NPGS

National Plant Germplasm System

Twenty-Second Meeting Report
January 10, 2012

Sunflower Crop Germplasm Committee

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The Sunflower Crop Germplasm Committee (CGC) met for the 22nd time on January 10, 2012, at USDA-ARS- Northern Crop Science Laboratory, Fargo, ND. Committee members present were: Gerald Seiler, USDA-ARS-NCSL, Fargo, ND (Chair); Tom Gulya, USDA-ARS-NCSL, Fargo, ND (Vice Chair); Kathy Grady, SDSU, Brookings, SD; Charlie Block, USDA-ARS-NCRPIS, Ames, IA; Laura Marek, ISU, Ames, IA (Ex-Officio, Curator); Khalid Rashid, Agriculture and Agri-Food, Canada, Morden, MB, CA; and Mark Bohning, USDA-ARS, Beltsville, MD (Ex-Officio- via telecom). Observers present were: Jarrad Prasifka, USDA-ARS-NCSL, Fargo, ND; Lili Qi, USDA-ARS-NCSL, Fargo, ND; C.C. Jan, USDA-ARS-NCSL, Fargo, ND; Mike Foley, USDA-ARS-NCSL, Fargo, ND; Irvin Larson, USDA-ARS-NCRPIS, Ames, IA; and Calvin Trostle, Texas Agrilife Ext. Service, Lubbock, TX.

AGENDA

1. Sunflower Evaluations

Disease Evaluation: Dr. Tom Gulya, USDA-ARS, Fargo, ND updated the Committee on the progress of disease evaluation for Sclerotinia stalk and head rot, and Phomopsis stem canker **(APPENDIX 1)**. About 250 cultivated accessions were evaluated with artificial inoculation for resistance to Sclerotinia stalk rot. Data set will be used in association mapping.

In 2011, Dr. Gulya evaluated 250 Plant Introductions of cultivated sunflower for Sclerotinia head rot at two locations, Staples, MN, and Sabin, MN, under artificial inoculations and mist irrigation. The range of head rot observed was from 0 to 100% at Sabin, with seven accessions having 0% infection, and 40 with 100% infection. At Staples, there were 13 accessions with 0% infection and 32 with 100% infection. Plans are to test the same group at the same location in 2012 to obtain more data sets for association mapping.

In 2011, in response to the increasing incidence of Phomopsis stem canker and the need for resistance sources in the USDA breeding program, four field nurseries were planted to evaluate 226 Plant Introductions, along with 34 USDA inbred lines for resistance to Phomopsis stem canker under natural infection. The test sites were located in Crookston and Rothsay, MN, Grandin, ND, and Java, SD, and were in cooperation with four seed companies who generously offered plot space and took care of plot maintenance. The companies were Croplan, Mycogen, CHS and Seeds 2000. Natural Phomopsis developed at three locations: Crookston, Rothsay and Java. Disease incidence ranged from one accession with a zero rating, to 70 with 10% or less infection. Plans in 2012 are to repeat this effort once more in three to four locations.

Dr. Charlie Block, USDA-ARS, Ames, IA, and Dr. Gulya developed a Sclerotinia stalk rot greenhouse test for evaluating wild annual *Helianthus* accessions funded by the USDA-ARS Sclerotinia Initiative **(APPENDIX 2)**. Perennial wild accessions of *H*. *resinosus*, *H*. *tuberosus*, *H*. *salicifolius*, *H*. *ciliaris*, *H*. *grosseserratus*, and *H*. *eggertii* were evaluated in greenhouse trials. A high level of resistance was observed in nearly all the perennial accessions tested. Field testing of wild annual species accessions for stalk rot was

performed at Staples, MN in, 2011. Sclerotinia stalk rot developed well, with the most resistant entries being found in *H. argophyllus* (PI 649865), *H. debilis* (PI 468686), and *H. praecox* (PI 435849).

The Committee would like to thank all the cooperators who have provided evaluation data for the many descriptors. Dr. Laura Marek, Curator, coordinates the transfer of the data into GRIN. The GRIN database for sunflower has one of the highest frequencies of descriptors per accession of any crop in the GRIN system.

2. Curator's Report with Status of the Sunflower Germplasm Collection

Dr. Laura Fredrick Marek, Oilseeds Curator presented a report on the sunflower germplasm collection **(APPENDIX 3)**. Regeneration efforts were generally scaled back compared to previous years due to budget uncertainties. Regeneration of 168 cultivated accessions in the 2009-2011 period resulted in successful regeneration of 159 accessions. In the same period, 168 wild annual *Helianthus* accessions produced 158 successful regenerations. Forty-three wild perennial accessions were caged and seed harvested from 34 of the regenerations. Also, in 50 previously established perennial accessions, 40 successfully regenerated seed.

After the 2010 harvest, the collection is 92% available (cultivated 99%; wild 85%). **The CGC Committee would like to compliment Dr. Marek and her staff for the significant progress made in the last few years in making more of the collection available for improving the sunflower crop.** Inactivation of accessions continues from collections made in the 1970s or early 1980s that have never been successfully increased and 100 older collections from that period remain to be increased.

Since the last CGC meeting in June, 2009, 255 *Helianthus* accessions (144 wild *Helianthus* accessions and 111 cultivated accessions) have been received at the North Central Regional Plant Introduction Station (NCRPIS), Ames, IA.

Dr. Marek reported that in the 2009-2011 period, 238 requests were made from international and domestic sources for cultivated sunflower germplasm, which was distributed to 193 recipients. The 4688 seed packets represented 2388 unique accessions. In the same period, 219 requests were made from international and domestic sources for wild *Helianthus* germplasm, which was distributed to 194 recipients. The distributions represented 3187 packets of 2245 unique accessions. Since 2000 the number of requesters has more than doubled in each category of germplasm (cultivated, wild annual and wild perennial accessions). Requesters of wild annual germplasm, the species most closely related to the crop species, have increased almost fourfold since 2000. This increase in the number of requesters is an excellent indicator of the increased interest in and use of NPGS sunflower germplasm in research programs. From June 1, 2009 through December 2011, the greatest proportion of *Helianthus* distributions with a stated utilization was sent for disease evaluation by several cooperators (about 25% of total seed packets distributed). About 14% of the distributions went towards molecular related research

(mapping, marker development, sequencing, evolutionary relatedness, flowering time analyses) and about 14% were sent out for oil quality research.

Observations of plant and seed characters are recorded during the regeneration process and loaded into GRIN. The NCRPIS oilseeds project has standardized image file names and loading protocols. Images can be viewed at http://www.ars-grin.gov/npgs/searchgrin.html.

Dr. Marek has continued to partner with NPGS, Parlier, CA as an alternate regeneration site with personnel to increase taxa that require longer growing seasons than are reliably obtained in Ames, as well as for cold-sensitive wild *Helianthus* taxa. The association with the Parlier group has evolved into a very successful program. In the 2009-2011 period, 67 accessions were grown at Parlier and material harvested from 66 accessions, plus seed heads from four re-caged accessions established in 2010.

The Committee **strongly supports the activities of the Parlier site and hope** that cooperation with this location will help alleviate the backlog of sunflower accessions waiting to be regenerated because of specific requirements not being able to be met at the present regeneration site at Ames.

FUTURE PLANS: Dr. Marek has made significant progress towards the long-term goal of making all *Helianthus* maintenance groups at 90% or higher availability and having accessions available for all *Helianthus* taxa represented in the NPGS collection. Currently 52 species and 69 of the 70 *Helianthus* taxa are represented in the NPGS collection. An additional long-term goal is to make accessions available for all *Helianthus* taxa and to have broad geographical/ecological representation of all taxa, a strategy expected to capture maximum genetic diversity.

A need to increase and maintain mapping populations of the lines used in the public sunflower map were discussed. Dr. Marek expressed a concern about the cost to regenerate the large number of lines within the constraints of the current budget for the NPGS sunflower collections. Discussion followed about the cost to do a one-time regeneration with possible funding from outside sources. This will be explored further.

3. Status of *Helianthus* germplasm— Vulnerability, Needs, and Recommendations

The Committee reviewed the status of sunflower germplasm in the U.S. and crop vulnerability. A crop vulnerability statement has been produced as requested by the National Plant Recovery System mandated by the Department of Homeland Security. The Secretary of Agriculture in cooperation with other federal departments and agencies was directed to accelerate and expand development of current and new countermeasures against the international introduction or natural occurrence of catastrophic animal, plant, or zoonotic diseases. Most of the discussion centered on the “Recommendations” section of the report. The Committee acknowledged the support that the NPGS Management has

given the sunflower germplasm collection in the past and encouraged them to continue the high level of support during the current tight budgets. A copy of the updated sunflower status, vulnerability, needs, and recommendations report is included in **APPENDIX 4**.

4. Status of the National Plant Resources Laboratory, including the Plant Exploration Office and the Germplasm Resources Network (GRIN) System

Mark Bohning, Crop Germplasm Committee Coordinator (via teleconference) from the National Plant Resources Laboratory outlined their recent activities (**APPENDIX 5**). He reported that Dr. Gary Kinard has been appointed Research Leader of the National Germplasm Resources Laboratory, Beltsville, MD since 2009. He updated the Committee on the activities of the Germplasm Resources Information Network (GRIN). A project has been started to develop a new version of GRIN which is named GRIN-Global. The project is a cooperative effort between the Global Crop Diversity Trust, USDA-ARS and Bioversity International. A test version was released in July of 2011. The system will be freely available to any country to use. A beta version of the GRIN-Global public website can be found at: http://test.grin-global.org/gringlobal /search.aspx. The second phase of the project is implementing GRIN-Global for the NPGS that will be initiated immediately after the release of version 1.0 of the software package needed for international deployment (estimated Spring 2013). It will replace the current GRIN system with all new maintenance and public retrieval software such as downloadable spreadsheets, and a shopping cart. Current GRIN has been enhanced to handle molecular data. New tables have been added to the database to store this data and software has been developed to display it. SSR data generated on apple, cacao, grape, hazelnut, hops, pear and blueberry, along with AFLP data on rhubarb, has been loaded into the system. GRIN has joined the Global Bioversity Information Facility (GBIF), which allows many databases from around the world to be queried at the same time about basic data such as taxonomy.

The Plant Exchange Office (PEO) supports the collection of germplasm for the NPGS through the management of a Plant Exploration and Exchange Grant Program. Plant explorations involve field collection of germplasm not available in any germplasm collections, while plant exchanges are expeditions to arrange exchange of germplasm already conserved in foreign genebanks. In FY-2011, 11 explorations, three foreign and eight domestic with one sunflower exploration to the southeast U.S. in Alabama, Louisiana, Mississippi, and Florida were funded by the PEO. A large potential germplasm exchange could possibly happen with China and South Korea in the near future. If this happens, the Committee expressed an interest in obtaining large-seed confectionary sunflower seeds from China as a need for the sunflower industry.

The mission of the Database Management Unit (DBMU) is to develop and maintain information systems for the National Genetics Resources Program comprising plants, animals, microbes, and invertebrates. Over 95,800 taxonomic names (including synonyms), 535,473 accessions representing 13,388 species and 2,208 genera,;1,866,764 inventory records; 1,628,283 germination records; 7,291,757 characteristics /evaluation records; and over 201,156 images are in the GRIN system, the database management system for this

information.

Dr. Peter Bretting, National Program Leader for Plant Germplasm and Genomics provided a report of the U.S. National Plant Germplasm System **(APPENDIX 6)**.

5. CGC Chairs Meeting, Geneva, NY June 2010

The 13th biennial meeting of the CGC Chairs was held at Geneva, NY, in July of 2010 in conjunction with the Plant Germplasm Operations Committee. This meeting provided an opportunity for the Chairs to hear presentations on the status of the NPGS sites, plant germplasm exchange, international issues, preservation and utilization, the molecular characterization of accessions, interactions between curators and CGCs and plant quarantine issues. It also allowed the Chairs to meet and interact with each other, NPGS managers and curators, and invited guests from ARS, other government agencies, and non-government organizations.

6. Sunflower Explorations and Future Needs

The NPGS, PEO sponsored three collection trips in the 2009-2011 period in the US. The exploration in 2009 targeted two sunflower species, *Helianthus salicifolius* and *H. silphioides*, and secondary species *H. X laetiflorus*, *H. occidentalis* ssp. *occidentalis*, *H. occidentalis* ssp. *plantagineus*, *H. pauciflorus* ssp. *pauciflorus*, and *H. simulans* in Missouri, Kansas, Oklahoma, and Arkansas. Drs. Laura Marek and Gerald Seiler collected 28 accessions of the targeted species: 18 accessions each of *H. salicifolius* and 10 accessions of *H. silphioides.* They also made 21 collections of secondary target species: 4 accessions of *H. X laetiflorus*, 3 accessions of *H. occidentalis* ssp. *plantagineus*, and 14 accessions of *H. pauciflorus* ssp. *pauciflorus*. In addition, two accessions of *H. annuus* were collected. The exploration covered 4600 miles over a 12- day period. They were very pleased to make the *H. occidentalis* ssp. *plantagineus* collections.

