

ANNUAL REPORT FOR 2003
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Joseph Postman, Plant Pathologist/Pear Curator
Barbara Reed, Research Plant Physiologist
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Dennis Vandever, Facilities Manager



**Joseph Postman at NCGR Pear
Open House September 11, 2003**

Temporary Staff

Jeffrey D'Achino, Bio Sci. Aide, Cryo Lab
Janine de Paz, Bio. Sci. Tech, TC Lab
Andrew Fisher, Bio. Sci. Aide, Greenh.
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Deborah Provenzano, Office Auto. Clerk
Laura Schumacher, OSU, Cryo Lab
Debra Tyson, Ag. Sci. Aide, Greenhouse
Marisa Wahnsiedler, Work Study, TC Lab

Graduate Students and Visiting Scientists

Hailu Aynalem, GRA, Tissue Culture
Peter Boches, GRA, Genetics
Jodi Jackson, GRA, Horticulture
Deric Picton, OSU GRA, Horticulture
Andrey Sabitov, Senior Research Scientist,
FEES, VIR, Russia

Annual Report for Calendar Year 2003

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Major Accomplishments for 2003

Service

Plant expeditions: Dr. Kim Hummer, Dr. Tom Davis (University of New Hampshire), Dr. Hiroyuki Iketani (National Institute of Fruit Tree Science), and Dr. Hiroyuki Imanishi (Akita University) will participate in plant exploration expedition to Hokkaido to collect genetic resources of temperate small fruits from July 7 through July 28, 2004. This is under a bilateral agreement between the USDA ARS and the MAFF in Japan. Joseph Postman, Dr. Paul Meyer (Morris Arboretum of the University of Pennsylvania) will participate in temperate fruit crop exploration in the Republic of Georgia. Jim Oliphant and Jodi Jackson collected native North American hops from 18 locations the Arizona and New Mexico in September 2003. Seedlings from these hops are being screened for powdery mildew resistance and essential oil content.

In 2003, Dr. Bruce Bartlett, Plant Distribution Manager, coordinated the distribution of 3,007 seeds, cuttings, runners, scions, rooted plants, in vitro cultures and seed packages to 257 recipients around the world. This is the largest amount of accessions distributed in one year from NCGR-Corvallis since establishment in 1981.

During 2003 Dr. Barbara Reed and her laboratory worked with high school students at Canby High School and Illinois Valley High School. Both schools are implementing tissue culture programs. The student groups spent several days learning about the tissue culture procedures and are now performing projects at their schools. Barbara Reed has developed a PowerPoint presentation for teaching in vitro culture protocols. The presentations are available through the web at: www.ars-grin.gov/cor/

Jack Peters, November 2003 hire, Cat. 3, Plant Physiologist outfitted the NCGR's new seed laboratory with equipment and reorganized the seed freezers. He repackaged, relabeled, and completed inventories of the 2500 seed accessions in the Repository collection. He is now testing viabilities of the seed accessions, and developing literature review on germination protocols for our genera.

With partial support from the Hop Research Council, Dr. Reed and her laboratory crew cryopreserved 15 core *Humulus* accessions in 2002-2003. Reed, B. M., N. Okut, J. D'Achino, L. Narver, and J. DeNoma. 2003. Cold storage and cryopreservation of hops (*Humulus* L.) shoot cultures through application of standard protocols. *CryoLetters* 24:389-396.

Collaboration on the in vitro storage and cryopreservation of fruit germplasm with the Kazakh Institute of Horticulture and Viticulture has resulted in good progress in storing Kazakh germplasm. Barbara Reed is assisting Institute scientists in learning and implementing cryopreservation techniques and storing native germplasm. Dr. Svetlana Kusharenko spent 5 weeks at NCGR in May 2003, training in cryopreservation techniques. Dr. Irena Kovalchuk visited for a week to review the project. Dr. Reed visited their laboratory in September.

Joseph Postman and the NCGR Staff hosted a pear open-house on September 11, 2003. More than 300 individuals attended to sample pears and learn about pear genetic resources.

