

# CALIFORNIA ANNUAL REPORT TO THE W-6 TECHNICAL COMMITTEE FOR DISTRIBUTION YEAR 2005

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Approximately 319 requests for plant introductions from California users were filled by the Regional Plant Introduction Stations in 2005. Figure 1 shows the usage of germplasm in California from the National Plant Germplasm System expressed by the number of requesters for California from 1993 to the present. The number of requesters, 221, was significantly smaller than the number of requests indicates, as some requesters made multiple requests. In addition a number of requests came from school children at Etna school for materials to use in school projects. The request level for this year was about average for recent years and much less than last year since almost no one requested pomegranates this year (they were 1/2 of the total last year).

Collection of germplasm information: The collection methodology was similar to that used last year. Because I did not receive a specific allocation for regional research this year, I did not have regional research funds to use for mailing, secretarial funds, etc. Therefore, all possible requests (196) were sent via e-mail. A few requesters were queried by FAX. 18 requesters had neither FAX or e-mail. Because the number was so few and prior levels of response have been between 5 and 20%, a regular mailing was not done. About 8 % of the e-mail addresses bounced back (either the addresses were no longer valid or the recipients filters blocked them). A total of 18 responses were received (9 % of

Figure 1: Requests for NPGS germplasm from California.

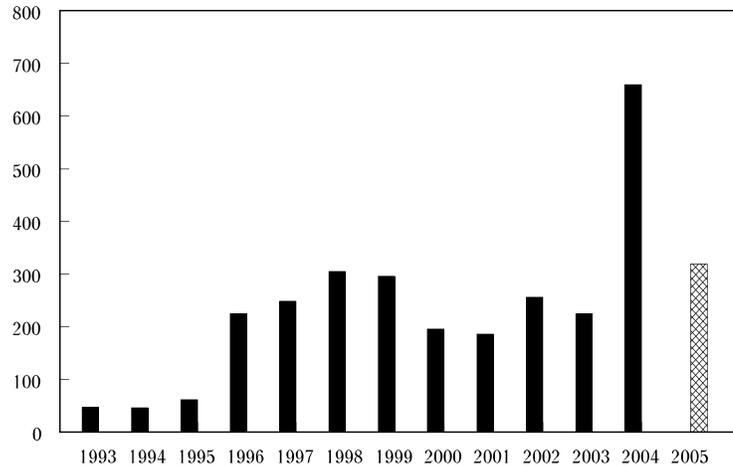
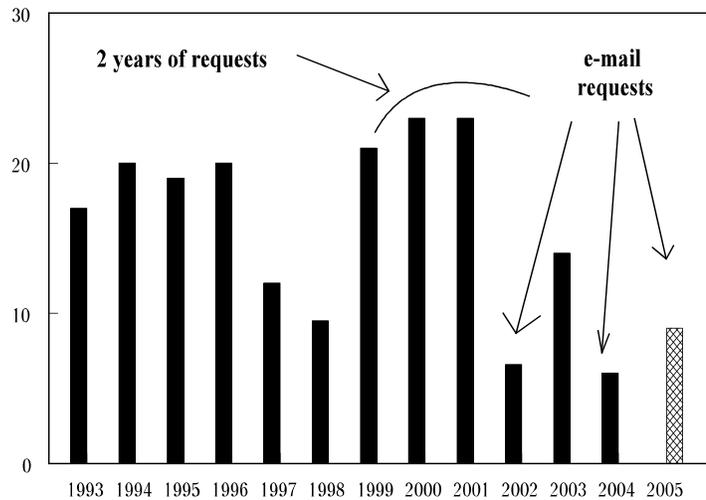


Figure 2: % of responses



those sent) for the year 2005. A large number of additional queries may have been lost in spam filters. This is indirectly suggested by reference to Fig. 2, where years in which queries were primarily done by e-mail show a lower level of response.

The distributed germplasm was used in a wide variety of applications, from basic research to home gardening. The large number of requests for a specific unusual fruit, eg. pomegranate or fig, were not present this year. Most of the use this year appeared to be for commercial breeding or research (University or USDA). A number of requests were received from school children at Etna school, (located in a foothill community). A summary of the replies is provided below to show the nature of germplasm use.