An exploration in 2010 to the southeastern U.S., Alabama, Louisiana, Mississippi, and Florida targeted two sunflower species, *Helianthus heterophyllus* and *H. simulans* in their southern distributional ranges. Several additional *Helianthus* species with limited representation in the NPGS from this region were secondary targets: *H. agrestis*, *H. floridanus*, *H. radula*, *and H. silphioides*. They collected 14 accessions of the primary targeted species, *H. heterophyllus* (13 accessions) and *H. simulans* (1 accession). In addition, they observed an immature population of *H. simulans* from which Dr. Karen Williams, Plant Exchange Office, National Germplasm Resources Laboratory, was able to collect mature seed in December. We collected 33 accessions of the secondary targeted species: *H. agrestis* (6 accessions), *H. floridanus* (2 accessions), *H. radula* (21 accessions) and *H. silphioides* (4 accessions). In addition, one accession of *H. resinosus* and seven accessions of *H. angustifolius* were collected. A total of 55 populations of eight different species were sampled during this exploration covering 3555 miles over 12 days. *Helianthus angustifolius* was not an original target for this exploration; however, because this is also a

late-flowering sunflower species for which mature plants with seeds were observed, collections were made from populations in regions for which no samples existed in the NPGS, especially when they could co-collect with target species.

An exploration in 2011 was planned and approved to collect *Helianthus paradoxus,* a threatened species on the U.S. Fish and Wildlife Service's Threatened and Endangered Species list in New Mexico and Texas. Unfortunately, due to the extremely dry conditions in this area of during the summer of 2011, this exploration was postponed until 2012 if sufficient rain replenishes the soil moisture, since this species is an annual species that grows in saline marshes.

More details about the explorations can be found in the trip report available from Drs. Laura Marek and Gerald Seiler or the Plant Exploration Office.

Future Plans: The long-term goal for the sunflower germplasm collection is to make accessions available for all *Helianthus* taxa. Currently 69 of the 70 *Helianthus* taxa are represented in the NPGS collection, and all 69 taxa have at least one available accession (**APPENDIX 7**). An additional long-term goal is to have broad geographical/ecological representation for all taxa, a strategy expected to capture maximum genetic diversity. Three taxa are not represented in the NPGS collection, *H. niveus* ssp. *niveus*, *H. nuttallii* ssp. *parishii*, and *H.* x *multiflorus*. Principal issues associated with achieving full representation of the genetic diversity of *Helianthus* in the collection are the continued funding of germplasm collection trips, availability of critical personnel, and the establishment of clear authority over access to plant genetic resources in Mexico necessary to allow the collection and unencumbered distribution of collected germplasm (*H. niveus* ssp. *niveu*s is endemic to Baja California, Mexico). Two taxa may not be wild collectible: *H. nuttallii* ssp. *parishii* is likely extinct and *H. multiflorus* is a sterile triploid represented only by cultivated forms propagated by vegetative means.

An exploration is being developed to collect *H*. *gracilentus* and *H*. *bolanderi* in California for funding by the PEO for 2013.

7. Changes or Amendments to the By-Laws

There were no changes or amendments to the By-Laws (**APPENDIX 8**).

8. Location and Date of Next Meeting

The CGC Committee is scheduled to hold its next meeting in conjunction with the winter meeting of the National Sunflower Association Research Forum in January 2013. An interim meeting could be held between the scheduled meetings if it is deemed necessary.

APPENDIX 1

Disease Evaluations on Cultivated Sunflower from the USDA-NPGS Collection

Tom Gulya
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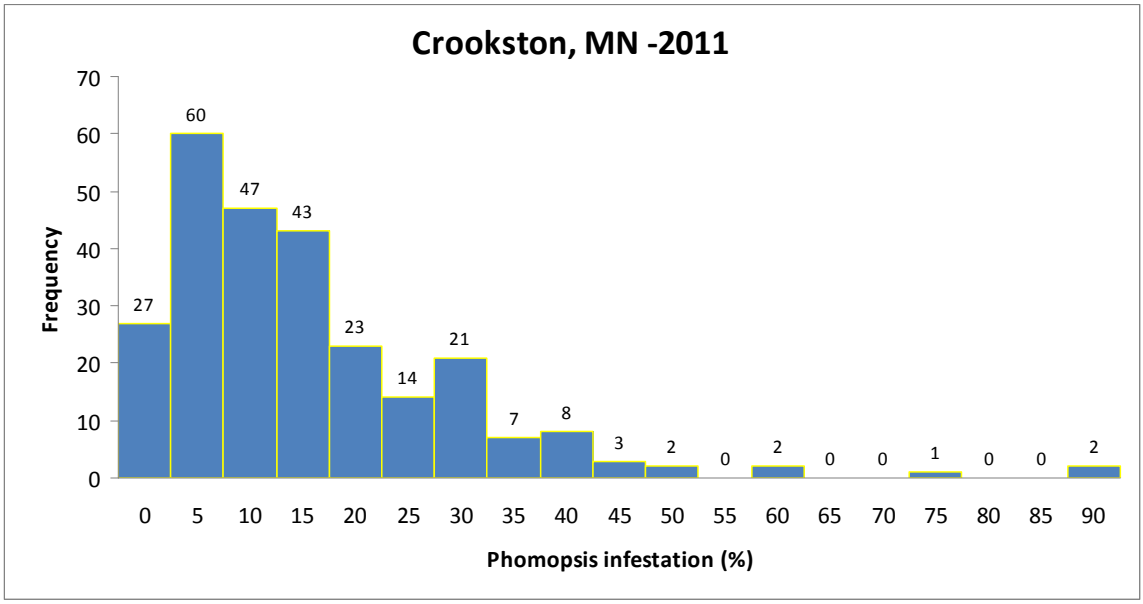
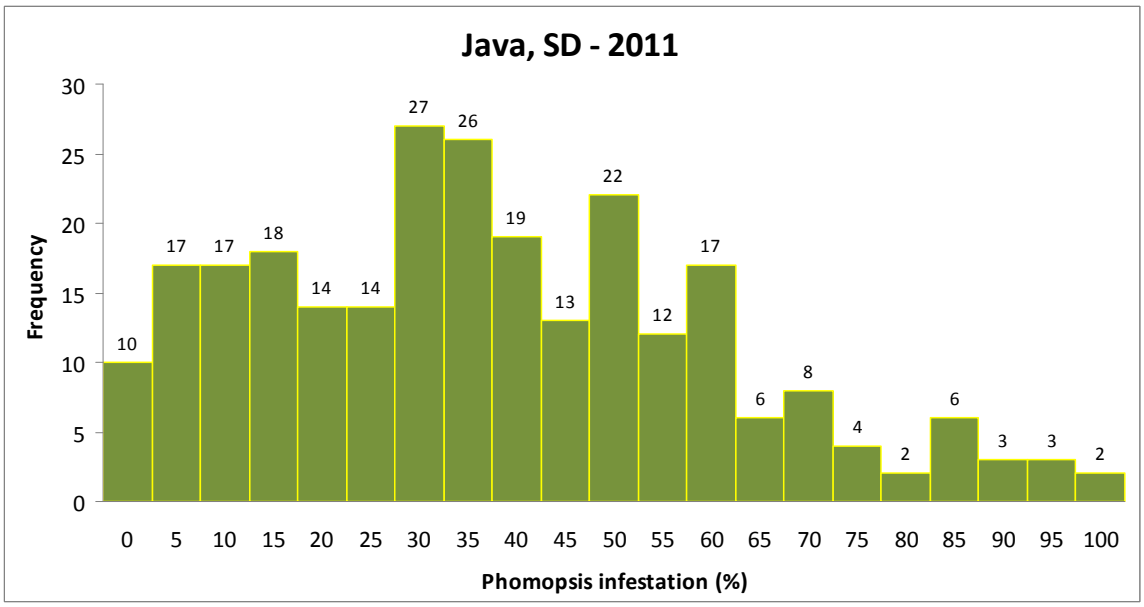
1. Sclerotinia Stalk Rot
   In 2008 and 2009, a group of ~ 250 cultivated sunflower accessions were evaluated with artificial inoculations for resistance to Sclerotinia stalk rot. A total of four successful trials yielded data, and this was the incentive to utilize these datasets in association mapping.

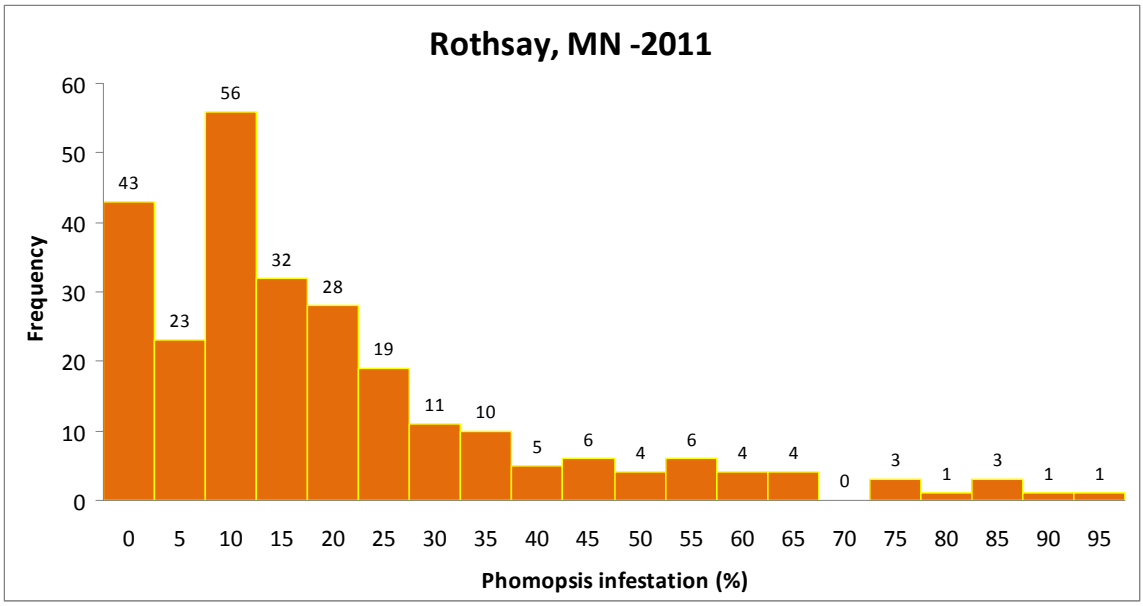
2. Sclerotinia Head Rot
   The same group of 250 cultivated PIs phenotyped for Sclerotinia stalk rot were planted in 2010 in Carrington, but a severe infestation of midge damaged the heads so severely that it made head rot ratings impractical. In 2011, the same group of PIs were tested (minus those considered too tall or too late flowering), with artificial inoculation and automated mist irrigation at two locations outside of the main sunflower production area and thus avoiding midge damage. The 2011 trials at Staples and Sabin MN each had two replications of single row plots, and discounting those PIs with late flowering, both trials were successful. Histograms illustrating the distribution of head rot ratings are found in the Appendix. Future plans are to test this same group in 2012 at Staples and Sabin and thus generate a total of four datasets, to be used in association mapping.