Research

Dr. Nahla Bassil developed and optimized molecular techniques for use in hazelnut research. She introduced genotypic descriptors in *Corylus avellana* by mining a microsatellite-enriched library for the development of the first molecular markers in hazelnut. She implemented and optimized a large-scale DNA extraction and an RNA isolation protocol from various hazelnut tissues including catkins, leaves and germinated shoot and root tips. She isolated a marker that identifies the S₂ self-incompatibility allele at the seedling stage. She developed 36 microsatellite loci from an enriched genomic library. She trained an M.S. student (Tufan Gokirmak) in using microsatellite markers to detect duplicate accessions in the hazelnut collection. Mehlenbacher, S. A., R. N. Brown, J. W. Davis, H. Chen, N. Bassil and D. C. Smith. 2004. RAPD markers linked to eastern filbert blight resistance in *Corylus avellana*. Theor. Appl. Genet. 108:651-656

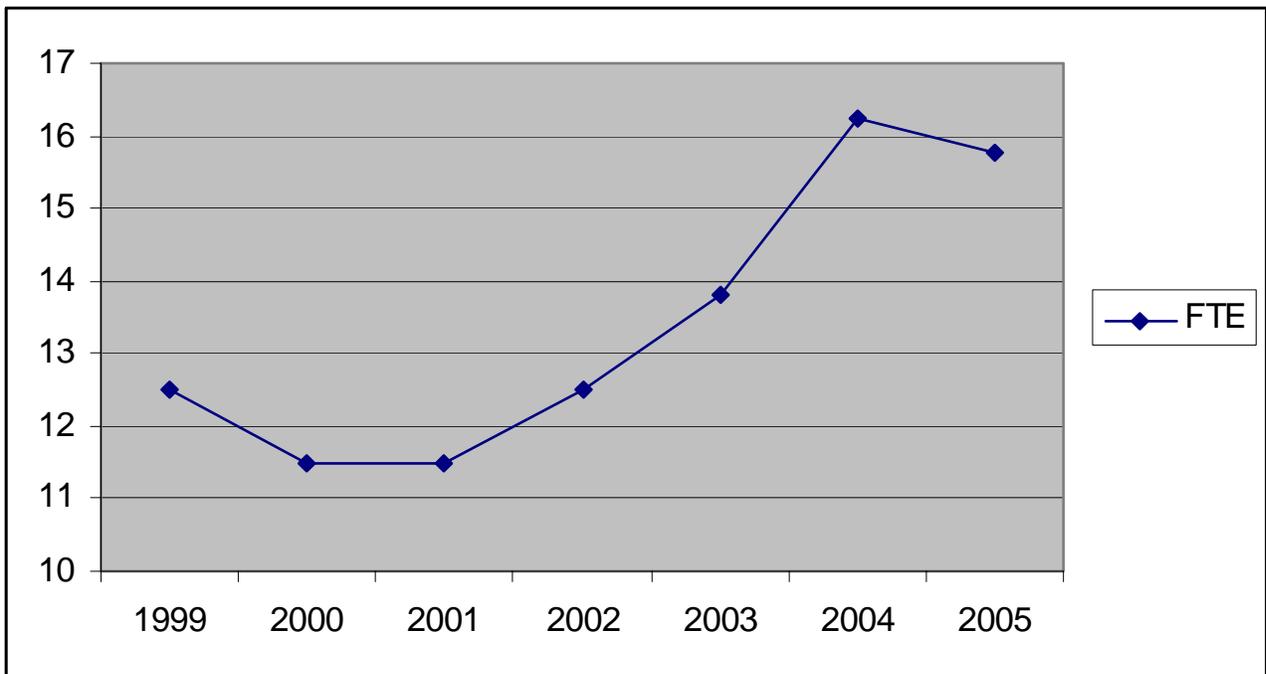
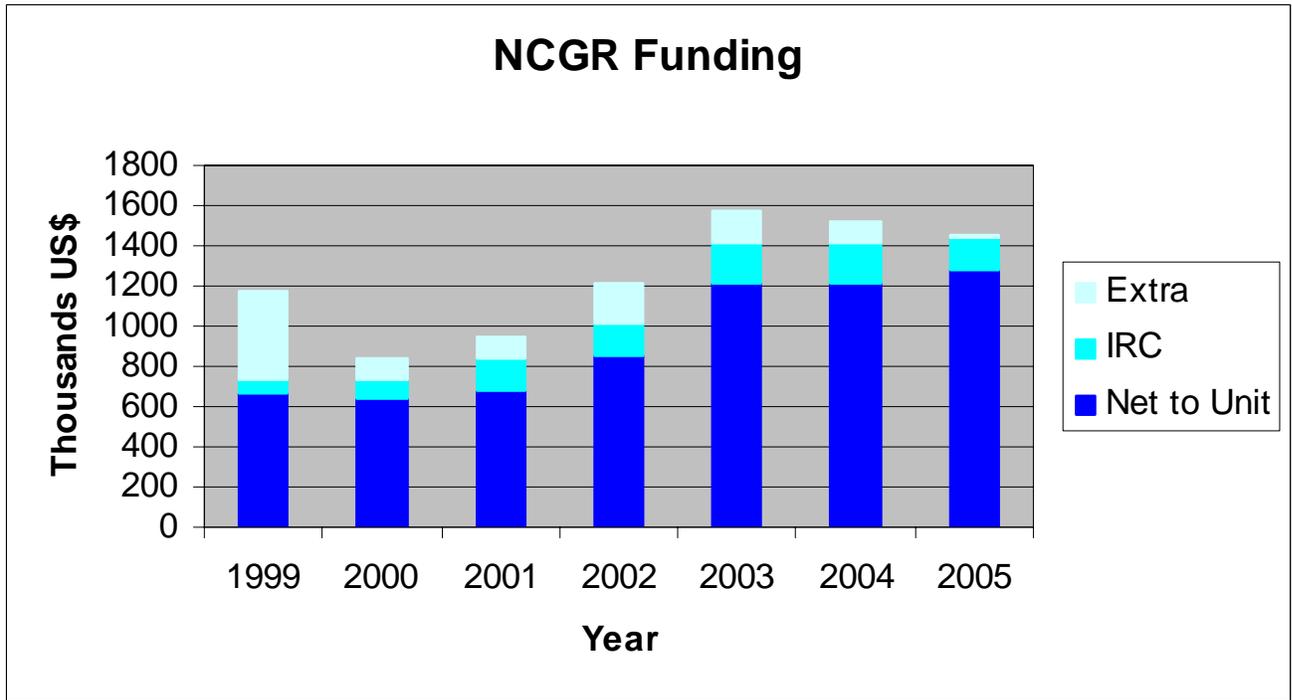
Dr. Barbara Reed and her graduate student, Nan Wang determined that pathogenic fungus can be easily detected and eliminated from plants in the field, greenhouse and in tissue culture. Wang, N. and B. M. Reed. 2003. Development, Detection and elimination of *Verticillium dahliae* in Mint Shoot Cultures. HortScience 38:67-70.

