding member of the Consortium for Legumes in Agriculture, Society and Environment and the Chair of the PGOC Subcommittees- GIS and Georeferecing and Crop Wild Relatives. She is also the Local Chapter Chair of Slow Food Southeast Washington. *Phaseolus* Curator **Molly Welsh** serves as a member in the following organizations: *Phaseolus* CGC, Bean Improvement Cooperative Genetics Committee, W1150 Regional Project and Seed Savers Exchange.

WRPIS scientists and curators were actively engaged in conducting mission-related research and in serving the scientific community. They made a total of 36 oral or poster presentations at either scientific or general public meetings, contributed three book chapters and published 12 peer reviewed scientific journal papers in 2010. They were invited to review research manuscripts by editors of the following scientific journals:

BMC Genomics, Theoretical and Applied Genetics, Crop Science, Genome, Plant Breeding, Theoretical and Applied Genetics, Genes and Genomics, Euphytica, Genetic Resources and Crop Evolution, Pisum Genetics, Plant Pathology, Journal of Plant Registrations, Mycologia and Plant Disease. They also reviewed research proposals submitted to the following funding organizations: National Science Foundation, European Science Foundation and Agriculture and Agri-Food Canada (AAFC).

PUBLICATIONS

a) Peer Reviewed Journal Papers Published in 2010

Peer reviewed journal articles (12):

Attanayake, R.N., D.A. Glawe, K.E. McPhee, F.M. Dugan, and W. Chen. 2010. *Erysiphe trifolii* - A newly recognized powdery mildew pathogen of pea. Plant Pathology 59: 712-720. DOI: 10.1111/j.1365-3059.2010.02306.x.

Bensch, K., J.Z. Groenewald, J. Dijksterhuis, M. Starink-Willemse, B. Andersen, B.A. Summerell, H.D. Shin, F.M. Dugan, H.-J. Schroers, U. Braun and P.W. Crous. 2010. Species and ecological diversity within the *Cladosporium cladosporioides* complex (*Davidiellaceae, Capnodiales*). Studies in Mycology 67: 1-94. DOI: 10.3114/sim.2010.67.01.

Casler, M.D., R.C. Johnson, R.E. Barker, M.M. Jenderek, Y.A. Papadopoulos, and J.H. Cherney. 2010. Feasibility of Seed Production from Nonflowering Orchardgrass. Crop Sci. 50:35–42.

Clement S.L. and Elberson L.R. 2010. Variable effects of grass-Neotyphodium associations on cereal leaf beetle (*Coleoptera: Chrysomelidae*) feeding, development and survival. J. Entomol. Sci. 45:1-7.

Coyne, C.J., McGee, R.J., Mattinson, D.S., Fuch, S., Fellman, J.K. 2010. Preliminary assessment of the genetic diversity of *Pisum sativum* USDA core seed collection for seed sugar composition and concentration. Pisum Genetics 41:49-50.

Hellens, R.P., Moreau, C., Wang, K., Schwinn, K., Thomson, S., Fiers, M., Frew, T.J., Murray, S.R., Hofer, J., Jacobs, J., Davies, K.M., Allan, A.C., Bendahmane, A., Coyne, C.J., Timmerman, G.M., Ellis, N.T. 2010. Identification of Mendel's white flower character. PLoS One. 5 (10) e13230. doi:10.1371/journal.pone.0013230.

Johnson, R.C., V. J. Erickson, N. L. Mandel, J. B. St Clair, K. W. Vance-Borland. 2010. Mapping genetic variation and seed zones for *Bromus carinatus* in the Blue Mountains of Eastern Oregon, U.S.A. Botany 88: 725–736.

Johnson, R.C., W.J. Johnston, F.B. Bertoli, and C.T. Golob. 2010. Seed yield, development , and variation in diverse *Poa pratensis* accessions. Crop Sci. 50:337-344.

Kwon, S.J., J. Hu and C.J. Coyne. 2010. Genetic diversity and relationship among faba bean (*Vicia faba* L.) germplasm entries as revealed by TRAP markers. Plant Genetic Resources. 8:204-213.

Pecetti, L., R. C. Johnson, M. Romani, M. Bassignana, and G. Della Marianna. 2010. Ecological characterization of supina bluegrass (*Poa supina* Schrad.) germplasm from the Italian Alps. Grass and Forage Science doi: 10.1111/j.1365-2494.2010.00766.x.

Smykal, P., Kenicer, G., Flavell, A.J., Kosterin, O., Redden, R.J., Ford, R., Coyne, C.J., Maxted, N., Ambrose, M.J., Ellis, T.N. 2010. Phylogeny, phylogeography and genetic diversity of *Pisum* genus. Plant Genetic Resources. 1-15 doi:10.1017/S147926211000033X.