The Viticulture Department at UC Davis continues to maintain grape collections for teaching and research. The Agronomy, Environmental Horticulture, Pomology, and Vegetable Crops Departments at UC Davis were merged into a single Plant Sciences Department last year. The future status of the stone fruit, persimmon, pistachio, and walnut collections remains uncertain, although most collections continue to be maintained. With the departure of our Cherry- Apricot specialist, the associated collections are likely to be eliminated. Most, if not all, of the persimmon accessions in the persimmon collection have been repropagated to the NCGR, Davis. No formal process for supporting or tracking the departmental collections within the new departmental structure has been developed to date. The Department of Botany and Plant Science at UC Riverside maintains several collections of *Citrus* germplasm for cultivar evaluation and disease related research, as well as collections of avocado, cherimoya, and persimmon.. The California Genetic Resource Conservation Program is also located at UC Davis. This unique program, supported by the State of California, supports plant and animal germplasm conservation efforts within California. Information on GRCP may be found at their website at <http://www.grcp.ucdavis.edu/> . Appendix 1 is extracted from the web page, which also contains publications and other materials.

## **Narratives from recipients concerning germplasm observations and the value of NPGS.**

### **1. Jean Poulos, Acampo CA: melons- PI 161373 and PI 140471**

- no problems with germination and multiplication. (Materials used for insect screening.)

### **2 Patrice Dreckman, Rainbow CA (San Diego Co):**

Rainbow Heights Nursery and Research is a small farm corporation located in northern San Diego County. We dedicate an important amount of our limited resources to do basic and applied research on crops that might represent a viable economic alternative to this semi-arid region where irrigation water is becoming scarce and, when available, extremely expensive. Being aware of the need to on time acquire our foundation plant material and establish a reliable gene pool we contacted the U.S Department of Agriculture, National Plant Germplasm System [Clonal Germplasm] [R] repository. We are grateful for the plant material, information and support that we have received from the NPGS program. With their generous cooperation our scientific database today is sufficient to guide our development efforts.

Growers and scientist with far reaching vision consider that the future of this arid a semi arid land largely depends on the sustainable farming system using suitable crops. The genetic resources of these crops, essential for our research work, have been secured and made available to us by the National Plant Germplasm System [Clonal Germplasm] [R] repository.

A special word on the *Opuntia* genus hold at Rainbow Heights. The *Opuntia* collection received from Parlier is of special interest since many of the collected accessions are not available from foreign sources any longer, due to international germplasm exchange restrictions. In addition to the biological and cost problems with shipments of high-water-content cladodes across international boundaries, there are significant legal problems. Some agricultural customs agents are not aware that cladodes of *Opuntia* subgenus are specifically exempt from the

Convention on International Trade in Endangered Species (CITES). Furthermore, the descriptors and characterization data for *Opuntia* provided to us by Maria M. Jenderek, USDA, ARS, National Arid Land Plant Genetic Resource Unit and her staff has been of enormous value since there is a lot of confusion in the taxonomy of *Opuntia* and considerable variability is found in the current plantations that cannot be traced back to individual plant repositories.

In the last decade we have seen a renew interest in the research and development on cactus. The use of *Opuntia* as an agricultural crop has been systematically adopted in many countries for fruit and vegetable production. The genus has been object of more intense research activities and has given rise of various producer's associations and regional boards. There is a noticeable increase in area and production.

We trust that with the continuous cooperation of the NPGS program in general and the professional advise of their staff in particular, our research efforts will lead to the production of quality planting material and the development of management technologies that will allow the region's farmers to realize the different species' of economic potential.