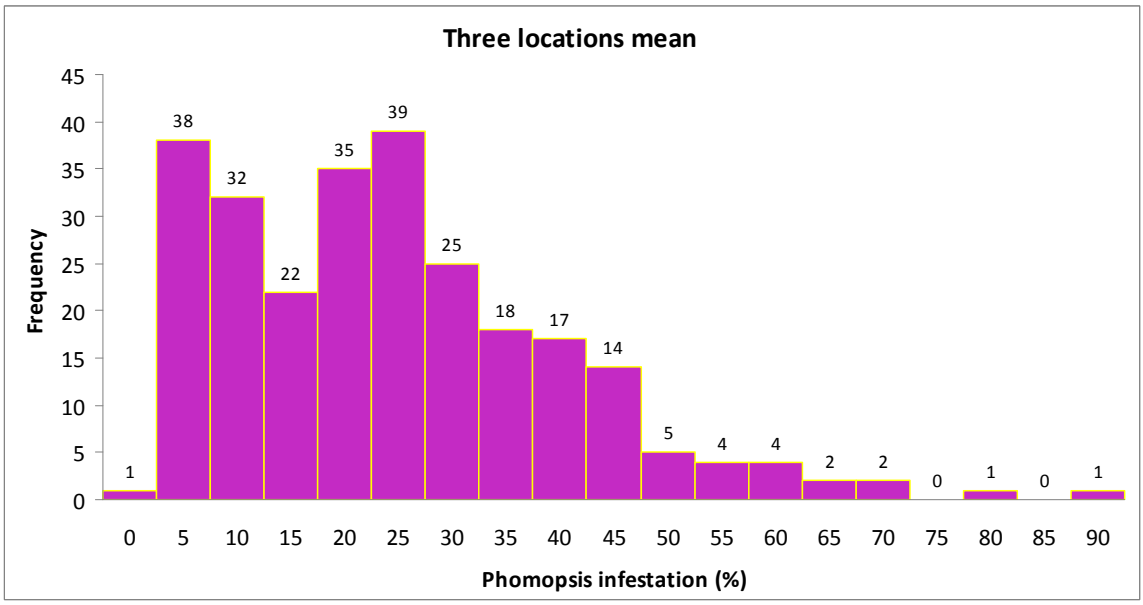
3. Phomopsis Stem Canker
   In 2011, in response to the increasing incidence of Phomopsis stem canker and the need for resistance sources in the USDA breeding program, four field nurseries were planted to evaluate 226 Plant Introductions, along with 34 USDA inbred lines for resistance to Phomopsis stem canker under natural infection. The test sites were located in Crookston and Rothsay, MN, Grandin, ND and Java, SD, and were in cooperation with four seed companies who generously offered plot space and took care of plot maintenance. The companies were Croplan, Mycogen, CHS and Seeds2000. Two replications of single row plots were planted at each location. Natural Phomopsis developed at three locations: Crookston, Rothsay and Java, and histograms in the Appendix illustrate the distribution of resistance ratings. Plans in 2012 are to repeat this effort once more in three to four locations.

Phomopsis Disease Evaluation Histograms from 2011.

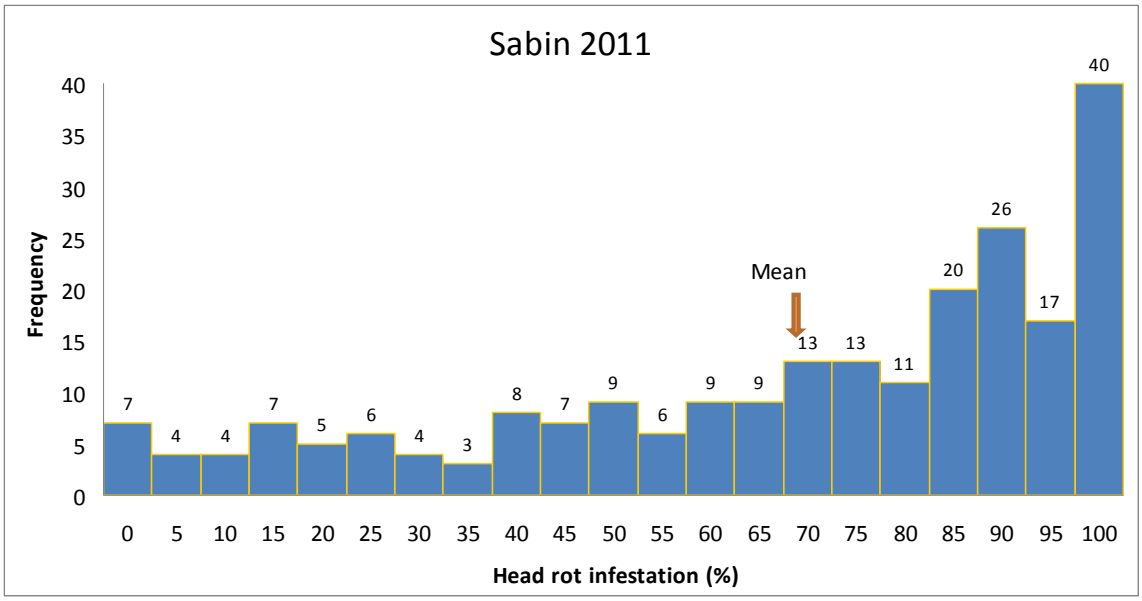




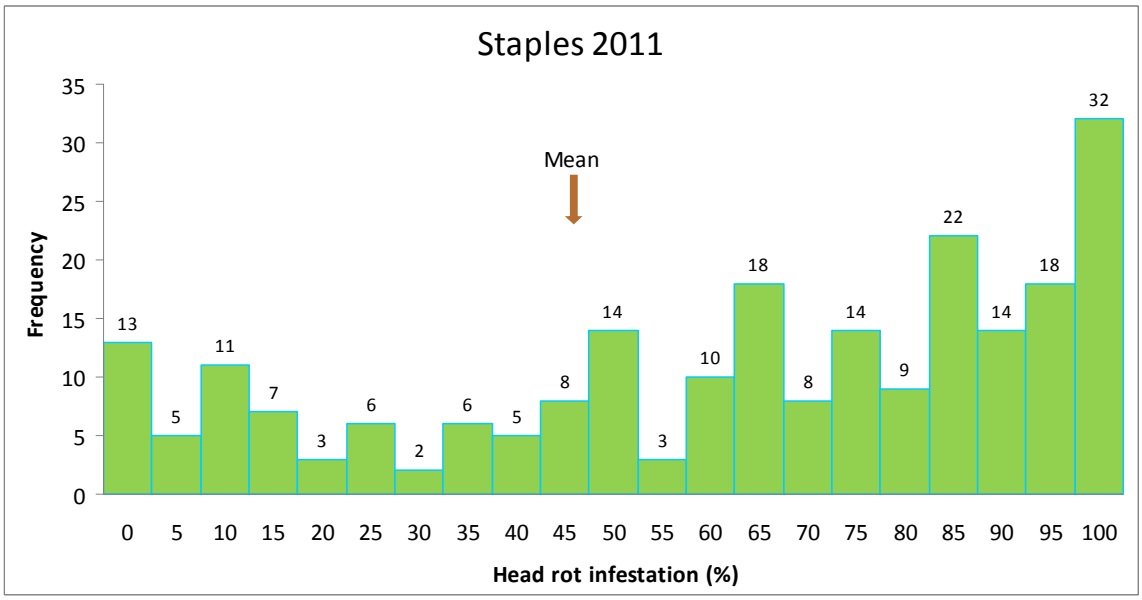




Histograms showing the distribution of Phomopsis stem canker ratings at three naturally infected trials in 2011 (Crookston, Java and Rothsay) and the mean across all three locations.



Histogram of Head Rot ratings of 250 entries in the 2011 trial at Sabin, MN (artificial inoculation under automated mist irrigation).



Histogram of Head Rot ratings of 250 entries in the 2011 trial at Staples, MN (artificial inoculation under automated mist irrigation).

APPENDIX 2

Report to the 22nd Sunflower Crop Germplasm Committee
January 10, 2012

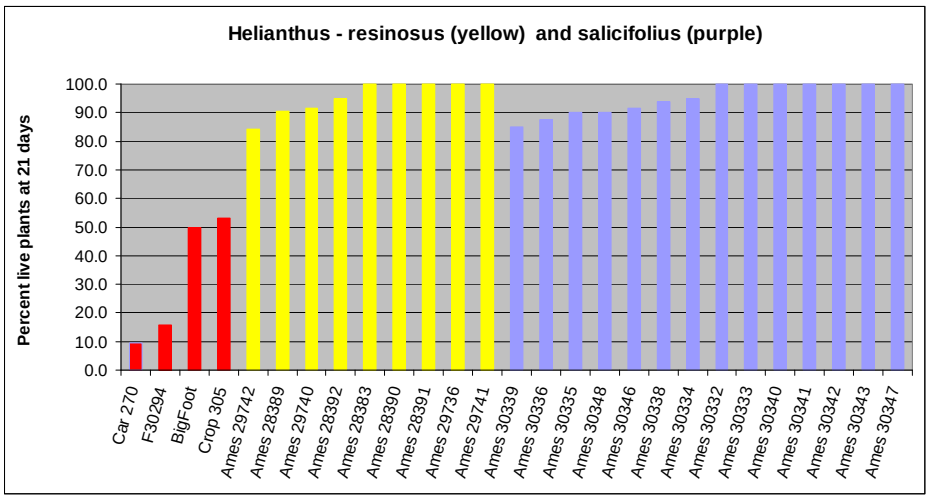
Evaluation of Wild *Helianthus* Species for Resistance to Sclerotinia Stalk Rot

Charles C. Block, Laura F. Marek, and Thomas J. Gulya, Jr.

Perennial germplasm screening:

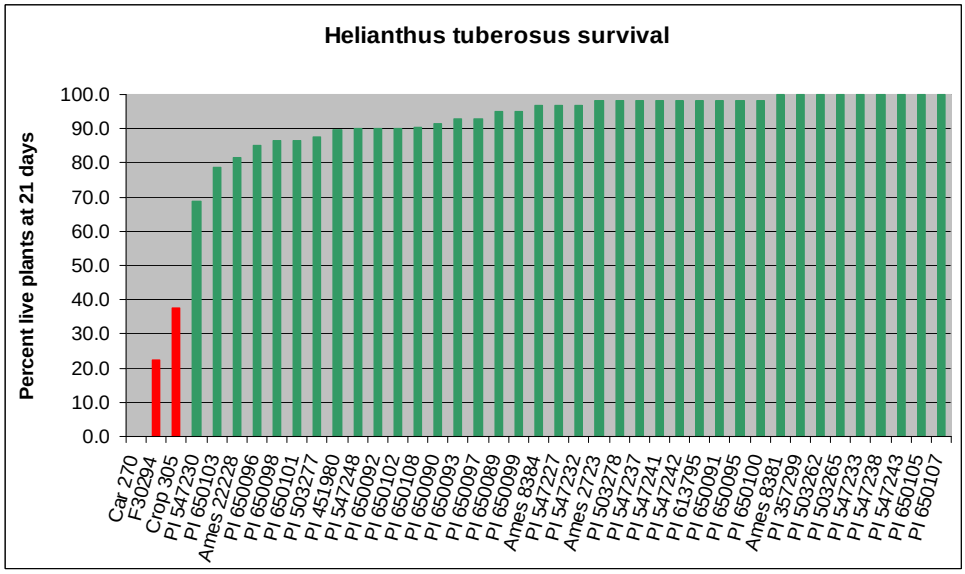
Six perennial species were evaluated in greenhouse trials from Jun-2010 to Nov-2011:
H. resinosus (14 acc.), *H. salicifolius* (14 acc.)
H. tuberosus (38 acc.), *H. grosseserratus* (37 acc.)
H. ciliaris (4 acc.), *H. eggertii* (5 acc.)
This was the first test of these species except for *H. resinosus.* All species showed very good resistance.

Fig. 1. Evaluation of *Helianthus resinosus* and *H. salicifolius* for Sclerotinia resistance.



Among *H. resinosus*, 11 of 14 accessions had ≥ 90% plant survival and eight had 100% survival (Fig. 1). For *H. salicifolius*, 12 of 14 accessions had ≥90% survival and seven had 100% survival (Fig. 1). *Helianthus salicifolius* is a diploid species.

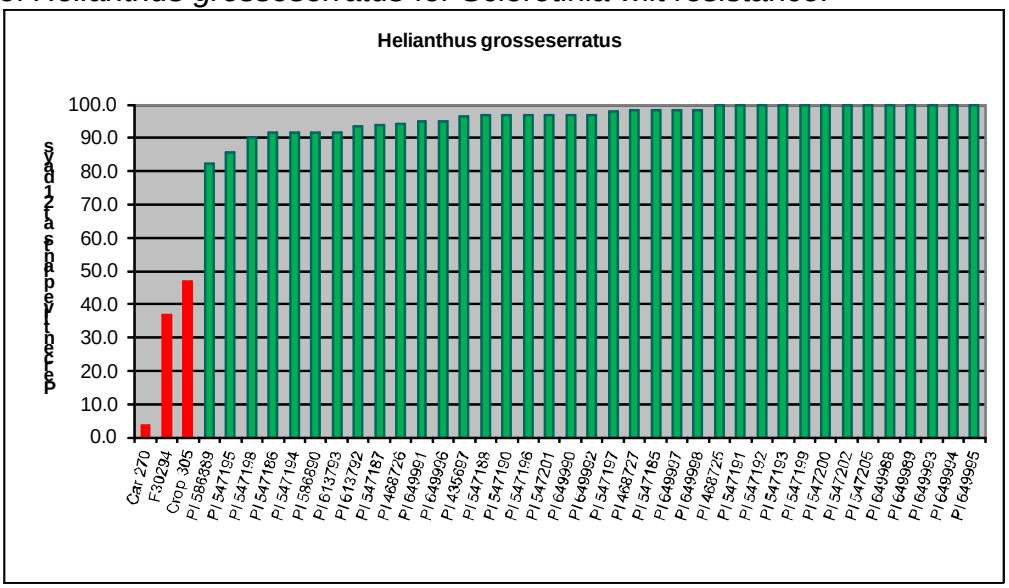
Fig. 2. Evaluation of *Helianthus tuberosus* for Sclerotinia wilt resistance.