Yue, B., B.A. Vick, X. Cai and J. Hu. 2010. Genetic mapping for the Rf1 (fertility restoration) gene in sunflower (*Helianthus annuus* L.) by SSR and TRAP markers. Plant Breed. 129:24-28.

b) Others (book chapters, conference proceedings, research progress reports and popular presses)

Attanayake, R., W. Chen, D.A. Glawe, and F. Dugan. 2010. Powdery mildew of lentil, pp. 49-51 in: Compendium of Chickpea and Lentil Diseases and Pests, W. Chen, H.C. Sharma, and F.J. Muehlbauer eds., APS Press, St. Paul, Minnesota.

Bradley, V.L. 2010. Isolation Distance, Inflorescence Sampling, and Population Size: Maintaining Genetic Diversity in the U.S. Temperate Grass Germplasm Collection. *In* Proceedings of 2010' International Symposium of Forage, Turf-grass and Biofuel Germplasm Research, October 9 -13, 2010, Yangling City, China. p. 100 -103.

Dugan, F.M., K.P.R.N. Attanayake, D. Glawe, and W. Chen. 2010. Powdery mildew of chickpea, pp. 51-52 in: Compendium of Chickpea and Lentil Diseases and Pests, W. Chen, H.C. Sharma, and F.J. Muehlbauer eds., APS Press, St. Paul, Minnesota.

Newcombe, G., and F.M. Dugan. 2010. Fungal pathogens of plants in the Homogocene, pp. 3-34 in: Molecular Identification of Fungi, Y. Gherbawy and K. Voigt eds., Springer, New York.

Clement S.L., Husebye D.S. and Eigenbrode S.D. 2010. Ecological factors influencing pea aphid outbreaks in the US Pacific Northwest, pp. 107-128 in: Aphid Biodiversity under Environmental Change, Kindlmann P, Dixon AFG, Michaud JP, eds. Springer, Dordrecht.

Hu, J. 2010. Genetic linkage maps: strategies, resources and achievements, pp. 79-109 in: Hu, J., Seiler, G., Kole, C., Eds. Genetics, Genomics and Breeding of Sunflower. Science Publishers. Enfield, New Hampshire.

Vick, B.A., J. Hu. 2010. Future Prospects, pp. 313-326 in: Hu, J., Seiler, G., Kole, C., Eds. Genetics, Genomics and Breeding of Sunflower. Science Publishers. Enfield, New Hampshire.

Appendix 1

Western Regional Plant Introduction Station
Current Staffing List as of December, 2010

Position	Name	Federal or State	Posit. Type
Pullman Station			
Research Leader/Station Coordinator	Jinguo Hu	Fed	PFT
Research Geneticist (postdoc)	Soon-Jae Kwon	Fed	TFT
Program Support Assistant	Jannis Bacani	Fed	PFT
IT Specialist	Gwen Pentecost	Fed	PFT
Seed Manager/Computer Specialist	Dave Stout	Fed	PFT
Plant Technician	**Paula Lundt**	**Sta**	**PFT**
Farm Manager, Pullman	**Wayne Olson**	**Sta**	**PFT**
Plant Technician	**Jacqueline Cruver**	**Sta**	**PFT**
Plant Technician	**Sean Vail**	**Sta**	**PFT**
Farm Manager, Central Ferry	Kurt Tetrick	Fed	PFT
Plant Technician	**Mark McGee**	**Sta**	**PFT**
Research Entomologist	Steve Clement	Fed	PFT
Biological Science Technician	Leslie Elberson	Fed	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	PFT
Plant Biologist	Michael Cashman	Fed	TFT
Biological Science Technician	Kelcie Mosely	Fed	TFT
Geneticist	Theodore Kisha	Fed	PFT
Biological Science Technician	Lisa Taylor	Fed	PFT
Agronomy Curator	Vicki Bradley	Fed	PFT
Biological Science Technician	Bob Guenthner	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	Corey Wahl	Fed	TFT
Biological Science Technician	Marie Pavelka	Fed	PFT
Phaseolus Curator	Molly Welsh	Fed	PFT
Plant Technician	**Julie Thayer**	**Sta**	**PFT**
Prosser Station			
Forage Curator	Stephanie Greene	Fed	PFT
Biological Science Technician	Martha Cervantes	Fed	PFT
Biological Science Aid	Jesus Prieto	Fed	TFT

Appendix 2

Scientific and Service Activities

January 5, Jinguo Hu participated in a teleconference called by Dr. Richard Michelmore, Professor and Director of the UC Davis Genome Center to discuss the lettuce proposal to be submitted to SCRI of NIFA. Dr. Hu was invited to serve as a member of the Lettuce SCRI proposal Advisory Committee.

January 8, Clarice Coyne presented seminar at Cropping Connections Workshop, at WSU Northwestern Washington Research and Extension Center, Mount Vernon, WA.

January 8-14, Jinguo Hu attended the 18th International Conference on Plant and Animal Genome (PAG) and chaired the "The Use of Molecular Markers by Plant Breeders" Workshop on January 9.