Some notes on the Germplasm requested and hold at our site:

Genus/Species	Observations
<i>Anona muricata</i>	The seed received was place on our germination chamber. During the germination process we kept a constant temperature of 72° F and the humidity at over 90%. After several weeks only two seeds germinated. The seedlings are strong and growing in good conditions in the greenhouse.
<i>Allium</i>	In the fall of 2005 we received several species of the genus <i>Allium</i> . The material was planted on a double row the first week of November 2005. Most of the material germinated in good conditions. Harvest will be done during the summer of 2006. Several data has been collected regarding the growing habit, disease a pest resistance and response to fertilizer and mulch application. *Picture attached
<i>Bambusa</i>	All accessions received were dehydrated and all efforts to recover them fail. The 6 species received died a few days later in the propagation greenhouse.
<i>Capsicum</i>	We intent to germinate the 138 accessions received in the next couple of weeks. This year unseasonable cold weather has delay the establishment of all our annual crops.
<i>Ipomoea batatas</i>	The 25 accessions received were severely damage by the cold weather. We are hoping that some of them, that are still showing signs of life will come back during the warm month. Probably this Specie is not apt for our growing conditions.

*Mentha*

The 9 accessions received are doing very well. We have the raw data ready to be analyzed.

*Psidium guava*

All the cuttings and seedlings have been placed in 3 gallon containers. We plan to put these plants on the field in late May. Their final location is an area that gets a couple of frost events during the winter that is what we need to make a selection base on their hardiness.

*Passiflora flavicarpa*

The plant has been planted in our Passiflora collection. We expect to use this variety in our breeding program.

*Rubus*

The accessions received from the Corvallis station were initially planted in the greenhouse. On April 22 they were transplanted in their final location. We hope to be able to reproduce this material to obtain the necessary plants needed for our statistical design.

*Vitis vinifera/Vitis lambrusca*

We have received cuttings of several accessions on February 2003. The material was received in excellent conditions, fresh, well-packed and well label. The wood was rooted under mist and placed in the field on November 2003. Plants were planted 12' apart on the row and 15' between the rows. We opted for a four wires flat top high trellis (6'6"). Plants are trained with a four canes and will be pruned leaving four canes and four spurs. First data was collected during the 2005-growing season. The accessions received in February 2006 are being rooted under fog in our shade house.  
\*Pictures attached

*Ficus carica*

We have ordered and received several accessions during the years 2002 and 2003. All the wood was rooted under mist and transplanted to their final location on November 2003. Plants were planted at 15' between the rows and 12' on the row. The accessions received during 2004 were rooted and planted at 15' by 6'. All plants are being evaluated for fresh fruit production. The evaluation test for the different varieties will be carried out during the next couple of years. The accessions received on February 2006 are being rooted under fog in our shade house.

*Morus alba/Morus nigra*

Wood was ordered on 2002 and 2003. All the material was received in excellent conditions with proper labels

and good packing. The rooted cuttings were planted for evaluation purposes on December 2003. Plants were planted 20x20'. The evaluation process will be initiated the summer of 2004 and will be extended for the next five years.

*Cucumis melo*

The seeds of these accessions were received just a week ago, April 26, 2006. The material is going to be germinated immediately in the germination chamber.

*Cydonia*

Accessions received on March 2006 were very hot and despite all our efforts they died a few days later. We inform the site of this occurrence.

*Opuntia ficus-indica*

We order all available accessions. We received the material on November 2003 and April 2004. All material was planted under drip irrigation on decompose granite soil using a distance of 10' on the row and 15' between rows. The plants were prune and all new flower buds were removed during the 2005-growing season. The first data recording are going to be implemented during this growing season. \*Pictures attached

All the material that we have order from the National Germplasm System in 2002 and 2003 have come in excellent conditions and has been a very valuable contribution to our growing and breeding purposes. Please keep up the excellent work the Germplasm System is doing. It allows us growers and researchers to obtain an extremely valuable resource in our efforts to introduce new species and varieties for the consumer market and developed some new improved material for the future.

If you need any further information or some of the data that we are collecting, for the different accession that we have in our possession, please do not hesitate to contact at your convenience. It will be a pleasure for us to make a modest contribution to the great work that you do to improve the possibilities of the USA farmers.

Once more, thank you very much for the very valuable work that your staff is doing and, please accept our congratulations for the particularly valuable material that you have supply us.