Among *Helianthus tuberosus*, 30 of 38 accessions tested had ≥90% plant survival and nine of these 30 had 100% plant survival (Fig. 2).

Fig. 3. Evaluation

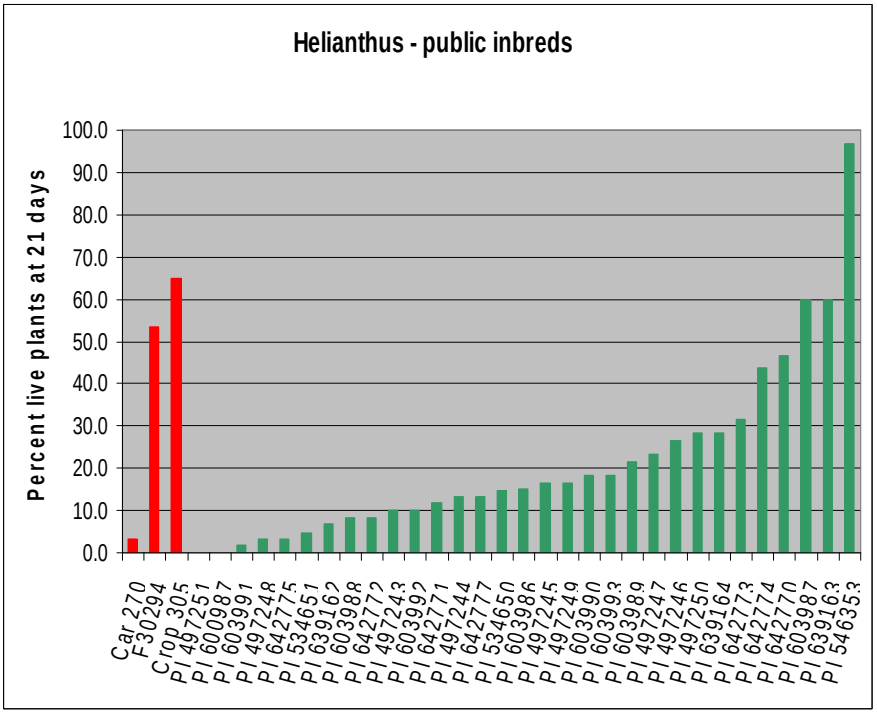
of *Helianthus grosseserratus* for Sclerotinia wilt resistance.



Among *H. grosseserratus*, 35 of 37 acc. had ≥90% plant survival (Fig. 3) and 13 of these had 100% survival.

Two small perennial collections were evaluated, *Helianthus eggertii* (5 acc.) and *H. ciliaris* (4 acc.). These were slightly lower in terms of plant survival than some of the other perennial species, but still had 75-96% survival for *H. eggertii* and 62-100% for *H. ciliaris*.

Fig. 4. Evaluation of 31 *Helianthus annuus* inbreds with some mention of Sclerotinia head or stalk rot resistance/ tolerance in their background.



We tested 31 inbreds that had some mention of Sclerotinia resistance in their background. PI 546353 (CM 615) was superior to the moderately resistant check hybrids F30294 and Croplan 305. PI 639163 (RHA 440) and PI 603987 (RHA 391), initially released as head rot tolerant, also showed some stalk rot tolerance.

2011 Field trial at Staples, MN:

Twenty-one entries were planted in an inoculated field trial at Staples, MN including accessions of *H. annuus, H. argophyllus*, *H. debilis, H. neglectus* and *H. praecox*. Six to 8 replications of each accession were planted along with check hybrids Cargill 270 and Croplan 305. Disease developed well, with the most resistant entries being found in *H. argophyllus* (PI 649865), *H. debilis* (PI 468686), and *H. praecox* (PI 435849). The data has not been evaluated.

APPENDIX 3

REPORT TO THE SUNFLOWER CGC

From the North Central Regional Plant Introduction Station (NCRPIS), USDA-ARS/Iowa State University, Ames, IA
For the period: June 1, 2009 -- December 31, 2011
submitted by: Dr. Laura Fredrick Marek, Curator III
January 10, 2012

Personnel

The oilseeds collection at the NCRPIS is managed by Dr. Laura Marek with the assistance of Mr. Irvin Larsen and Mr. Lloyd Crim (half time). Dr. Marek has responsibility for *Helianthus* accessions held at the NCRPIS as well as oilseed Brassicaceae, *Cuphea*, *Linum, Euphorbia* and a group of miscellaneous Asteraceae accessions. The oilseeds collection includes 11,392 accessions, 4,031 of which are *Helianthus*.

The Collection

Acquisitions:

Since the June 2009 CGC meeting, 255 *Helianthus* accessions (144 wild *Helianthus* accessions and 111 cultivated accessions) have been received at the NCRPIS. New accessions, described in Table 1, and their documentation have been entered into the National Plant Germplasm System's (NPGS) Germplasm Resources Information Network (GRIN) database. The majority of the cultivated accessions were not new to the NPGS during this time period; however, due to intellectual property right restrictions and other considerations, they had not been released to the NCRPIS for regeneration and distribution.

Regeneration and Maintenance:

The *Helianthus* collection is 92% available for distribution; current status is summarized in Table 2A. For comparison, Table 2B describes the status of the collection at the time of the previous CGC meeting (89% available). Collection availability has stayed the same or increased in all categories (Table 2A). The absolute number of accessions is dynamic, increasing with new collections and germplasm received from the National Center for Genetic Resources Preservation (NCGRP) and decreasing due to inactivation of non-viable accessions. Increased availability is the result of successful increases in Ames, IA and Parlier, CA.

I continue to manage the collection to eliminate non-viable accessions. In the current reporting period, 89 Helianthus accessions were inactivated. In-activations primarily follow failed germination during regeneration attempts. An oilseed accession is inactivated if it has one or no seeds or if it has fewer than 10 seeds and more than one failed germination attempt. The majority of inactivated accessions were collected in the 1970's or early 1980's and regeneration was not attempted until recent years.

Regeneration efforts remain generally scaled back compared with previous years due to

budget uncertainties. We have increased our emphasis on cultivated accessions so that recent inbred material and older introgression lines are available for distribution. In 2009, 42 cultivated accessions were attempted for regeneration, 39 of which are available for distribution (3 accessions have low seed numbers). In 2010, 56 cultivated accessions were attempted for regeneration, 49 of which are available for distribution (1 accession was not harvested due to an off type plant in the cage, 4 have low seed numbers, and 4 have low viability). In 2011, 70 cultivated accessions were attempted for regeneration, all accessions were harvested and processing is underway. We attempted 19 wild annual *Helianthus* regenerations in 2009; ten populations were established in the field and eight were harvested (two accessions did not produce mature seed). In 2010 we did not attempt any wild annual accessions. In 2011, we grew three wild annual accessions and all three were harvested. We attempted 47 perennial regenerations in 2009; we established field populations for 29 of the accessions. Twenty-one of the accessions were harvested and four made available. Seven of eight previously established plots were also harvested. In 2010 we attempted 29 perennial regenerations; we established 18 field populations of which 17 were harvested and eight made available. Eighteen previously established populations were caged and ten were harvested. During July 2010, we experienced a severe wind storm which damaged many perennial cages about half of which were not re-built because the plants were already flowering. In 2011, we attempted three new perennial accessions, of which two were harvested. We screened 17 previously established populations and harvested seed from all. Two cultivated accessions were successfully regenerated during the 2008-2009 winter greenhouse season and two were successfully grown during the 2010-2011 season. We did not attempt a winter greenhouse sunflower regeneration during the 2009-2010 season. We generally increase two to four cultivated accessions in the greenhouse each winter season, as space and time allow.

Alternate increase location (Parlier, CA):
We continue to partner with NPGS Parlier personnel to increase most accessions of taxa requiring longer growing seasons than are reliably obtained in Ames as well as for some cold sensitive wild *Helianthus* taxa. The Parlier environment also provides a valuable alternative for growing specific mountain and desert species that have not done well in the Mid-western humidity and heavy soils. The Parlier location uses sunflower cages purchased by NCRPIS, and can grow up to 40 sunflower accessions per year. We germinate seeds in Ames and ship live seedlings to Parlier. The Parlier staff transplants seedlings and manages plant growth. As in Ames, plots are caged before flowering, pollinator insects are introduced, and plants are harvested as seed heads mature. Seed heads are shipped to Ames for processing.

In 2009 we sent seedlings for 23 accessions to Parlier, 22 of which were harvested and 19 of which became available for distribution. In 2010 we sent seedlings for 28 accessions of which 28 were harvested. One plot established in 2009 was maintained and harvested in 2010. In 2011, we sent seedlings for 26 accessions and four plots established in 2010 were maintained and re-caged. All 30 plots were harvested and seed processing is underway.

The Parlier group records basic field data (such as date transplanted, date of first flowering, dates of harvest) but does not have the staff resources to record descriptor data (including ray and disc flower color, plant height, branching status, others) or to take images. Because some accessions represent taxa we never see growing in Ames, it is important that these observation data be captured. Generally at the end of September each year, Mr. Larsen and I traveled to Parlier to take images and record descriptor information.

Update on Parlier personnel: Since December 2009, Dr. Gabriela Romano has been the fulltime NPGS curator in Parlier. Mr. Jerry Serimian, who had been fulfilling many curator duties since Dr. Maria Jenderek transferred to NCGRP in November 2006, has returned full time to managing field work. We have an excellent partnership with the NPGS Parlier location ensuring successful regenerations of many wild sunflower taxa.

Distribution:
Distributions from January 1, 2006 through December 31, 2011 are detailed in Table 3 as well as the average distribution over that time period. The 2000 distributions are included for comparison. It is difficult to determine trends from these data due to large, one time distributions intended for specific evaluations or other uses. For example, in 2010, 1197 accessions were sent to Spain for an oil quality trait analysis. However, since 2000 the number of requesters has more than doubled in each category of germplasm (cultivated, wild annual and wild perennial accessions). Requesters of wild annual germplasm, the species most closely related to the crop species, have increased almost four-fold since 2000. This increase in the number of requesters is an excellent indicator of the increased interest in and use of NPGS sunflower germplasm in research programs.

Evaluation and research uses:
From June 1, 2009 through December 2011, the greatest proportion of *Helianthus* distributions with a stated utilization was sent for disease evaluation by several cooperators (about 25% of total seed packets distributed). A significant number of scientists and seed company users do not give specific information about the intended accession use (general breeding or unstated purpose, 16%). About 14% of the distributions went towards molecular related research (mapping, marker development, sequencing, evolutionary relatedness, flowering time analyses) and about 14% were sent out for oil quality research. Accessions have been distributed during the current reporting period for evaluation of resistance to various sunflower insect pests as well as for studies of drought tolerance and for phytoremediation research. Accessions have been requested to investigate biomass production and resource allocation as well as to support ornamental variety development and to help repatriate the newly opened (2010) Mexican GeneBank.

Characterization:
Observations of plant and seed characters are recorded during the regeneration process and loaded into GRIN. The NCRPIS oilseeds project standardized its image file names and loading protocols and has been loading seed, plant and flower images into GRIN. Descriptor data can be viewed at http://www.ars-grin.gov/npgs/searchgrin.html. Select “Research Crops and Descriptor/Evaluation Data Queries”; select “SUNFLOWER”; select

"List of Descriptors". Select each descriptor to view accessions which have been evaluated for that characteristic. Alternatively, descriptor data can be viewed under "OBSERVATIONS" when querying public GRIN for specific accessions under "Accession Area Queries" at the "search grin" URL given above.