January 12, Bill Luna attended WSU CAHNRS Safety committee meeting.

January 19, Jinguo Hu visited Dr. John Vogel of the Genomics and Gene Discovery Research Unit in Albany, CA and discussed an issue of handling *Brachypodium distachyon* genetic resources.

January 21, Barbara Hellier attended the WSU Arboretum Committee monthly meeting.

January 25–28, Barbara Hellier attended the Great Basin Restoration Plant Selection and Increase annual meeting, Salt Lake City, UT.

January 26, Bill Luna attended Wilbur-Ellis pesticide education seminar. Spokane, WA.

January 27, Barbara Hellier presented "*Allium acuminatum* Seed Production: First Look at Cultural Parameters" at the Great Basin Restoration Plant Selection and Increase annual meeting, Salt Lake City, UT.

February 1 -5, Vicki Bradley, Clarice Coyne, Stephanie Greene, Barbara Hellier, Jinguo Hu, Dave Stout and Molly Welsh attended the NPGS' 3rd Curators workshop, Atlanta, GA.

February 2-3, Clarice Coyne presented two seminars, "Converting Published Data to Descriptors" and "Carbohydrate Studies in Green Pea Germplasm" at the NPGS' 3rd Curator's Workshop, Atlanta, GA.

February 3, Stephanie Greene presented a talk entitled "Georeference Project: update and data review issues" at the NPGS' 3rd Curator Workshop Atlanta, GA.

February 8-9, Bill Luna attended WA Department of Agriculture Pesticide License re-certification training, Moscow, ID.

February 11, Barbara Hellier presented a Horticulture Crops program update to WRPIS at the Unit Food and Fact Fest, Central Ferry, WA.

February 11, Clarice Coyne presented a seminar on "2009 Studies on Genetic Diversity of Cool Season Food Legume Germplasm" at WRPIS Food and Fact Fest, Central Ferry, WA.

February 16, Bill Luna attended USDA-ARS Pullman location Health and Safety committee meeting.

February 18, Barbara Hellier attended the WSU Arboretum Committee monthly meeting.

February 18, Richard Johnson was invited to speak "Creating Seed Zones for Native Plants: Examples for Mt. Brome and Tapertip Onion" at the Society for Ecological Restoration Workshop, Tulalip WA.

February 23, Richard Johnson was invited to speak "Developing Seed Zones for Native Forbs and Grasses" at the Workshop on Seed Production of Native Grasses and Forbs, Ontario OR.

February 25, Barbara Hellier provided collection and propagation information to stake holder, Dr. Mike Grusak, regarding *Scorpiurus*.

February, Jinguo Hu, at the invitation of the Israel Science Foundation (ISF), reviewed a research proposal entitled "Natural populations of rare wild *Lactuca* spp.: An eco-geographical and taxonomical study" and submitted to ISF.

March 3, Barbara Hellier attended the WSU Land Use Committee meeting.

March 10, Theodore Kisha gave an oral presentation to perspective USDA interns regarding USDA research in Pullman Location.

March 11, Bill Luna attended WSU CAHNRS Safety committee meeting.

March 15, Theodore Kisha met with CRISSP members at the University of Idaho to review applicants for the 2010 Research Experience for Undergraduates program funded through a grant from the National Science Foundation.

March 15, Clarice Coyne presented a seminar to legume breeding group at Institute of Crop Sciences, Chinese Academy of Agricultural Sciences, Beijing, China on USDA Grain Legume Breeding and Genetic Resources.

March 15-17, Barbara Hellier and Jinguo Hu attended the California Leafy Greens Research Council meeting, Coalinga, CA.

March 16, Jinguo Hu presented an oral talk entitled "Lettuce germplasm collection in the National Plant Germplasm System"at the California Leafy Greens Research Program Meeting in Coalinga, CA.

March 23, Clarice Coyne attended the Workshop and Regional Cooperation Meeting on Genetic Improvement and Breeding of Cool Season Legume Crops, Kunming, China, and presented "USDA Grain Legume Breeding and Genetic Resources: the future of genomic-assisted breeding."

March 23, Frank Dugan presented "Resistance in *Allium* accessions to *Penicillium* decay" at the 56th Annual Soil Fungus Conference, Mt. Vernon, WA.

March 25, Richard Johnson consulted with Dick Auld, Rockwell Chair, and Zach Hinds, Texas Tech University, concerning safflower germplasm for use in AFLP evaluation.

March 25, Richard Johnson consulted with Stephanie Pearl, University of Georgia, and advised on growth stages of safflower.

March 25, Vicki Bradley, Lisa Taylor and Theodore Kisha served as judges for the Art, Technology, and Science Fair at Jefferson Elementary School in Pullman.

March 29, Stephen Clement was invited to present "Anti-Insect Properties of Grass Endophytes for Plant Resistance to Insects" at the International Plant Resistance to Insects Workshop, Charleston, SC.