Dr. Nahla Bassil and her graduate student, Peter Boches, developed microsatellite markers in blueberry. These markers will provide unique fingerprints for each blueberry accession and enhance management of the collection by detecting duplicates and validating core accessions. They will estimate the population structure and will indicate whether colonization of wild species in primary succession is the result of long distance or local dispersal. These markers will be instrumental in the development of a universal linkage map in blueberry than can be used by researcher's worldwide for cloning of genes encoding desirable traits into blueberry development programs.

Dr. Kim Hummer working with Dr. Andrey Sabitov, Senior Scientist of the Far East Experiment Station, VIR, Vladivostok, Russia, determined that *Ribes* cultivars and species have differential genetic resistances to currant cane borers. They identified resistant cultivars and species. Working with Dr. David James, Washington State University, they confirmed that pheromone twist ties can reduce cane borer infestation by 2/3 when applied at 250 ties/acre and beginning with infestations of 0.6 larvae.

Administration

Budget and Staffing at the NCGR Corvallis



Non-base and Extramural Funding for the USDA-ARS NCGR

Amount	Purpose	Source
<u>FY 2004</u>		
24,500	Blueberry Evaluation	NW Center for Small Fruit
11,000	Former Soviet Union Science Cooperative program for using former weapons scientists	ARS-OIRP
20,000	Evaluate hops for powdery mildew	HRC
27,880	Mint virus identification	MIRC
20,000	Japan plant collection	USDA Exploration Grant
16,000	Georgia plant collection	USDA Exploration Grant
119,380	Total	
<u>FY 2003</u>		
12,000	Water supply equipment	ARS Headquarters
10,000	Molecular analysis supplies	National Program Staff EOY
25,000	Multi-label plate reader for molecular analysis	PWA EOY funds
16,000	Molecular Evaluation of Pears	USDA Germplasm evaluation grant
11,790	Plant exploration to Sakhalin and Kurile Island and for hops in Arizona and New Mexico	USDA Plant Exploration Grants
1,436	Genetic Evaluation of clonal crops	PWA Summer intern
22,000	Evaluation of Hop Powdery mildew	Hop Research Council
5,000	Cryopreservation of hop clones	Hop Research Council
15,000	Blueberry Genetic Analysis	USDA Plant Evaluation Funds
4,500	Honeysuckle evaluation proposal	USDA Plant Evaluation Funds
15,000	Cryo training for international scientists	FAS- SCRP
11,000	Former Soviet Union Science Cooperative program for using former weapons scientists	ARS-OIRP
148,726	Total	