Dr. Patrice Dreckmann  
Technical Director  
Rainbow Heights Nursery & Research, Rainbow, California



**3. Kanti Rawal:** Cowpea

We have just planted these cowpea PIs in Southern Baja. We are looking for a cover crop - green mulch for our organic vegetable growers. We will provide you with data and information as soon as they become available.

**4. Jill Bushakra, Watsonville CA:** Strawberry

We are using the *F. chiloensis* clones in a breeding experiment to look at inheritance of day-neutrality/ever-bearing flowering. The clones were multiplied to produce at least 10 plants of each. Crossing with ananassa is on-going. No results at this time.

**5. Andrew Breksa, USDA Albany CA:** 1 *Citrus aurantium*, 1 *Poncirus trifoliata*

I obtained seeds and they were used for extractions.

**6. Chris Sommerville, Stanford CA:** Cranbe and Jojoba - 1 *Simmondsia chinensis*

I have been using the Crambe and jojoba seeds in a project concerning the development of a new crop with

industrially useful oils. It is a long-term project so there is nothing substantive to report except that we are still working with the material.

**9. Mary Donovan, San Francisco CA:**

Unfortunately, all of the scions I grafted died--my fault, not the germplasm's.

**10. Michael Striem, Bakersfield CA: Grape: *Vitis vinifera***

Re: Materials received from the National Plant Germplasm System.

Dear Dan,

Here is the list of materials I received from the National Plant Germplasm System:

<b>Accession #</b>	<b>Cultivar</b>	<b>Form of material</b>	<b>Year received</b>	<b>Comments</b>
DVIT0424	Italia (IP 65)	Cutting	2002	
DVIT0468	Muscat Hamburg	Cutting	2002	
DVIT0487	Perla Di Csaba	Cutting	2002	
DVIT0503	Ribier	Cutting	2002	
DVIT0577	Italia (IP 65)	Cutting	2002	
DVIT0594	Ribier	Cutting	2002	
DVIT0856	Muscat Canelli	Cutting	2002	
DVIT1274	D'anjac	Cutting	2002	
DVIT1305	Barret #50	Cutting	2002	
DVIT1416	Barret #50	Cutting	2002	
DVIT1444	Grand Glabre	Cutting	2002	
DVIT1985	Couderc 161-49	Cutting	2002	
DVIT2042	Perla Di Csaba	Cutting	2002	
DVIT2067	Trebbiano Bianco	Cutting	2002	
DVIT2208.6	Trebbiano Bianco	Cutting	2002	
DVIT2218.2	Trebbiano Bianco	Cutting	2002	
DVIT2238.1	Trebbiano Bianco	Cutting	2002	
DVIT0465	Muscat of Alexandria	Cutting	2003	
DVIT1422	Pillans	Cutting	2003	
DVIT1595	A.De Seres	Cutting	2003	
DVIT2208.6	Vitis aestivalis	Cutting	2003	
DVIT0358	Black Kishmish	Cutting	2003	Not black nor seedless – I discarded it.
DVIT0468	Muscat Hamburg	Cutting	2003	
588067.03	Moored	Cutting	2004	
588070.01	Catawba	Cutting	2004	
588070.01	Catawba	Pollen	2004	
588077.14	Concord	Cutting	2004	
588095.01	Himrod	Cutting	2004	
588095.01	Himrod	Pollen	2004	
588111.03	Golden Muscat	Cutting	2004	
588158.01	Athens	Cutting	2004	
588158.01	Athens	Pollen	2004	
588421.L	V. yenshanensis	Seeds	2004	
588421.S	V. yenshanensis	Seeds	2004	
588421.W	V. yenshanensis	Seeds	2004	
588130	Winchell	Seeds	2005	
588150	Herbert	Seeds	2005	

588283	Lucile	Seeds	2005
588317	Gaillard 2	Seeds	2005
DVIT0507	Rozovii Kishmish	Cuttings	2005
DVIT1326	Black Kishmish	Cuttings	2005
DVIT2055	Black Kishmish	Cuttings	2005

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The material received has been, and still is used for research and breeding.