March through December, Stephen Clement reviewed 22 journal articles submitted to seven peer reviewed journals and reviewed two NSF proposals.

April 5, Richard Johnson provided data to Andy Bower, USFS, who requested our data for research validating provisional seed zones.

April 14, Richard Johnson consulted for Art Weisker of SeedTec/Cal Oils on Safflower, regarding identification of winter hardy plants.

April 20, Bill Luna attended WSU CAHNRS Safety committee meeting.

April 25-29, Jinguo Hu attended the 5th International Food Legume Research Conference and presented two posters: 1. "Evaluating winter-hardiness of faba bean (*Vicia faba* L.) accessions from the USDA NPGS collection" and 2. "Genetic diversity and phylogenetic relationship among 151 faba bean (*Vicia faba* L.) germplasm entries as revealed by TRAP markers" in Antalya, Turkey. He also visited a former collaborator in the Trakya Agricultural Research Station in Edirne, Turkey after the conference.

April 29, Barbara Hellier provided information to Peter Bretting, USDA National Program Leader and Lauren Axely, USDA legal counsel, regarding the Beta collection.

April-May, Richard Johnson had consultations with BLM and USFS to determine provisional seed zones for the Great Basin based on historical temperature and precipitation data; part of Great Basin Restoration Project developing protocols; and wrote justification for procedures.

May 4, Vicki Bradley received an Unsung Heroes Award from the Office of Professional Employees of the USDA for a high level of service to the public directly related to her duties.

May 10 -13, Barbara Hellier travelled to Salinas, CA to participate in planting Lactuca sativa descriptor data collection and demonstration plots.

May 11, Barbara Hellier participated in conference call for the Palmer, AK curator selection committee.

May 11, Bill Luna attended USDA-ARS Pullman location Health and Safety committee meeting.

May 11, Bill Luna attended WSU CAHNRS Safety committee meeting.

May 12, Jinguo Hu, along with Dr. Soon-Jae Kwon and Barbara Hellier, planted 1,200 cultivated lettuce accessions from Pullman genebank on the Spence research Farm in Salinas, CA for field evaluation in collaboration with our ARS lettuce research group in Salinas.

May 13, Theodore Kisha and Gwen Pentcost attended a free ESRI, GIS Conference in Spokane, WA

May 16-18, Stephanie Greene attended the Consortium for Legumes in Agriculture, Society and Environment (Invited) Noble Foundation, Ardmore, Oklahoma "USDA Temperate Forage Legume Germplasm Collection: current capacity and research objectives."

May 17, Barbara Hellier provided information on the garlic collection and cultural practices to stake holder, Joe Rutherford.

May 18, Richard Johnson was invited to speak "Genecology and seed zones for native grasses and forbs" at the National Native Seed Conference, Snowbird UT.

May 20, Theodore Kisha participated, as an adjunct scientist, in the Washington State University, Crop and Soil Science curriculum meeting for Plant Breeding and Genetics.

May 26, Barbara Hellier provided *Lactuca* descriptor information to Seed Savers Exchange lettuce curator.

May, Stephen Clement attended WSU Commencement and co-advised PhD student in Entomology and Hooded her at graduation.

June 5-August 8, Theodore Kisha mentored Intern with the NSF Research Experience for Undergraduates Program with the University of Idaho GIS and landscape genetics analysis of *Pao supina*

June 8, Theodore Kisha participated, as an adjunct scientist, in the second meeting of the Washington State University, Crop and Soil Science curriculum meeting for Plant Breeding and Genetics.

June 8 -24, Barbara Hellier participated in collection mission to Morocco targeting wild Beta species.

June 24, Vicki Bradley was a tour guide, photographer, and classroom helper for the Life Science camp at WSU.

June 24, Theodore Kisha volunteered as a tour guide of Washington State University events and demonstrations for 5^{th} – 8^{th} grade students of the SKWANT summer camp.

July 1, Stephen Clement was invited to present "Bioprospecting Grass-Endophyte Symbiota for Research and Agronomic Applications at the International Symposium on Endophytes of Grasses, Lexington, KY.

July 8, Jinguo Hu invited five lettuce breeders from private seed companies to observe the lettuce germplasm field evaluation plot in Salinas, CA.

July 2-7, Jinguo Hu attended the Fifth International Congress on Legume Genetics and Genomics in and presented a poster entitled Pacific Grove, CA.

July 2-8, Clarice Coyne Co-authored one oral presentation of "Association mapping of yield candidate gene homologs in a diverse collection of pea (*Pisum sativum* L.) lines" and two poster presentations "Assessment of 275 world-wide collected chickpea (*Cicer aiertinum* L.) Accessions using molecular approaches and

"Inheritance and linkage study of several morphological traits in lentil (*Lens culinaris medikus* subsp. *culinaris*)" at Fifth International Congress on Legume Genetics and Genomics, Pacific Grove, CA.