EEO/CR/Outreach

The Unit federal permanent and term staff totals 16.75 FTE. During FY 2004 we had 9 women (53%), 1 individual of Hispanic extraction, 1 individual of Lebanese extraction, and 2 individuals with disabilities. We have three female incumbents in our four SY positions. Our temporary/student staff was composed of 75% female 12% Hispanic and 25% Asian employees. Our three graduate students in training include 1 of Ethiopian extraction, 1 female, and 1 white male. This past year we trained a number of challenged people including an individual with multiple-sclerosis, individuals with learning disabilities, and more than 15 physically or mentally challenge high school students. The unit continues to actively recruit from multi-cultural associations such as the Minority Education and the Native American Education Departments in Western Universities. We also work with The Native American Marine and Social Science

(NAMSS) program at Oregon State University to train Native American Students in the sciences. We are actively working with private, Oregon State Vocational Rehabilitation and high school programs in recruitment, hiring and training of disabled individuals. We train graduate, undergraduate, and high school interns through collaborative programs at Oregon State University and local high school apprenticeship programs. Our scientists regularly participate as advisors at state, local, and graduate student science fair competitions. We collaborate with Kentucky State University on an 1890's Capacity Building Grant for evaluation of Asimina (Pawpaws) for antioxidants.

Facilities and Security

By Dennis Vandever and Kim Hummer

2003 was another very busy year for facilities. We installed a propane transfer station to eliminate the need to transport fuel tanks on the highway. Our phone system was replaced with a new digital Mitel system. The exterior of the entire main building was painted with force account. Additional siding was replaced completing the headhouse. Numerous ceilings were replaced and two offices were repainted. The seed storage freezers and germinators were relocated for security reasons and fire and burglar detection were extended into that area. We installed an additional swamp cooler in greenhouse 3. We converted all side vents in greenhouses to computer controlled. We conducted annual fire safety inspection with the fire department. We moved the North Farm fence out to the property line. We replaced the compressor in the main building HVAC system and installed numerous back flow preventers on the water system. We replaced the air compressor for the labs.

Security

Identification cards are worn by employees and visitors. All visitors now check in at the front desk. Security information concerning foreign workers is provided to tracking personnel in headquarters and area in compliance with regulations. A card-lock gate was installed at the north farm in FY 2004 for added security. We added additional lighting for the fuel tank area and tractor barn. Additional lighting was installed in the screenhouse and South gate areas. Purchase and installation for a closed circuit video surveillance system was begun.

Equipment

We purchased a transmission and antifreeze recycling machines for the shop. The row crop tractor engine was failing so it was retro fitted with a new diesel engine. With year end funding from Area we purchased a new Chevy 1 ton truck with a dump bed.

Awards 2003

Compiled by: Deborah Provenzano

Bruce Bartlett-A Spot Award for diligence and extra effort in plant distribution/activities in meeting more specific International Phytosanitary and shipping regulations to keep our customers happy.

Presented in May 2003.

Janine de Paz-A Spot Award for assuming responsibilities for running the Tissue Culture Lab in the summer of 2003 and performing those duties in an exemplary manner.

Presented in October 2003.

Melissa Fix-A Spot Award for improving the plant organization, seasonal maintenance and cleanliness of Repository screenhouses and for extra effort in the construction of new screenhouse benches
Presented in February 2003.

Jason Fumasi-for the William G. Ward Award I for Agricultural Education.
Presented in August 2003.

Kim Hummer-A Quality Step Increase for outstanding performance as Curator of the NCGR, Corvallis, OR in calendar year 2002. Presented in May 2003

Joseph Postman-A Spot Award for proposing, organizing and implementing a highly successful Open House featuring the Repository Pear Collection. Presented in September 2003.

Dennis Vandever-A Spot Award for excellence in managing the maintenance effort for the NCGR-Corvallis Repository and coordinating contractors. Presented May 2003.