Thank you for your dedicated service

*(Note comment re: item DVIT0358. He also mentioned this in last year's report, that this item is not 'true to variety'.)*

**11. Craig Dreman, Palo Alto CA:**      20 *Brassica tournefortii*

Comments about germplasm: There is a strain of *Brassica tournefortii* destroying tens of thousands of acres of the Southwest desert ecosystem, and I was trying to determine what the source of origin was, including as an escape from the GRIN collection. I am recommending to Ames that the GRIN *Brassica tournefortii* collection and distribution be considered as if they are a Federally-listed noxious weed seed, because once they escape into the arid wildlands of the United States, they have a devastating impact on the desert ecosystems, that you can see at <http://www.ecoseeds.com/mustards.html>

I'm hoping that USDA will stop the distribution of viable seeds of the *Brassica tournefortii* seeds, at least until we can get learn how to get this invasion in the arid West under control.

When I talked with Ames last year, the normal protocol is to only treat plant material as the current laws require---so if it is not yet listed either as a State noxious weed, or Federal noxious weed, then there's no requirement to limit or stop the distribution of viable seeds by USDA. Unfortunately, this weed is spreading in our southwest almost as fast as a wildfire, within only the last 10 years. Dr. Powell and I have independently calculated that this weed spreads 5-fold every year, even during drought years. Dr. Powell's chart, plus her and my calculations are on my web page at <http://www.ecoseeds.com/mustards.html>

**12. Sunny Du Puis:**      Pomegranates

Initially your communication stated you would like to receive info on the plants status. They were planted in pots and watered and fertilized (fish emulsion) for 2 years in pots. This spring we transplanted them to our well drained clay soil. All three are doing well, just beginning to bud out. They had started to bud prior to the frost in mid March so, some took a little hit from that. They seem to have recovered sufficiently.

The largest of the three plants is about 2 ½ feet in diameter and approx 36" tall. The other two are as follows. One is about 12" tall and perhaps 12 - 14 " in diameter. As above all are budding. The additional one is perhaps 14" tall and about the same (12 - 14" in diameter.

We have examined them with a loop and they show no signs of any bugs or disease. We look forward to seeing them with fruit. If you have time would you email back at what age we can look forward to that actuality

**13. Keith Wycoff, Hayward CA:** *Zea mays*

I have not yet done anything with the *Zea mays* germplasm that you sent me.

**14. Susan Miyasaka, UC Davis Plant Sciences:** *Medicago truncatula*

I am attaching a summary of research conducted on aluminum response of several accessions of *Medicago truncatula*.

Summary

Soils contain an average of 7% total aluminum (Al). Under acidic conditions, Al is solubilized, increasing availability to plants. One of the first symptoms of Al-toxicity is inhibition of root growth due to both reduced root elongation and cell division. In the method developed to screen for Al-response in plants, we grew 22 cultivars of *M. truncatula* for 3 d in 1 % agarose gels containing either 0 or 200 mM Al (pH 4.2). Using this agarose screening method, roots retained border cells and mucilage, in contrast to other methods that use hydroponic solutions. Significant differences in relative root elongation (ratio of root elongation in presence of Al divided by that in absence of Al) of cultivars were found after 1 d of Al exposure. PI 6037 was the most Al-tolerant, A-17 intermediate, and PI 535615 among the most Al-sensitive cultivars. These results were contrary to those reported earlier, and could be attributed to differences in the screening methods or to natural variation of plants within the accessions

**15. Larry Pierce, Salinas CA** *Celery - 9 Apium graveolens var. dulce*

It is true, I received samples of apium (celery). The samples that I obtained were varieties that are no longer being produced today. My first step has been to initiate a small seed production on each of the samples in order to obtain enough material for research. Our intent is to compare the old varieties with the new. In many cases this is actually required when submitted for patents. It is impossible to put a value on the germplasm. However, we have found in the literature several references to traits that have been observed in many old varieties. In protecting new germ plasm with patents or PVP we must ensure that the traits are not present in old varieties. That means that we require the ability to access the old varieties. The National Plant Germplasm System is truly valuable in this endeavor