Future plans

Acquisitions:

We have made substantial progress towards our long term goals of maintaining all *Helianthus* groups at 90% or higher availability (see Table 2A) and of having accessions available for all *Helianthus* taxa. Currently all 52 species and 69 of the 70 Flora of North America (FNA) recognized taxa are represented in the NPGS collection, and all 69 of those taxa have at least one available accession. The one non-FNA listed taxa not represented in the NPGS collection, *H. nuttallii* ssp. *parishii,* may not be wild-collectible because it is likely extinct. The FNA *Helianthus* volume only recognizes taxa found north of Mexico. One taxa also not represented in the NPGS collection, *H. niveus* ssp. *niveus*, is endemic to Baja California, MEX. It is a goal to have samples of *H. niveus* ssp. *niveus* populations in the NPGS sunflower collection; however fulfilling that goal depends on the establishment of clear authority over access to plant genetic resources in Mexico necessary to allow collection and unencumbered distribution of collected germplasm. An additional long term goal is to have broad geographical/ecological representation for all taxa, a strategy expected to capture maximum genetic diversity. Principal issues associated with achieving full representation of the genetic diversity of *Helianthus* in the collection are continued funding of germplasm collection trips and the availability of critical personnel. The wild species have been important genetic resources for cultivated sunflower, providing cytoplasmic male sterile germplasm to allow the establishment of a hybrid seed industry, and providing herbicide tolerance and disease resistance genes and genes for salinity and drought tolerance. We strive to maintain an adequate genetic reserve for future research endeavors.

The NPGS Plant Exchange Office (PEO) sponsored one sunflower collection trip in 2009 to the south-central U.S. Fifty-one accessions of five targeted and one non-targeted taxa were collected during a 13 day, 4627 mile trip across MO, KS, OK and AR in early October (Table 1). Sampling *H. salicifolius* populations was a priority because the NPGS had never had distributable accessions of this wild species prior to the 2009 collections. In 2010, the PEO sponsored a collection trip to the southern U.S. Fifty-five accessions of six targeted and two non targeted taxa were collected during a 13 day, 3554 mile trip across LA, MS, AL and FL in November (Table 1). Sampling *H. heterophyllus* in its southern distribution range was a priority following the 2008 PEO sponsored collection trip to this species northern range. We also were able to sample *H. silphioides* populations in the pimple mound habitat in southwestern LA, an area disjunct from all previously known and sampled distributions for this species. The PEO approved funding for a 2011 collection trip to target *H. paradoxus*, a threatened *Helianthus* species endemic to the (vanishing) cienega habitats in far western TX and central to eastern NM. However, due to drought in that region and scheduling complications, the trip was postponed until October 2012.

Regeneration and Maintenance:

A goal at the NCPRIS is to accelerate the conversion of accessions with Ames numbers, a temporary local number, to PI numbers, a permanent NPGS-based number. The percentage of accessions with PI numbers increased during the current reporting period except for wild perennial accessions which decreased due to the large number of new collections. 109 Ames and NSL numbered cultivated accessions received PI numbers during December 2011. Approximately 214 Ames numbered wild *Helianthus* accessions are pending receipt of PI numbers. Ames numbered accessions are assigned PI numbers if the curator has some confidence in taxonomic identity and seed viability and knowledge of IPR status.

Research Update:

USDA/DOE Woody Biomass Feedstock Grant:

During 2008, the proposal to investigate "the Genomics of Wood Formation and Cellulosic Biomass Traits in Sunflower" developed by Dr. Steve Knapp, University of Georgia was fully funded by the joint DOE-USDA program which supports fundamental research in biomass genomics to further the use of cellulosic plant material for bioenergy and biofuels. We participated in this research as a field location during the 2009 and 2010 summer field seasons. Ames received funding directly from the DOE. In 2009 we established field populations to support project objectives by recording observations of selected morphological traits and by collecting samples for DNA (leaves), chemical (stem sections), and biomass analysis (whole plants). 260 plants from a BC1 population (*H. argophyllus* x *H. annuus*) and its parental lines were established as well as eight accessions (four *H. argophyllus* and 4 *H. annuus*) planted at three densities, two replications per density (864 plants total). A third field group of 382 RILs (elite oilseed x Hopi landrace) and the RIL parents in 20 plant plots was also established. 2010 and 2011 field work was modified and compressed into the 2010 field season due to the time required for sample preparation and analysis for wood chemistry traits at NREL. Also during 2010, Dr. Knapp left UGA and the project was taken over by Dr. John Burke, UGA. We established a 288 member association mapping population composed primarily of USDA developed inbred lines, two replications each line, 4 to 12 plants per replication. The 382 member RIL population was planted again in 2010. 169 lines were phenotyped and sampled based on 2009 and early 2010 data. In addition, an association mapping population of *H. argophyllus* accessions comprised of 10 different accessions, five early flowering and five late flowering types, was planted. Phenotypic data were recorded and samples were harvested for 16 of the 32 plants established for each accession. Three posters reporting results from this project are being presented at the 2012 National Sunflower Association's Research Forum, Fargo, ND and at the XXth Plant and Animal Genome Conference, 2012, San Diego, CA.

Table 1. *Helianthus* accessions received at the NCRPIS between June 1, 2009 and

December 31, 2011. Cultivated accessions were received from the National Center for Genetic Resources Preservation, Ft. Collins after expiration or waiver of intellectual property rights.

year	source*	species	# of accessions
2009	NCGRP	*H. annuus* , cultivated	18
2009	LFM, GS	*H. annuus* , wild	2
2009	BLM/SOS	*H. anomalus*	1
2009	ST	*H. argophyllus*	8
2009	SNP	*H. maximilianii*	2
2009	KS, SNP	*H. mollis*	3
2009	BLM/SOS	*H. nuttallii ssp nuttallii*	1
2009	LFM, GS	*H. occidentalis ssp plantagineus*	3
2009	KS, LFM, GS	*H. pauciflorus ssp pauciflorus*	16
2009	BLM/SOS	*H. pumilus*	1
2009	LFM, GS	*H. salicifolius*	19
2009	LFM, GS	*H. silphioides*	11
2009	LFM, GS	*H.* x *laetiflorus*	4
2010	NCGRP	*H. annuus* , cultivated	62
2010	LR	*H. annuus* , wild	1
2010	LFM, GS	*H. agrestis*	6
2010	LFM, GS	*H. angustifolius*	7
2010	LFM, GS	*H. floridanus*	2
2010	LFM, GS	*H. heterophyllus*	13
2010	JC	*H. mollis*	1
2010	LFM, GS	*H. radula*	21
2010	LFM, GS	*H. resinosus*	1
2010	LFM, GS	*H. silphioides*	4
2010	KW, LFM, GS	*H. simulans*	2
2011	NCGRP	*H. annuus* , cultivated	31
2010	CB	*H. annuus* , wild	3
2011	CM	*H. agrestis*	1
2011	CM, NCGRP	*H. angustifolius*	4
2011	CM	*H. debilis*	1
2011	CM	*H. porteri*	1
2011	CM	*H. radula*	3
2011	CM	*H. simulans*	1
2011	MW	*H. ciliaris*	1
*CM=Chase Mason CB=Charles Bryson BLM/SOS=BLM/Seeds of Success Program			
GS=Gerald Seiler JC=Jeff Carstens KS=Katie Sparks KW=Karen Williams			
LFM=Laura Fredrick Marek LR=Loren Rieseberg MW=Mark Widrlechner			
NCGRP=National Center for Genetic Resources Preservation			
SNP= Shaw Nature Preserve ST=Sue Thompson			

Table 2A. Status of the NCRPIS *Helianthus* germplasm collection, December 31, 2011.

		available accns		accns duplicated at NCGRP***		accessions with PI numbers	
maintenance group	# of accns	#	%	#	%	#	%
cultivated	1816	1742	96	1749	96	1804	99
wild *H. annuus**	933	913	98	917	98	908	97
wild non-*H. annuus* annual*	425	404	95	395	93	398	94
wild perennial*	831	627	75	564	68	566	68
wild, misc**	26	23	88	23	88	21	81
total collection	4031	3692	92	3648	91	3422	92
*There are 14 wild annual 38 wild perennial species.							
**misc includes *H. hybrid* accessions and accessions (*H.* sp.) in process of being identified to species							
***NCGRP = National Center for Genetic Resources Preservation, Ft. Collins, CO							

Table 2B. Status of the NCRPIS *Helianthus* germplasm collection, May 31, 2009.

		available accns		accns duplicated at NCGRP***		accessions with PI numbers	
maintenance group	# of accns	#	%	#	%	#	%
cultivated *H. annuus*	1737	1662	96	1648	95	1615	93
wild *H. annuus**	929	907	98	910	98	907	98
wild non-*H. annuus* annual*	437	387	89	396	91	400	92
wild perennial*	777	499	64	507	65	590	76
wild, misc**	11	5	45	5	45	5	50
total collection	3891	3460	89	3466	89	3517	90
*There are 14 wild annual 38 wild perennial species.							
**misc includes *H. hybrid* accessions and accessions (*H.* sp.) in process of being identified to species							
***NCGRP = National Center for Genetic Resources Preservation, Ft. Collins, CO							

Table 3. Distributions of Helianthus germplasm from the NCRPIS, 2006 - 2011.

	cultivated				wild annual including *H. annuus*				wild perennial			
year	seed packets	unique accns	# of orders	# of users	seed packets	unique accns	# of orders	# of users	seed packets	unique accns	# of orders	# of users
2006	468	346	56	44	927	571	35	32	145	77	17	15
2007	755	542	64	47	1156	1020	33	31	146	85	17	16
2008	1673	985	83	68	730	526	40	36	326	228	31	30
2009	757	550	96	82	474	348	46	41	346	223	30	29
2010	2465	1380	81	57	518	373	50	43	370	302	19	17
2011	1466	958	61	54	1145	749	37	32	334	250	37	32
average	949	794	74	59	825	598	40	36	278	194	25	23
2000	826	717	25	25	529	426	15	10	148	105	9	9

Curator contact information:
Laura Fredrick Marek, Curator III, Iowa State University/North Central Regional Plant Introduction Station, G202 Agronomy, ISU, Ames, IA 50011, lmarek@iastate.edu, 515-294-3519

APPENDIX 4
2-2012

REPORT ON THE STATUS OF SUNFLOWER GERMPLASM IN THE U.S.

Sunflower is one of the four most important annual oilseed crops grown for edible oil. It is also the second largest hybrid crop grown in the world. U.S. production in 2006 was estimated at 2.0 million acres with an estimated total economic impact of $1.8 billion. The ultimate goal of the entire sunflower germplasm effort is the enhancement and development of superior germplasm for the producer to ensure a continued and viable industry.

PRESENT GERMPLASM ACTIVITIES

The USDA-ARS, North Central Regional Plant Introduction Station, Ames, Iowa has the responsibility for the maintenance and distribution of the sunflower germplasm collection. Evaluation of the collection is being conducted by the Plant Introduction Station, the Agricultural Research Service (ARS), State Universities/Experiment Stations, and various cooperators around the world depending on the expertise and environments needed to evaluate various characteristics.

STATUS OF CROP VULNERABILITY

Sunflower hybrids grown in the U.S. are based on a single male-sterile cytoplasm derived from wild *Helianthus petiolaris*, which makes them extremely vulnerable to many insect and disease pests. One of the potential threats to the sunflower crop could be the introduction of new races of pathogens. Rust (*Puccinia helianthi*) and downy mildew (*Plasmopara halstedii*) are pathogens that have evolved with the crop in the U.S. New races are continually evolving in the U.S. and other countries, so the impact of the introduction of new races from outside of the U.S. is unknown, but would be expected to be just as destructive and to have similar infection mechanisms resulting in the destruction of plants. Broomrape [*Orobanche cumana* (*cernua*)] is a parasitic weed that attacks sunflower in parts of Europe and Asia. This would probably be one of the greatest potential threats to the U.S. sunflower crop. The parasite has been present in other parts of the world for a number of decades, but has not been found in the U.S. Its impact on the U.S. sunflower industry is unknown. The parasite is of concern, but at the present time we do not understand the infection mechanism and why it is not present in the U.S. There have not been any extraordinary precautions taken to prevent this parasite from being introduced into the U.S. The seeds are very small (almost like dust) and could easily be transported with many different types of seeds traded in commerce. Other species of *Orobanche* exist in the U.S., but do not attack sunflower. Albugo rust (white rust) is another pathogen which has existed in sunflower production areas, especially in South America, Australia, and South Africa, but has not been a problem in the U.S. It occurs on wild *Helianthus* species in the U.S. These could be a potential source of genes for resistance.

Currently there are no commercially available genetically modified organism (GMO) traits in the U.S. The possibility exists that GMOs with negative effects on human health could be released that could potentially contaminate sunflower production fields. This would most likely be in the area of allergens, which generally have an effect on a limited portion of the

human population. GMOs with various traits from other species could also be a potential threat to the sunflower crop.