July 2-8, Soon-Jae Kwon attended and presented two posters at the 5th International Congress on Legume Genetics and Genomics, Pacific Grove, CA.

July 7-9, Barbara Hellier traveled to Salinas, CA to collect descriptor data on the Lactuca sativa plots.

July 23, Barbara Hellier provided garlic collection and cultural information to stake holder, Avram Druker.

July 26-29, Jinguo Hu attended the Joint PGOC/CGC Chairs/RTAC meetings (The W-6 Technical Advisory Committee annual meeting was held on July 27) in Geneva, NY.

July 27, Stephanie Greene attended the CGC Chairs Meeting, Geneva, NY

July 28, Stephanie Greene made two presentations at the PGOC Meeting: 1) NPGS Georeferencing project, 2) Summary of preliminary draft of the US National Inventory of Crop Wild Relatives.

July 1-31, Theodore Kisha mentored student under the USDA Summer Intern program, Pullman, WA.

August, Molly Welsh was interviewed by Tim Steury for an article about beans in one of the WSU publications.

August 1–6, Barbara Hellier attended the American Society for Horticultural Sciences conference, Palm Desert, CA.

August 2, Barbara Hellier attended the Root and Bulb Crop Germplasm committee meeting, Palm Desert, CA and presented a collection update.

August 3, Barbara Hellier presented an invited talk "Collecting in Central Asia: National Plant Germplasm System Plant Explorations" in Workshop 11: Horticultural Value of Wild Genetic Resources, ASHS 2010 conference, Palm Desert, CA.

August 4, Barbara Hellier attended the Leafy Vegetable Crop Germplasm committee meeting, Palm Desert, CA and presented a collection update.

August 5, Theodore Kisha gave a presentation entitled, "Determining redundancy of short-day, onion (*Allium cepa* L. var. *cepa*) accessions in a germplasm collection" at the American Society for Horticultural Sciences Conference in Palm Desert, CA

August 5, Bill Luna co-organized Active Shooter Training for ARS Pullman employees.

August 5, Marie Pavelka and Corey Wahl attended Active Shooter Training, Pullman, WA.

August 12, Bill Luna attended USDA-ARS Pullman location Health and Safety committee meeting.

August 17, Richard Johnson consulted with Grant Poole, Wheat Genetic WSU, concerning multivariate statistical analysis.

August 24-25, Jinguo Hu attended the ARS Pacific West Area Leadership Conference in Meridian, ID.

August 25, Vicki Bradley submitted a Biosafety Manual to the WSU Biosafety Officer in preparation for receipt of transgenic *Brachypodium distachyon* accessions.

August 26, Barbara Hellier provide garlic collection and cultural information to 3 stake holders, John Dey, Tina Keaton, Mike Delamonte.

September 3, Richard Johnson consulted with Ivone Lindström, University of the South, Bahía Blanca, Argentina, concerning analysis of safflower data using mixed models.

Sept. 3-13, Jinguo Hu had an all-expense paid travel to China. He attended the 3rd International Conference of Plant Molecular Breeding (September 5-10, Beijing, China). He was invited to serve as the co-Chair of the Program Committee and a Member of the International Organizing Committee. He co-chaired the Concurrent Session #11 "Germplasm and Genetic Diversity" and gave an oral presentation entitled "High-throughput SNP genotyping of a subset of lettuce landraces for genetic diversity assessment". After the conference, Dr. Hu visited the Institute of Crop Sciences, the Institute of Vegetables and Flowers and the Institute of Crop Germplasm Resources of the Chinese Academy of Agricultural Sciences in Beijing, China.

September 13-16, Stephanie Greene attended the Symposium for the establishment of European genetic reserves for CWR and landraces (Invited, paid by ARS Office of International Research Projects) Funchal, Portugal Crop wild relatives of Medicago in Russia and neighboring countries: gap analysis for effective conservation.

September 14, Bill Luna attended WSU CAHNRS Safety committee meeting.

September 18-26, Stephanie Greene travelled to St. Petersburg, Russia- Collaborated on AgroAtlas project and helped teach a GIS school at St. Petersburg State University. Travel funded by the ARS Office of International Research Projects.

September 18–23, Barbara Hellier attended the Association for the Advancement of Industrial Crops conference, Fort Collins, CO.

September 19, Barbara Hellier attended the New crops Crop Germplasm Committee meeting and presented a collection update.

September 20, Vicki Bradley submitted the WSU Biosafety Approval Form to the Biosafety Committee to allow WRPIS to store and distribute transgenic *Brachypodium distachyon* accessions.

October 9-13, Stephanie Greene attended and presented a poster entitled "Managing the U.S. Germplasm Collection of Temperate Forage Legumes to Serve Diverse Collection Users and Global Conservation" at the International Symposium on Forage, Turf-grass and Biofuel Germplasm Research (Invited) Yangling, China.