**16.Scott Johnson, UC Kearney Ag. Center:** *Barley - Hordeum*

The germplasm I received was seed of a zinc efficient barley. I have it planted around a peach tree to see if it improves zinc uptake into the peach tree. We took leaf samples last week but it will be at least 2 months before I get the results back

**17. Parm Randhawa, Davis CA:** *strawberry - Fragaria*

I have received *Fragaria* species as you listed from Corvallis repository. In addition, we received some grapevine samples from Davis (USDA repository). These materials have been used to develop disease assays and genetic fingerprints. I am highly appreciative for this resource.

**18. Joshph Jacobs,** *1 Capsicum chinense*

The chinense accession we received from the NPGRS is being evaluated for disease resistance, especially viruses. We do not have any resistance response to report as of this date. The GRIN collection remains an

important source of breeding material for our program.

**19. Tom Ferenz, Half Moon Bay, CA:** Pomegranate?

From 2005 request:

Dan, My apologies for getting back to you so late. I received the three stocks kind of dried out. FedEx up here takes longer than elsewhere to deliver, even if it's so-called priority. I put them in a water bucket overnight first, then put Rootone on, planted them in their separate pots with potting mix and watered. Unfortunately, I never got any response and finally threw them out a month later.

**20. Dan Parfitt, UC Davis Plant Sciences:** Litchi and Longan

These materials were used in a UC cooperative project to characterize litchi and longan cultivars using SSR and ISSR markers.

**Appendix 1: Description of California Genetic Resources Conservation Program projects.**

*Annual Grants Program*

The Program provides funding to support conservation of imperiled collections of genetic resources and genetic stocks critical to California. The support is targeted toward living collections that are in danger of being lost or are in need of attention to be safely conserved, documented, and made available for research or other uses. The funds available are from the Program's general budget from the State of California. Indirect costs are not allowable. It is expected that collections to be assisted will be maintained and will be accessible to researchers. At the end of the fiscal year, reports documenting work enabled by GRCP, including an inventory of supported collections, are required.

A roster of projects funded since 1985, when GRCP was established, through FY 2004-2005 is available in pdf format.

*Genetic Resources Task Forces*

The Avian Genetic Resources Task Force was a US national and Canadian committee of researchers, federal agency officials, and private industry representatives convened to assess the status of poultry genetic resources in these two countries. The work was motivated by the increasing loss of important collections of chicken genetic stocks primarily due to reduced funding and retirements. GRCP employed a part-time analyst (J.M. Pisenti) to facilitate the task force activities. A survey of US and Canadian institutions was conducted to determine current holdings. The results of this survey and the task force's evaluation of the status data, valuation of the extant stocks, and recommendations for the long-term conservation of critical material are presented in their report "Avian Genetic Resources at Risk: An Assessment and Proposal for Conservation of Genetic Stocks in the USA and Canada".

The Citrus Genetic Resources Task Force was a committee of citrus industry representatives, researchers, curators, and USDA representatives organized to address the long-term status of citrus genetic resources maintained in California, primarily those at the UC Riverside campus. The citrus industry is one of the most

productive agricultural industries in California and its success has been due to the development of new citrus varieties that made use of genes from the Citrus Variety Collection at UC Riverside. GRCP and the task force officially released its report "Citrus genetic resources in California: Analysis and recommendations for long-term conservation" on September 12, 2001.

The Avocado Genetic Resources Task Force is a committee of California avocado researchers and industry representatives convened to determine the status of avocado genetic resources. An inventory is underway, primarily of UC Riverside holdings, and will be used by the task force in its assessment. Since important germplasm can still be collected from wild species, not native to California or the US, an international meeting will be held to determine the extent of conservation that occurs in those habitats and to assess the holdings in other national collections. The task force will issue a report on its findings, including its recommendations.