In a more general sense, weedy species of plants could be introduced as invasive weeds that could overcome native species in agricultural systems. On a global basis, there are probably herbicides that would control most weeds. As with the pathogens, insects evolved with the wild and cultivated sunflower crop in the U.S. This has resulted in a large pest complex for the cultivated sunflower crop in the U.S. There are very few countries outside of the U.S. that have severe insect problems.

The likelihood that insects could be introduced into the U.S. exists, but it is unlikely they would have a significant impact since we already have the major sunflower insect pests. The diversity of the wild species is an invaluable resource for genes to protect the cultivated crop. Since most of the wild species are native to the U.S., destruction of the many populations spread all over the U.S. is highly unlikely, but the possibility does exist that some endemic species could be eliminated due to their restricted distribution. The present gene bank contains a good representation of the available genetic diversity. However, many of the accessions have not been evaluated for specific traits, but could be mobilized with a substantial effort. Several interspecific and elite germplasms are available from USDA-ARS sunflower projects as the need arises. The use of biotechnology to move genes from other species into sunflower could be another source of germplasm to protect the crop against various pests. Use of the OXO gene from cereals to improve *Sclerotinia* tolerance, incorporation of antifungal proteins for resistance to the major diseases, and the use of BT or similar genes for insect protection are a few examples.

STATUS OF CROP SECURITY

The sunflower germplasm collections, both cultivated and wild species, represent a wealth of genetic diversity for improving and protecting the cultivated sunflower. With heightened awareness of security threats, the germplasm in the gene banks and at other locations is restricted in access and protected.

GERMPLASM NEEDS: COLLECTION

Sunflower is unique in that it is one of the four crop species that has its progenitor species native to the U.S. The genus *Helianthus* contains 52 species and 15 subspecies that offer genetic diversity for many agronomic characteristics for the improvement and expansion of cultivated sunflower. The present germplasm collection is representative of all extant species and subspecies, but does not come close to adequately representing the potentially available genetic diversity that needs to be conserved. Continued efforts are needed to strive toward collecting as many populations of all species as are feasible. Since Mexico has not been systematically collected, this area represents a wealth of genetic variation and should be collected as soon as possible. Due to the persistent *Sclerotinia* disease complex, emphasis will be put on collecting selected perennial species in the U.S. Herbicide resistance, especially to the imidazolinone chemistry, is more prevalent in the wild *H. annuus* populations than previously thought. Collection of wild *H. annuus* and screening to currently used herbicides (particularly triazine and glyphosate chemistry) could have a major impact on the sunflower industry. With the advent of several glyphosate-resistant crops, the potential for resistance of wild sunflower species to these herbicide chemistries increases. Collection of wild annual species from these areas may be a source of useful herbicide tolerance genes in the future.

GERMPLASM NEEDS: MAINTENANCE

The seed multiplication program is the most valuable link of the *Helianthus* germplasm program. There is a critical need to regenerate and replenish wild *Helianthus* seed stocks. The number of accessions waiting to be regenerated is large. Until accessions are regenerated, this produces a bottleneck in the evaluation process. Due to the large number of wild perennial accessions waiting to be regenerated, and the difficulty in obtaining an adequate number of plants for regeneration, in situ conservation should be considered as a maintenance option.

GERMPLASM NEEDS: EVALUATION

An evaluation plan for disease and insect pests listing priorities for evaluation is in place. Evaluation information obtained to date has been a valuable addition to the GRIN system in characterizing the value of germplasm accessions. There is a continuing need to evaluate more accessions as pest races change and to evaluate additional species populations and accessions. Priority descriptors of the accessions of the wild species continue to be collected in an effort to make the information available in the GRIN system. There is a particular need for additional funds to evaluate the wild perennial species for *Sclerotinia* stem and stalk rots, and to screen wild species for *Rhizopus* head rot resistance, a persistent and increasing problem in the High Plains. Evaluation of wild species for glyphosate resistance could provide a potential source of herbicide tolerance genes. Also, the wild species have not been systematically screened for tocopherol content and concentration.

GERMPLASM NEEDS: ENHANCEMENT

Increasing genetic variability of cultivated sunflower is critical for ensuring survival of the crop. An enhancement plan is in place for the inclusion of wild *Helianthus* species into a domesticated background utilizing embryo rescue and other techniques. The plan includes interspecific gene transfer, germplasm pool development, and development of cytoplasmic male-sterility and fertility restoration programs. Based on current needs, crossing wild perennial species into the cultivated background is necessary since many of the perennial species have shown promise as potential sources of genes for resistance to some of the persistent pests. There is a critical need to utilize the molecular characterization techniques available to facilitate the difficult task of transferring genes from the wild perennial species into cultivated sunflower. There is a need to apply molecular characterization techniques, such as molecular profiling, to assessments of the genetic diversity in the sunflower collection both within and between accessions and taxa. The information obtained would have two applications: first, it will allow us to determine need for additional collection of specific taxa and second, identification of maximum diversity would be used to select material that should be moved into the germplasm enhancement program for cultivated sunflower. Germplasm enhancement applications would intersect with work being done to identify specific trait-associated markers in the marker-assisted selection program.

RECOMMENDATIONS

The priority needs and actions for the *Helianthus* germplasm collection are as follows:

1. Fund explorations to explore the wealth of genetic variability in the wild species of the U.S. and continue to explore opportunities to collect wild species in Mexico in spite of the absence of a material transfer agreement with Mexico.

2. Provide funding to the Plant Introduction Station at Ames, IA to build a greenhouse complex to increase regenerations of accessions that require special conditions, and continue the high level of support for curation of the sunflower collection.

3. Provide $100,000 of permanent funding for evaluation of wild annual and perennial species, interspecific, and exotic germplasm for resistance to diseases such as *Rhizopus* head rot and *Phomopsis* stem canker and insect resistance.

4. Provide $100,000 of permanent funding for molecular evaluation of wild sunflower germplasm to generate information to better assess diversity and need for collection and to determine sources of genetic variability for improvement of cultivated sunflower.

5. The Committee strongly recommends increasing funding for activities of the NPGS site at Parlier, CA as an alternate grow-out site for sunflower and encourages the continued cooperation utilizing it as an alternate site for difficult-to-regenerate sunflower accessions.

6. The Committee recommends exploring the opportunity and the possibilities of integrating existing databases in a seamless fashion in the GRIN system.

7. Continue to explore opportunities to initiate a germplasm and information exchange with the N. I. Vavilov Institute in St. Petersburg, Russia and the VNIIMK Institute, Krasnodar, Russia.

8. Request a one-time $20,000 grant for increasing the mapping populations used to develop the public sunflower map to preserve them in the NPGS sunflower germplasm collections.

9. Explore opportunities to discover herbicide resistance in germplasm that fits rotation with other commonly grown crops.

10. With the recent interest in biofuels, the Committee recommends exploring the opportunities of using sunflower oil for biodiesel, sunflowers for biomass, and the possibly of converting sunflower to a perennial crop.

APPENDIX 5

National Germplasm Resources Laboratory
USDA-ARS
Beltsville, Maryland
2011 Report to PGOC, RTACs and CGCs

The National Germplasm Resources Laboratory (NGRL), Beltsville, MD, supports the acquisition, introduction, documentation, evaluation, and distribution of germplasm by the National Plant Germplasm System (NPGS) and other components of the U.S. National Genetic Resources Program (NGRP). The Laboratory is comprised of the Plant Exchange Office (PEO), the Germplasm Resources Information Network/Database Management Unit (GRIN/DBMU), and the Plant Disease Research Unit (PDRU), whose functions are provided below. Dr. Gary Kinard has been the Research Leader for NGRL since January 2009.

Plant Exchange Office

Plant Exploration and Exchange Program

The PEO supports the collection of germplasm for the NPGS through the management of a Plant Exploration and Exchange Grant Program. Plant explorations involve field collection of germplasm not available in any germplasm repositories, while plant exchanges are expeditions to facilitate the transfer of germplasm already conserved in foreign genebanks. Annual guidelines for developing plant exploration and exchange proposals are prepared by the PEO and distributed to the CGC chairs for distribution to their members.

An extensive review procedure is used to assess the relevance of the proposals to the NPGS needs and the likelihood that the proposed explorations or exchanges will accomplish their stated objectives. Before submission, proposals are reviewed by the appropriate CGC or other crop experts. After submission to the PEO, proposals are reviewed by a subcommittee of the NPGS Plant Germplasm Operations Committee (PGOC). The PEO then evaluates the proposals and the PGOC reviews and makes recommendations on funding to the ARS Office of National Programs (ONP).

All foreign explorations supported by PEO comply with the provisions of the Convention on Biological Diversity on access and benefit sharing related to genetic resources. Prior informed consent to collect genetic resources is obtained from the appropriate host country before the exploration occurs. The permission includes agreement on the benefits to the host country associated with access to genetic resources. The PEO is involved in most requests to foreign governments for permission to collect and negotiates the terms of agreements when necessary. Foreign explorations are always conducted in cooperation with scientists from the host country and cooperation with their national genetic resources programs is strongly encouraged. Germplasm obtained on explorations is shared by the NPGS and the host country.

FY 2011 NPGS Plant Explorations

Target Crop	Country	Principal Contacts
Camellina	Georgia	M. Mosulishvili, G. Arabuli
Fruits and nuts	Albania	J. Postman, J. Preece, E. Kullaj
Small fruits (exchange)	Canada	K. Hummer, A. Jamieson
Sunflower	United States (AL, FL, LA, MI)	L. Marek, G. Seiler
Johnsongrass	United States (AL, FL, GA, SC)	G. Pederson, J. Pedersen
Ash	United States (NY, PA)	M. Dosmann, A. Schmitz
Small fruits and mint	United States (AK)	D. Barney, P. Holloway
Bean	United States (FL)	M. Welsh, K. Williams
Apple	United States (CA, OR, WA)	K. Routson, S. Hayes
Phlox	United States (AL, FL, GA, LA, MI, OK, TX)	P. Zale, S. Haba
Potato	United States (AZ, TX)	J. Bamberg, A. Del Rio

GRIN Taxonomy for Plants

GRIN Taxonomy provides online current and accurate scientific names and other taxonomic data for the ARS National Plant Germplasm System and other worldwide users. This standard set of plant names is essential for effective management of ARS plant germplasm collections, which now represent over 13,600 taxa. GRIN taxonomic data now include scientific names for 26,800 genera (14,190 accepted) and 1,340 infra-genera and 95,500 species or infra-species (56,300 accepted) with nearly 48,500 common names, geographical distributions for 51,140 taxa, 397,100 literature references, and 26,170 economic impacts. A broad range of economically important plants are supported by GRIN nomenclature, including food or spice, timber, fiber, drug, forage, soil-building or erosion-control, genetic resource, poisonous, weedy, and ornamental plants. Most or all species of important agricultural crop genera are represented. Information about the systematic relationships of species is provided, which is critical for optimally determining the disposition or use of individual germplasm samples. Included in GRIN Taxonomy are federal- and state-regulated noxious weeds and federally and internationally listed threatened and endangered plants, with links to information on noxious weed and

conservation regulations to ensure unimpeded interstate and international exchange of plant genetic resources. The scientific names are verified, in accordance with the international rules of botanical nomenclature by taxonomists of the National Germplasm Resources Laboratory using all available taxonomic literature and consultations with taxonomic specialists. Generally recognized taxonomic database standards have been adopted in GRIN Taxonomy.

The current focus of GRIN taxonomic work is to ensure that scientific plant names in GRIN continue to reflect recent plant taxonomic and nomenclatural literature, and that new data on classification, synonymy, native and naturalized distribution, economic impacts, and common names for plants and economic use categories currently treated in GRIN are incorporated. Recent efforts have focused on improving the documentation of sources for the information provided in GRIN Taxonomy. We also seek to expand the nomenclatural, classificatory, and ecogeographical information for crop taxa and their relatives. In late 2008 a project to provide thorough coverage in GRIN-Taxonomy to wild relatives of all major and minor crops was initiated. We have now completed our initial work on 60 crops, and an interface to query these data in various ways has been developed (www.ars-grin.gov/~sbmljw/cgi-bin/taxcrop.pl). We invite feedback from NPGS curators and CGC members for those crop wild relative classifications already developed. The breadth of coverage and quality of GRIN taxonomic data has encouraged usage of GRIN-Taxonomy data among genetic resource managers and other agricultural workers worldwide. GRIN taxonomic data are the most requested item on public GRIN, with ca. 800,000 of these reports retrieved monthly.