October 9-13, Vicki Bradley attended and gave presentation entitled "Maintaining genetic diversity in the U.S. cool-season grass germplasm collection" at the 2010 International Symposium on Forage, Turfgrass, and Biofuel germplasm research in Yangling China.

October 10-13, Theodore Kisha presented "Using molecular markers to analyze genetic diversity in forage, turf, and biofuel crops" at the International Symposium on Forage, Turf-grass, and Biofuel Germplasm Research, Yangling University, China, and chaired the session, "Applying Genomics to Genetic resources". All expenses paid except travel.

October 5, Jinguo Hu attended the California Leafy Greens Research Program Meeting in Seaside, CA.

October 7, Barbara Hellier attended the WSU Land Use committee meeting.

October 26, Barbara Hellier participated in conference call meeting of the Aromatic and Medicinal Crop Germplasm committee.

October 28, Barbara Hellier provided peer review for article on *Lactuca* germplasm conservation for Crop Science.

October 31, Clarice Coyne presented the Cool Season *Vicia* and *Lathyrus* curator report to the Clover and Special Purpose Crop Germplasm Committee, Long Beach, CA.

October 31, Vicki Bradley attended and gave reports on the cool-season grass collection and the activities of the Descriptor Subcommittee at the Forage and Turfgrass Crop Germplasm Committee meeting in Long Beach, CA.

October 31 and November 3, Clarice Coyne presented two posters entitled "Phenotypic Description of the USDA Faba Bean Collection" and "Winter-Hardiness and Yield Potential of Faba Bean (*Vicia faba* L.) Under Sub-Freezing Temperature at ASA-CSSA-SSSA Annual Meeting, Long Beach, CA.

October, Stephen Clement wrote an article about Dr. Clement's endophyte research for publication in upcoming volume of Agricultural Research magazine.

November 2, Clarice Coyne presented the Cool Season Food Legume curator report to the Food Legume Crop Germplasm Committee, Long Beach, CA.

November 6-15, Molly Welsh travelled to the State of Florida and collected wild beans (*P. polystachios*) native to the United States to fill the gap in WRPIS germplasm collection.

November 9, Bill Luna attended USDA-ARS Pullman location Health and Safety committee meeting.

November 11, Barbara Hellier provided peer review for 8 NPGS plant exploration proposals for the Plant Exchange Office.

November 16, Theodore Kisha gave a presentation on genetics to students (5th, 6th, 7th, 8th grades) at the Nespelem School, WA.

November 17, Barbara Hellier travelled to Parlier, CA to meet with Steve Tebbets and Spencer Walse of the Insect Rearing and fumigation unit regarding pilot study to control dry bulb mite in the garlic collection.

November 18, Barbara Hellier travelled to Reno, NV to meet with David Shintani, University of Nevada, Reno regarding *Taraxacum kok-saghyz*.

December 6, Barbara Hellier attended the WSU Land Use committee meeting.

December 8, Clarice Coyne attended the Western Pea and Lentil Grower's Annual Meeting and participated in poster session, Moscow, ID.

December 8, Jinguo Hu attended the 45th Western Pea & Lentil Growers Association Annual Convention and presented a poster entitled "Preliminary field evaluation of 466 accessions of faba bean (*Vicia faba* L.) of the USDA germplasm collection" in Moscow, ID.

December 8–11, Barbara Hellier attended the National Allium Research Conference, Reno, NV.

December 10, Barbara Hellier attended the Root and Bulb CGC Allium subcommittee meeting and presented a collection update.

December 12, Stephen Clement was invited to present "EntoDiversity of Europe and Asia Minor for Thistle BioControl" at the symposium of Entomological Society of America national meeting, San Diego, CA.

December 31, Stephen Clement retired from ARS.

Appendix 3

Minutes of 2010 –W6 Technical Advisory Committee Meeting

(pending for approval at 2011 meeting)

- Annual Meeting Dates: 07/27/10 to 07/29/10
- Period the Report Covers: 10/2009 to 09/2010

Participants:

Committee members present:

- Ralph Cavalari - Administrative Advisor, Washington State Univ.
- Dan Parfitt - California - chair,
- Mark Brick - Colorado (connected by phone)
- Bob Zemetra - Idaho - vice chair, acting secretary
- Shawn Mehlenbacher - Oregon
- Jack Martin - Montana (connected by phone)
- Rich Koenig - Washington

Committee members absent:

- Bonnie Furman - Alaska
- Ian Ray - New Mexico
- Robin Groose - Wyoming
- Kevin Jensen - Utah