#### *International Triticeae Mapping Initiative (ITMI)*

With support of extramural funding, GRCP managed ITMI: an informal consortium of geneticists dedicated to developing recombination maps of the genomes of the species in the Triticeae tribe of the Poaceae family. Comparative mapping among the various genomes in polyploid species and in the diploid progenitors was a major goal for ITMI because of the importance of the various species as gene donors to the Triticeae crop plants (primarily wheat and barley) and for studies of evolutionary relationships and genome structure. The informal nature of ITMI encouraged independent research within the primary participating laboratories and at the same time encouraged collaboration so that good maps would be obtained rapidly and materials and resources could be shared. The progress in building such recombination maps was steady and the initial objectives of ITMI were achieved for wheat and barley. The momentum and data from these maps have been a major impetus for the increasing interest in genomics and comparative mapping both within Triticeae and between species of Triticeae and those of other grass tribes. Accordingly, a process for the reorganization of ITMI was carried out reflecting the extension of genomics research to species of the Triticeae. ITMI is now hosted by the Scottish Crop Research Institute. Dr. Wayne Powell is the new managing coordinator. Further information is available at the new ITMI web site.

Annual ITMI workshops are held to review progress in Triticeae genetic mapping and to exchange research results. The 2000 ITMI Public Workshop was held 14-16 June 2000 at the University of Delaware. The 1999 ITMI Public Workshop was held 25-28 August 1999 in Viterbo, Italy. The 1998 ITMI Public Workshop was held August 2 in conjunction with the Ninth International Wheat Genetics Symposium, 2-7 August 1998 in Saskatoon, Saskatchewan, Canada. An electronically accessible database (GrainGenes) of Triticeae genome maps and mapping information, much of it contributed by ITMI collaborators, is maintained by the USDA Agricultural Research Service. Under the new coordination structure, the 2001 ITMI Public Workshop was held in Scotland and the 2002 ITMI Public Workshop was held June 1-4 in Winnipeg, MB, CANADA.

#### *MILPA Project*

With extramural support of the McKnight Foundation, GRCP manages a multi-investigator, multi-location, international conservation project: Conservation of Genetic Diversity and Improvement of Crop Production in Mexico: A Farmer-Based Approach. The project entails (1) a description and analysis of the relationships

between farmer knowledge, socio-economic factors, and genetic diversity in the Mexican milpa agroecosystem; (2) a characterization of the structure of crop biodiversity and the magnitude of gene flow from wild or cultivated relatives to maize, bean, and squash crops; and (3) the development and evaluation of on-farm breeding methods to improve the productivity of local landrace germplasm through mass selection of introgression from improved germplasm (maize) or wild or cultivated relatives (bean and squash).

### *Wheat Genomics Projects*

With extramural support from the National Science Foundation (NSF), GRCP serves as project management office for multi-investigator, multi-institution plant genome research projects.

\* Haplotype polymorphism in the polyploid wheats and their diploid ancestors, DBI-0321757, PI: Jan Dvorak, Professor, UC Davis Dept. of Plant Sciences. This project began September 1, 2003 and runs until August 31, 2006. It involves nine laboratories in four states. The project builds on the resources generated in the following two projects with the goal of discovering 1,800 wheat SNPs (single nucleotide polymorphisms) and making publicly accessible their location in wheat chromosomes and the tools for their detection. More information on the project is available at its public website.

\* Assessment of the insular organization of the wheat D genome by physical mapping, DBI-0077766, PI: Jan Dvorak, Professor, UC Davis Dept. of Plant Sciences. This project ran four years, September 1, 2000 through August 31, 2004. It involved five laboratories in two states and generated a resource of some 200,000 fingerprinted BAC clones ordered into the physical map of the wheat D genome, yielding a detailed picture of gene distribution. More information is available at the public website for the project.

\* The structure and function of the expressed portion of the wheat genomes, DBI-9975989, PI: Calvin O. Qualset, GRCP Director Emeritus. The project ran four years, September 1, 1999 through August 31, 2003, involved 13 laboratories in 10 states, and generated some 110,000 expressed sequence tags (ESTs) for wheat, physically mapping about 40,000 loci generated from about 8,000 ESTs. More information is available at the public website for the project.