PI Documentation

Since 1898, Plant Introduction (PI) numbers have been used as unique identifiers for accessions incorporated into the NPGS. In earlier times, PI numbers were automatically assigned to all plant material received by the Plant Introduction Office, a predecessor of the PEO. Currently, before PI numbers are assigned, NPGS curators first evaluate the passport data, and if possible grow and observe new accessions to verify uniqueness and rationale for preservation in the NPGS. For this reason, curators usually assign a local identifying number to an accession until a decision is made to assign a PI number. When the decision is reached to assign a PI number to an accession, the curators contact Mark Bohning in DBMU for assignment of the next sequential number(s).

In FY 2011, the NGRL in collaboration with the National Agriculture Library completed the digitization of all volumes of the PI Books (Vol:1-206, 1898-1997) and the 8 volume Plant Immigrant series. These digitized volumes along with electronic copies of the PI books dating from 1998 – present, are currently accessible from the NPGS website: http://www.ars-grin.gov/npgs/searchgrin.html. In addition, the Accession records in GRIN have been modified so there is a link (*View original Plant Inventory data*) to the appropriate page in the PI Book. The digitized PI books are also available on the National Agricultural Library (NAL) website http://ddr.nal.usda.gov/, (select United States Department of Agriculture, then USDA/ARS Plant Inventories). The Plant Immigrant series are in the

process of being made available through the same entities above.

Facilitation of Germplasm Exchange

The PEO assists NPGS personnel and other scientists with acquiring germplasm from scientists, foreign national and international genebanks, domestic and foreign explorations, and special projects and agreements. The PEO also helps to expedite the distribution of germplasm from the NPGS to foreign scientists and other international genebanks. Through close collaboration with USDA/APHIS and the Maryland Department of Agriculture (MDA), PEO facilitated the agricultural inspection for the international distribution of NPGS germplasm. Eight hundred and thirty five (835) shipments containing a total of 49,156 samples of NPGS accessions were sent to individual's in72 countries throughout the world for the purpose of research and education. In addition, PEO facilitated the agricultural inspection of 15 shipments containing 314 accessions from 8 different foreign countries to researchers and NPGS sites in the United States.

Database Management Unit

GRIN and GRIN-Global

The mission of the GRIN Database Management Unit (DBMU) is to develop and maintain information systems for the National Genetics Resources Program comprised of plants, animals, microbes, and invertebrates. Recent statistics for data in the plant database include:

Over 95,800 taxonomic names (including synonyms)
535,473 accessions representing 13,388 species and 2,208 genera
1,866,764 inventory records
1,628,283 germination records
7,291,757 characteristic/evaluation records
Over 201,156 images

Germplasm accessions acquired by the National Plant Germplasm System (NPGS) since the effective date of the Convention on Biological Diversity continue to be flagged in the database with appropriate disclaimers and MTAs. The new SMTA issued under the International Treaty is also flagged and tracked through the system. These agreements are displayed with accession passport data and automatically printed on GRIN generated packing slips when accessions are distributed. During the past year, the DBMU continued to provide support to NPGS site personnel and assisted NPGS sites in loading passport data, evaluation data, distribution information and images into the database

The GRIN-Global project is a cooperative effort between the Global Crop Diversity Trust (GCDT), USDA-ARS and Bioversity International to develop a powerful, easy-to-use plant genetic information system that will be freely available to any country throughout the world. NPGS personnel at Ames, IA and Beltsville, MD are leading the project. The international

component of the project is almost complete and a test version was released in July of 2011. A demonstration of the new public software was presented at the biennial CGC Chair, Regional Technical Advisory Committees and Plant Germplasm Operations Committee joint meetings in Geneva, NY July 27-29, 2010. The technical steering group (TSG) for the GRIN-Global project held their final meeting in September 2010. They provided important guidance and recommendations to the development team throughout the project. A demonstration of the beta version GRIN-Global public website project was also presented at the Plant & Animal Genome XIX meeting in January 2011. Training sessions for GRIN-Global international trainers (Train the Trainers) were held April 12-23, 2010 in Beltsville, Maryland and November 15-22, 2010 in Ames, IA. Eighteen international participants attended the Beltsville session and 10 attended the Ames session. They all learned how to use the GRIN-Global application and offered their comments and suggestions. Throughout 2011, these international collaborators will assist in deploying the system to the international community. An additional workshop for international partners was sponsored by NORGEN/Procinorte at the new Mexican genebank (Centro Nacional de Recursos Geneticos) in Jalisco Mexico from October 31-November 10, 2011. The workshop included 27 trainees from 5 different countries.

The second phase of the project, implementing GRIN-Global for the NPGS, will be initiated immediately after the release of version 1.0 of the software package needed for international deployment. GRIN-Global will replace the current GRIN system with new site maintenance and public retrieval software. All the NPGS sites will be contacted to ensure all site specific software will be incorporated into the new system.

The development team is always interested in receiving feedback from the user community on the GRIN-Global NPGS public website. A beta version of the GRIN-Global public website can be found at:

http://test.grin-global.org/gringlobal/search.aspx

Comments, ideas and suggestions can be sent to feedback-grin.global@ars.grin.gov

Current GRIN has been enhanced to handle molecular data. New tables have been added to the database to store this data and software has been developed to display it. SSR data generated on apple, cacao, grape, hazelnut, hops, pear and blueberry, along with AFLP data on Rhubarb, has been loaded into the system.

The GRIN system was available 98% of the time on a 24 hour a day and 7 day a week schedule. Access to the database through the web pages continues at a brisk pace. In 2010, there were 1,928,387 visits to the GRIN database. We always encourage users to send any comments on the current GRIN system by email to dbmu@ars-grin.gov .

Security measures for the hardware and databases are regularly reviewed and constantly monitored for intrusion by those who may attempt to corrupt web pages or to destroy data. New security patches are implemented as soon as they become available. The system is

protected by a firewall and all data are backed up at onsite and offsite locations. Backup tapes are kept at several local offsite locations, including one set at Ft. Collins, CO for long term storage. The system has an Uninterruptible Power Supply for short term power outages and a diesel generator for longer power outages. The building housing NGRL is secured with access permitted only by proximity card. The GRIN server room is locked with further limited proximity card access and the room is monitored for temperature fluctuations 24/7/365.

Crop Germplasm Committees

Since June 1, 2010, over 20 of the 42 Crop Germplasm Committees (CGC) have met. An NGRL representative was present at most of the meetings, or participated via teleconference, to help facilitate their activities. Summaries of each meeting are prepared and distributed to appropriate National Program Leaders, NGRL staff and other NPGS personnel. The committees continue to provide advice on all aspects of the NPGS including identifying gaps and duplications in the collections, germplasm maintenance and evaluation, quarantine issues and maintaining updated versions of the crop vulnerability reports. The 13th biennial meeting of the CGC Chairs was held in Geneva, NY July 27-28, 2010 in conjunction with the Plant Germplasm Operations Committee and the Regional Technical Advisory Committees. This meeting provided an opportunity for the Chairs to hear presentations on the status of NPGS sites, plant germplasm exchange, international issues, preservation and utilization, the molecular characterization of accessions, interactions between curators and CGCs and plant quarantine issues. One of the major topics presented was a demo and discussion of the new GRIN-Global public interface. The meeting also allowed the Chairs to meet and interact with each other, NPGS managers and curators, and invited guests from ARS, other government agencies, and non-governmental organizations. A virtual meeting/web conference was held for CGC Chairs on October 26, 2011 with more than 35 participants. Given the limitations on travel funds that are widespread throughout the research community, it is likely that this technology will be used more frequently to maintain active participation and productivity among our committees.

Plant Disease Research Unit

Since October 1, 2005, the responsibilities for the quarantine indexing and distribution of prohibited genera germplasm that were performed by the former ARS Plant Germplasm Quarantine Office were transferred to APHIS-Plant Germplasm Quarantine Program (APHIS-PGQP). The quarantine program manager for APHIS-PGQP is Dr. Joseph Foster. For ARS, three SYs (Gary Kinard, Ruhui Li, and Ray Mock) and nine support staff now comprise the Plant Disease Research Unit within National Germplasm Resources Lab (NGRL-PDRU). The mission of NGRL-PDRU is to conduct research to understand the biology of pathogens that infect economically important prohibited genera plant germplasm, including their etiology, detection, and elimination by therapeutic procedures. These projects provide support to the APHIS quarantine programs and help facilitate the safe introduction and international exchange of valuable plant germplasm.

Personnel

Ray Mock works with sugarcane, and deciduous tree and small fruits. Dr. Ruhui Li provides molecular support for all unit projects and works more intensively on sugarcane, sweet potato, grasses, and stone fruits. Whitney Hymes, who was a student employee in PDRU for several years, began working in a permanent position as a Biological Science Research Technician in May 2010 and provides molecular lab support. Sam Grinstead, a Biological Science Research Technician, provides greenhouse support for the unit. Dr. Eun Ju Cheong was hired as a Support Scientist for the unit in December 2010. Her expertise is tissue culture and therapeutic methods. Four International Visiting Research Scholars have joined the lab since February 2008: Dr. Liming Lin, working on viroid detection in stone and pome fruits; Donglin Xu, working on characterization and detection of sugarcane viruses; Ae Rin Jeon, focusing on developing methods for the *in vitro* cultivation of a broad range of small fruit species, and elimination of quarantine pathogens from these 'prohibited' category crops; and Mingqiang Wang working on viruses of potatoes and sweet potatoes.

Research Objectives and Progress

The NGRL-PDRU performs research on viral pathogens of quarantine significance infecting clonally propagated prohibited crop genera, with an emphasis on deciduous tree and small fruits, sugarcane, grasses, and sweet potatoes. The mission is to characterize and investigate the etiology of poorly described diseases and pathogens of quarantine significance, and to develop more reliable detection and elimination methods. Once complete, these protocols will be submitted to the USDA, APHIS quarantine for validation and inclusion in the quarantine testing program. PDRU provides regular updates about its research projects to the CGCs that deal with prohibited genera crops. The staff regularly confers and collaborates with APHIS scientists on matters pertaining to the quarantine of plant germplasm. NGRL-PDRU personnel are glad to discuss potential collaborations with colleagues and stakeholders in the NPGS.

Key NGRL Contacts

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APPENDIX 6

2011 OFFICE OF NATIONAL PROGRAMS REPORT
FOR THE U. S. NATIONAL PLANT GERMPLASM SYSTEM
OFFICE OF NATIONAL PROGRAMS, NATIONAL PROGRAM 301: PLANT GENETIC RESOURCES, GENOMICS, AND GENETIC IMPROVEMENT
(PETER BRETTING, DAVID MARSHALL, JACK OKAMURO, SALLY SCHNEIDER, ROY SCOTT, GAIL WISLER, DA KAY SIMMONS)

Personnel changes:

1. Farewell and best wishes to Mark Widrlechner who retired as Horticulturist and woody ornamental plant curator at Ames, IA; Ray Schnell, who retired as Research Geneticist and tropical fruit crop and sugar cane curator at Miami, FL; Steve Clement, who retired as Research Entomologist at Pullman; Chuck Simon, who retired as Grape Curator at Geneva; Ray Mock, who retired as a Plant Pathologist at NGRL, Beltsville, MD and Doug Cook who retired as IT specialist at Corvallis.
2. Welcome to Thomas Chao, new grape, apple, and tart cherry curator at Geneva, NY; Noelle Barkley, new peanut curator at Griffin, GA; Osman Gutierrez, cacao Research Geneticist at Miami, FL; Hugo Cuevas, new sorghum Research Geneticist at Mayagüez, PR, and Pablo Jourdan, new director of the Ornamental Plant Germplasm Center, Columbus, OH. Roy Pittman, formerly peanut curator, assumed responsibility for the cowpea (Vigna) collection at Griffin.

2. **Site developments and changes:**

1. The USDA/ARS-NPGS partnered with Diversity and the GCDT on a three-year, $1.4 million project to transform GRIN into GRIN-Global, a powerful but easy-to-use, Internet-based, plant genetic information management system that will link world's plant genebanks. NPGS personnel in Beltsville, MD and Ames, IA are leading the project. The nucleus of the system is ARS's existing GRIN, which already houses information about the more than 541,000 accessions of more than 13,000 plant species in the NPGS. Software upgrades will enable GRIN be used by genebanks of all sizes from many countries, making more information about more plants available to researchers. GRIN-Global v. 1.0 was released to the international community in December 2011.
2. Citrus species are highly susceptible to many lethal diseases, damaging pests, and low temperatures. Genetic resources of citrus varieties are often reproduced as clones, and are currently maintained in field orchards and screen houses at the joint ARS-University of California NCGR at Riverside, CA because long-term storage of citrus clonal vegetative tissue has been infeasible. Researchers in the NCGRP at Ft. Collins, CO implemented new “micrografting” recovery methods that enable clonal citrus samples to be stored at the temperature of liquid nitrogen and successfully

re-propagated. Storing duplicate clonal samples in secure genebank vaults will safeguard and enable them to be distributed to researchers more efficiently.