Guests: Anne Marie Thro - CREES, Washington DC

- Peter Bretting - NPS, NPGS, Washington DC
- Andrew Hammond - USDA, ARS Western Region
- Jinguo Hu - W6, Pullman
- Dave Stout - W6, Pullman
- Harold Bockelman - National Small grains collection
- Kim Hummer - NCGR, Corvallis
- Joseph Postman - NCGR Corvallis
- Francis Zee - NCGR, Hilo
- John Preece- NCGR, Davis
- Richard Lee - NCGR, Riverside (connected by phone)
- Robert Kruege - CGR, Riverside
- Gabriela Romano - NCGR, Parlier

Brief Summary of Minutes of Annual Meeting:

W-6 Regional TAC meeting - July 27th, 2010,

To read the complete texts of the 2010 individual state reports and the budget, go to the NIMSS W-6 Homepage/Additional Documents from the sign-on menu or paste the following URL in your browser: **http://lgu.umd.edu/lgu_v2/homepages/attachs.cfm?trackID=11296**

Meeting started at 8:25 am

Review of 2009 minutes

Motion to approve minutes Rich Koenig
Seconded - Shawn Mehlenbacher

Minutes were approved by unanimous vote

Report from NIFA - Ann Marie Thro

Change in organization with CSREES now part of NIFA with the director now being a political appointee. Goal of the new organization is to increase productivity of crops and agriculture in general.

Budget highlights

- NIFA budget up 1% with AFRI being increased 20%. The increase in these areas occurred through cuts to funding for the barley genome project and other special grants. Targeted crops for AFRI in 2011 include characterization and use of legumes. HATCH funding is flat line in the new budget.

AFRI program

- Comments on concerns dealing with targeted funding areas of AFRI being too limited and excluding too many researchers/research areas. NIFA is actively soliciting comments on the program so it can be improved in the future.
- It was also stressed that it will be important to report successes associated with AFRI grants to leverage more funds from Congress in the future

REE News

- New common reporting format being implemented. Competitive grant reporting will be utilizing the new format this fall. HATCH reporting will use the format in 2012. The new format will have a section for comments and will provide the researcher with the ability to go back and add impacts. It was pointed out that accomplishments and activities should be targeted to peers while the outputs/outcomes and impacts should be targeted to the general public.
- It was emphasized again that it is critical to mention HATCH funds in all papers and presentations and that the specific HATCH project number be included in the citation. W-6 Hatch funds showed increase in 2007 but major increase due to no earmarks that year

Director's Report and Budget - Ralph Cavalari

Plant germplasm should get increased emphasis with the current interest in plant productivity, especially in relation to climate change. One challenge is that NPGS is underfunded to do the necessary trait characterization to maximize the usefulness of the plant germplasm collection.

In terms of W-6 funding, all the Agriculture Experiment Stations support the W-6 station and supported the increased budget request for W-6. Starting October 1, 2010 the total budget was targeted at $405,288 but no raises were allowed for Washington State University so the actual

budget will be $395,659 so the extra ~$9,000 will remain in the budget as discretionary funds. The full budget is included at the end of this report.

Motion to approve the proposed W-6 budget - Shawn Mehlenbacher
Seconded - Jack Martin
Minutes were approved by unanimous vote

Report from National Program - Peter Bretting

Budget

- FY09 Some reallocation of funds resulting in some increases in funding for some stations in the system
- FY-10 Modest increase across the board in funding

Areas that have potential for increased funding in the current budget

- $3.6 million to support increased germplasm capacity
- $6 to 9 million targeted at Crop Breeding and Crop Protection including support of applied breeding and breeding of perennial grains
- Additional funds for research related to impact of global climate change on crops/plants

Coordinated Germplasm committee - attempt to improve communication of successes of germplasm research.

International germplasm activity - some movement on two germplasm treaties

- FAO International Treaty
    - President signed in 2002
    - Congress held hearing in 2009, may pass in 2010/2011 though it will require a 60% majority for approval.
    - It is uncertain as to the overall impact of this treaty on germplasm collection since it only applies to a subset of crops
- Convention on Biological Diversity treaty
    - Currently in the last stages of discussion.
    - Hopefully will be submitted this fall
    - Aspects of treaty concern some collections and would be retro-active for some collections
    - Treaty is intended to cover everything not covered by the FAO treaty.

Harold Bockelman - Aberdeen

- 136,000 samples in collection - still growing, part of increase due to deposit of mapping populations
- Distributed 48,000 samples - 800 requests June 2009 to June 2010 with 30-50% of the requests being international.
- The wheat (5,400 lines) and barley (2,700 lines) have been submitted for DarT analysis.
- Cereal germplasm collections will be involved in a Climate Change phenotyping AFRI project if funded.
- Effort to respond to UG99 stem rust continue - coordinating Kenya screening nursery with an emphasis on wheat landraces.

- Working on GRIN-Global - targeted to be completed in 2011.