3. The genomes of wheat, barley and the biofuel crop switchgrass are so large and complicated that analyzing their genetic function and structure requires special genetic tools. Curators at the WRPIS in Pullman, WA greatly expanded the collection of genetic lines of Brachypodium, a small, rapidly flowering grass, with a relatively small genome which has been completely sequenced. Knowledge gained about this "model plant's" gene content, structure, and arrangement can be readily extended to small grains and bioenergy crops. Thus, by safeguarding and distributing this key "genetic tool," ARS genebanks are catalyzing efforts to map and manipulate key traits for genetically improving major crops.

3. Budgets:

The current Administration's research priorities for USDA include climate change, food safety, children's nutrition/health, international food security, and bioenergy.

The President's FY 12 budget proposed substantial budget increases ($3.3 million) for the NPGS. The FY 12 budget enacted by Congress did not include those increases. On the contrary, it reduced the USDA/ARS's budget by about 3.5%. Nine locations and one program will be closed, including the NPGS genebank at Palmer, AK. Closing the preceding locations will likely cost ARS an additional ca. $30 million or more for FY 12. The FY 12 budget reduction, on top of last FY's reduction, will substantially affect the ability of some NPGS genebanks to address their objectives.

4. National Programs:

ARS's research portfolio is organized as a series of 18 national programs. Plant and microbial genetic resource management, genetic improvement, genomics, molecular and biological processes, biotechnology risk assessment, bioinformatics, and genome database management are incorporated into National Program 301 (see the WWW at: http://www.nps.ars.usda.gov/programs/programs.htm?NPNUMBER=301). During 2011, NP 301 completed its second five year cycle. Its accomplishments are described in the 2006-2011 NP 301 Accomplishment Report available on the web at http://www.ars.usda.gov/research/programs/programs.htm?np_code=301&docid=22191

During late October 2011, NP 301 underwent an external review which in general found that the NPGS was performing high-quality research and service programs with significant impact (see Executive Summary of the panel review at the web site above). The external review was followed by teleconferences-webinars on 8 and 9 November 2011 to inform scientists and

customers-stakeholders of the review results. A customer/stakeholder workshop was held in Beltsville on November 15, 2011 to elicit input regarding future research needs and priorities. ARS leaders and researchers are now developing an Action Plan for the next five years, and hope to hold ARS scientist workshops and/or webinars in 2012 as a prelude for developing individual Project Plans.

5. National Plant Germplasm Coordination Committee (NPGCC):

The NPGCC seeks to promote a stronger, more efficient, more widely-recognized and better utilized NPGS. Its goals are to facilitate the coordination of ARS, NIFA and SAES planning and assessment mechanisms for NPGS policy, organization, operations and support; promote awareness and understanding of the NPGS across ARS, NIFA, and SAES and more broadly to the scientific community; and serve as a vehicle for improving communications and discussions about issues impacting the NPGS with ARS, SAES, and NIFA. It will assess, develop and recommend to the SAES, ARS and NIFA strategies for improved coordination of NPGS activities; develop and recommend a process for improved communication of the value of the NPGS; initiate a strategic planning effort for the NPGS to better define and communicate the vision, mission and short- and long-term goals; and to evaluate the current funding models for the NPGS and report findings to the SAES directors, ARS and NIFA.

The current members of the NPGCC are L. Sommers (Colorado State-SAES), Chair; E. Young (Executive Director, Southern Region); J. Colletti (Iowa State-SAES), G. Arkin (University of Georgia-SAES), T. Burr (Cornell University-SAES), A. M. Thro (NIFA), E. Kaleikau (NIFA), P. S. Benepal (NIFA), P. Bretting (ARS-Office of National Programs), D. Upchurch (ARS-Southern Plains Area), and G. Pederson (ARS-Griffin).

NPGCC members made a joint presentation on the NPGS to the 2006 Experiment Station Section/State Agricultural Experiment Station/Agricultural Research Directors Workshop September 24-27, 2006. That presentation, plus testimonials from key Directors about the NPGS's value, increased the NPGS's visibility to this important group. In May 2007, the NPGCC recommended to the National Research Support Project Review Committee that it recommend restoring off-the-top funds designated for NRSP-5 (the Prosser, WA virus-free pome and stone fruit project) and NRSP-6 (the potato genebank project at Sturgeon Bay, WI) to their FY 06 levels to sustain these valuable efforts. Support for NRSP-6 has been maintained at the FY 06 level for FY 07, FY 08, and FY 09. The NPGCC met on June 5, 2008, in conjunction with the annual PGOC and biennial CGC Chairs meetings. It discussed the NPGS's budget levels, funding for NRSP-5 and NRSP-6, the location of crop collections, and mechanisms for publicizing the NPGS.

Similarly, the NPGCC met on 23-24 June 2009, 9 June 2010, and 16-17 June 2011 in Beltsville, MD to continue its work on these priority issues.

1. International germplasm items:

The FAO Treaty (IT) for Plant Genetic Resources for Food and Agriculture came into force on 29 June 2004, and beginning in 2007 its standard material transfer agreement (SMTA) for plant genetic resource exchange was adopted by Parties to the IT and the CGIAR Centers for distributing plant genetic resources. On 7 July 2008, the White House transmitted the IT to the Senate; ratification would require the advice and consent of a 2/3 majority of the Senate. The Senate Foreign Relations Committee (SFRC) held hearings on the IT on 10 November 2009. During their last Business Meeting of the 111th Congress (30 November 2010), the SFRC voted the IT out of committee, for consideration by the full Senate. Unfortunately, the Senate adjourned on 22 December 2010 without voting on the IT. The SFRC might schedule new hearings on the IT during 2012, as a prelude to the full Senate for a vote for consent (or not) to IT ratification.

Concurrently, the Convention on Biodiversity (CBD) adopted the voluntary, non-binding Bonn Guidelines on Access and Benefit-Sharing during the sixth Conference of Parties (COP-6) of the CBD at The Hague in April 2002. Starting in 2006, Parties to the CBD began negotiating what became the legally-binding Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Adopted by the COP-10 on 29 Oct. 2010, the Nagoya Protocol is quite complicated, with many ambiguous components; its ramifications are currently under analysis (see http://ictsd.org/downloads/2010/11/abs-protocol.pdf for the text).

The preceding developments at FAO and with the CBD will substantially affect international exchange of plant genetic resources, and the NPGS, whether or not the U. S. is ultimately a Party to either or both treaties. Precisely how these treaties will affect U. S. users of germplasm depends on the treaties' implementation.

APPENDIX 7

Helianthus taxa listing, NCRPIS, January 2012					
Annual Taxa	**Total**	**Avail**	**Perennial Taxa**	**Total**	**Avail**
H. annuus, wild	933	913	H. angustifolius	26	16
H. annuus, cultivated	1816	1725	H. arizonensis	2	2
H. agrestis	10	9	H. atrorubens	14	12
H. anomalus	6	6	H. californicus	21	16
H. argophyllus	47	47	H. carnosus	2	2
H. bolanderi	7	5	H. ciliaris	27	15
H. debilis	1	0	H. cusickii	20	17
H. debilis cucumerifolius	11	11	H. decapetalus	30	24
H. debilis debilis	12	12	H. divaricatus	27	16
H. debilis silvestris	22	22	H. eggertii	13	12
H. debilis tardiflorus	5	4	H. floridanus	9	7
H. debilis vestitus	3	3	H. giganteus	25	19
H. deserticola	21	15	H. glaucophyllus	12	9
H. exilis	30	30	H. gracilentus	6	5
H. neglectus	28	28	H. grosseserratus	44	40
H. niveus	1	1	H. heterophyllus	17	12
H. niveus canescens*	19	15	H. hirsutus	12	6
H. niveus niveus*	0	0	H. laciniatus	7	7
H. niveus tephrodes	11	6	H. x laetiflorus	11	8
H. paradoxus	2	2	H. laevigatus	7	6
H. petiolaris	15	15	H. longifolius	3	3
H. petiolaris fallax	30	30	H. maximilianii	64	58
H. petiolaris petiolaris	94	94	H. microcephalus	13	10
H. porteri	9	8	H. mollis	27	15
H. praecox	2	2	H. nuttallii	8	8
H. praecox hirsutus	7	7	H. nuttallii nuttalli	22	20
H. praecox praecox	8	8	H. nuttallii parshii	0	0
H. praecox runyonii	24	24	H. nuttallii rydbergii	12	12
totals, annuals	3174	3042	H. occidentalis occidentalis	3	2
*taxa not listed in the Flora of North America			H. occidentalis plantagineus	12	10
			H. paucilforus	11	10
H. hybrid	17	15	H. pauciflorus pauciflorus	21	15
H. sp.	9	8	H. pauciflorus subrhomboides	14	14
			H. pumilus	52	46
			H. radula	40	27
			H. resinosus	23	21
			H. salicifolius	19	18
			H. schweinitzii	1	1
			H. silphioides	15	12
			H. simulans	5	4
			H. smithii	7	6
			H. strumosus	33	21
			H. tuberosus	92	41
			H. verticillatus	2	2
	Total	**Avail**	totals, perennials	831	627
totals, all NCRPIS *Helianthus*	4031	3692			

APPENDIX 8
2-2012

BYLAWS FOR THE SUNFLOWER CROP GERMPLASM COMMITTEE

NAME:

The official name for the committee concerning all species of *Helianthus* shall be the "Sunflower Crop Germplasm Committee".

FUNCTION:

To gather a committee of scientists and advisors on wild and cultivated *Helianthus* species to provide expert advice on germplasm collection, maintenance, evaluation, and enhancement for the curator of the sunflower collection, scientists of industry and public research programs, and organizations such as the USDA, Agricultural Research Service (ARS) and State Agricultural Experiment Stations (SAES).

OBJECTIVES:

1. Provide a strategic plan for strengthening the national scientific efforts on sunflower germplasm. Recommend means for organizing activities that would benefit the national program on the acquisition, maintenance, evaluation, and enhancement of sunflower germplasm.

2. Assess the adequacy of sunflower germplasm available to the scientific community and make recommendations to the National Plant Germplasm System for broadening the present germplasm base by additional acquisition through exploration and exchange.

3. Help develop guidelines for the effective maintenance of sunflower introductions.

4. Develop a strategic plan for evaluation of the sunflower germplasm collection for priority descriptors and to update the descriptor list as changes occur.

5. Consider needs for increasing the genetic variability of sunflower germplasm and develop a viable enhancement plan.

6. Provide a means for industry researchers to express needs for sunflower germplasm resources and their utilization.

7. Develop reports for National Plant Germplasm System and the ARS National Program Leaders for germplasm and oilseeds of ongoing germplasm activities, resource needs and status of evaluation, enhancement, and exploration plans.

8. Encourage greater cooperation among industry, federal, state, and other scientists for exchange of germplasm and descriptor information and for dissemination of information from scientists to commodity groups.

9. Maintain an awareness of sunflower germplasm activity of other national and international programs and cooperate in exchange of information and germplasm.

MEMBERSHIP:

1. Researchers from USDA. Three representatives.

2. Researchers from State Agricultural Experiment Stations. Three representatives.

3. Researchers from the sunflower industry. Three representatives.

4. Coordinator of the North Central Plant Introduction Station, or his or her representative, shall be a permanent member of the Committee, serving in an ex-officio capacity.

5. The representatives from the National Program Staff for Germplasm and Oilseeds shall be ex-officio members of this committee. Representatives from the National Plant Germplasm Resources Laboratory, the Plant Introduction Stations, the National Sunflower Association, and others may serve as consultants and ex-officio members for resource purposes.

Members of the Sunflower Crop Germplasm Committee shall serve four-year terms. The Chair will be elected for a four-year term. The Vice-Chair's term will coincide with the term of the affiliated person elected to that position. The Chair position will be a non-affiliated position, and their affiliation will not alter the balance of the Committee. All people having served previously on the Committee will be eligible for the Chair position.

New members of the Sunflower Crop Germplasm Committee will be recommended by the Sunflower CGC and approved by the Executive Committee of the National Sunflower Association. Any vacancy on the Committee will be appointed by the Chair, with the approval of the Committee.

FACILITATION:

1. The Sunflower Crop Germplasm Committee will be facilitated through the office of the Coordinator, National Plant Germplasm Resources Laboratory (NPGRL), USDA-ARS, Beltsville, MD.

2. The Sunflower Crop Germplasm Committee will report their activities to the Germplasm Program Coordinator, the National Program Leaders, and the sponsoring association, the National Sunflower Association.