Jinguo Hu - W-6 Pullman

Highlights of submitted report:

- First year over 53% of germplasm shipments were international.
    - The complete safflower collection (2,300 accessions) was sent out three times
    - The Brachypodium collection (30 accessions) was requested 1,000 times
- A discussion was held on the new lab facility, it is currently on hold. The station also needs more land and greenhouse space.
- There was also a discussion on what to do with accessions (17,000) that have never been tested.

John Preece- Davis report

Highlights of submitted report:

- Dr. John Preece is the new research leader at the Davis repository.
- A new ARS facility (building) has been proposed with planning funds already used for facility design.
- There are 7,000 total accessions with 3,500 being grapes and 1,200 Prunus species.
- There were 500 requests covering about 5,000 accessions
- Concern was raised regarding field space limitations for the orchard collection. Attempts are being made to get 50 acres at the Sustainable Agriculture Institute for the walnut collection. Relocating the walnut collection would be a cooperative effort with the University of California, Davis providing the land, the California walnut growers providing funding and the repository responsible for the grafting, movement and maintenance of the collection
- The collection has an increasing virus load so an effort is being made to clean up virus infected accessions with the Clean Plant Network/System providing the funds.
- A discussion followed concerning the need to clean up clonal material prior to release.

Francis Zee - Hilo report

Highlights of submitted report:

- The three tropical germplasm centers are trying to back up each other to insure against germplasm loss. Avocado being the first to be backed-up due to a disease outbreak in Florida.
- Visited China but could not bring out germplasm due to lack of an agreement between the two countries. An agreement exists now.
- Currently genotyping the tropical collection
- Process of regenerating collection is continuing (program nearing 20 years)
- Continued SCRI funded project on Ohelo berry, project is at the stage of being able to release germplasm for production.
- Received the remaining pineapple accessions from Maui Pineapple

Kim Hummer - Corvallis

Highlights of submitted report:

- The station is now also administrating the Palmer site. Advantages include:
    - Combination resulted in a better team for both sites
    - Allowed to rearrange species responsibilities between the two locations so Ribes collection was moved up to Palmer
    - The rearrangement of species responsibilities resulted in freeing up both time and space at the Corvallis repository.
    - The species reassignment also gave the Palmer staff more accessions to work on.
    - Other Palmer species were redistributed to other repositories
    - The Peonies collection was also moved to Palmer
    - Material being shipped to Alaska is being screened for virus at the Palmer station
- The Corvallis repository has 10,000 accessions with 5,000 being distributed. The reason for the high rate of requests/distributions relate to the on-line ordering system.
- Research conducted by the Corvallis repository on the Ohelo berry included tissue culture, cryogenic storage and molecular evaluation.

Gabriela Romano - Parlier

Highlights of report include:

- Dr. Gabriela Romano is the new research leader at the Parlier repository
- 1,021 accessions regenerated with 300 accessions regenerated.
- 113 accessions were sent to Fort Collins for distribution to Mexico.
- The collection is currently being evaluated for viability.

Richard Lee- Riverside

Highlights of submitted report:

- 1,057 accessions were requested with a 68% increase in domestic distributions and a 32% decrease in international distributions.
- Asian citrus cyllid is expected to arrive in the Riverside area so the station is improving its screen houses.
- Received citrus germplasm from Florida to back-up material threatened by disease in Florida
- The University of California - Riverside citrus collection is currently being cleaned up and grafted to protect the germplasm.

State Reports (Please use link to see attached state reports for specific information)

Reports made in-person

California - Dan Parfitt
Idaho - Bob Zemetra
Oregon - Shawn Mehlenbacher
Washington - Rich Koenig

Reports made via conference phone

Colorado - Mark Brick
Montana - Jack Martin

Reports to be submitted but not presented

Utah - Kevin Jensen

Report to be submitted at a later date

New Mexico - Ian Ray

States not submitting a report

Alaska
Hawaii
Wyoming

Business

An interim set of officers needed to be selected due to the departure of Stephen Jones from the committee. It was proposed that the new officers for W-6 will be:

Bob Zemetra - chair, replacing Dan Parfitt who is rotating out of the chair position
Mark Brick - vice chair
Shawn Mehlenbacher - secretary

Motion to approve the new slate of officers - Jack Martin
Seconded by Rich Koenig

New slate of officers was approved by unanimous vote

Next meeting will be by teleconference and will be based out of Pullman, WA as approved by the W-6 committee in 2009 (see 2009 minutes).

Resolutions

1st resolution - The W-6 committee would like to thank Dan Parfitt for his 6 years as an officer of the W-6 committee with the last two years serving as chair of the W-6 committee

2nd resolution - The W-6 Technical Committee thanks Larry Robertson and the staff of the PRGU - Geneva for its efforts in organizing the joint regional germplasm committee meeting.

Move to accept the first resolution - Shawn Mehlenbacher
Seconded - Rich Koenig

The motion on the resolutions passed unanimously

Motion to adjourn
Seconded - Rich Koenig
Passed unanimously

Meeting adjourned at 5:20 pm