Debra Tyson-A Spot Award for improving the plant organization, seasonal maintenance and cleanliness of Repository screenhouses and for extra effort in the construction of new screenhouse benches.
Presented in February 2003.

Joseph Snead-A Spot Award for excellence in performing as safety officer for NCGR with special emphasis in coordinating revisions of new employee orientation. Presented in May 2003.

Barbara M. Reed was named a Fellow of the Society for In Vitro Biology at the June 2003 meeting. Dr. Reed also serves as Secretary of the Society's Board of Directors.

Jim Oliphant, Debra Tyson and Melissa Fix-A PWA EEO Team Award for outstanding mentorship and training the physically and mentally challenged individuals in the preservation and evaluation of greenhouse plant collections at the NCGR-Corvallis.

Training 2003

Compiled by: Deborah Provenzano

Bruce Bartlett, Melissa Fix, Raymond Gekosky, Jim Oliphant and Joe Snead-OSU non-crop vegetation management course, various issues all pertinent to NCGR work. PSU IPPC/OSU Cordley Hall, Corvallis, OR January 2003.

Carolyn Paynter-Federal Employee Retirement System training. May 2003.

Yvonne Pedersen-ARIS "Hands -On" training Teleconference AD 416/417. Corvallis, OR. December 2003.

Yvonne Pedersen-Travel, STAR and ARIS training in programs utilized by the government to be used by the employee working in the position of Secretary. Albany, California, August 2003.

Barbara Reed-Research Position Evaluation System training to learn about and understand the promotion system for research scientists within the Agricultural Research Service. Beltsville, MD. May 2003.

Dennis Vandever-for developing performance-based work statements and monitoring contractor performance. Edmonds, Washington August 2003.

Promotions

Melissa Fix from GS-2 to GS-3.
Effective May 2003.

Janine de Paz from GS-3 to GS-4.
Effective March 2003.

Travel 2003

Compiled by: Deborah Provenzano

Nahla Bassil-to San Diego, California to give presentation to Plant and Animal Genome Conference. January 10-16, 2003.

Kim Hummer-to Stevenson, Washington to attend the Hop Research Council Meeting and present NCGR information. January 19-25, 2003.

Kim Hummer-to Skamania, Washington to attend the HRC meeting and give a presentation. January 27-29, 2003.

Kim Hummer and Joseph Postman-to Agassiz, British Columbia to attend the Western Small Fruit Pest conference. February 18-20, 2003.

Kim Hummer-to Riverside, California to serve on the Interview panel for Riverside. April 14-17, 2003.

Barbara Reed-to Beltsville, Maryland for Research Position Evaluation System training. May 5-7, 2003.

Barbara Reed-to Portland, Oregon for presentation at the Society for In Vitro Biology and Scientific Cooperation Research Program grant meeting. May 30-June 6, 2003.

Kim Hummer-to Seoul, Korea for ISHS executive Committee meeting. May 26-June 3, 2003.

Kim Hummer and Nahla Bassil-to Miami, Florida to present annual report to Plant Germplasm Operation Committee. June 10-13, 2003.

Joseph Postman-to Pullman, Washington to attend W-6 TAC meeting. June 26-27, 2003.

Kim Hummer-to Boise, Idaho to attend the Hop Research Council summer meeting. August 3-5, 2003.

Dennis Vandever-to Seattle, Washington for Monitoring Contractor Performance training. August 4-8, 2003.

Joseph Postman-to Manchester, New Hampshire for the North American Fruit Explorers meeting. August 16-24, 2003.

Yvonne Pedersen-to Albany, California for training in STAR, Travel and ARIS. August 17-21, 2003.

Doug Cook and Joseph Postman-to Prosser, Washington for DIVA Geographical Information System workshop on analyzing and managing Germplasm collections. September 22-27, 2003.

Jim Oliphant and Jodi Jackson-to Arizona and New Mexico for hop exploration and collection. September 8-20, 2003.

Barbara Reed-to Kazakhstan, Poland and Germany for review of Foreign Agricultural Service of USDA project on preservation of germplasm of fruit and berry crops. September 8-31, 2003.

Visitors to NCGR 2003

by: Deborah Provenzano

About 630 people toured the Repository during Calendar Year 2003. Guests arrived in large and small groups including a visiting plant physiologist from Kazakhstan and a Danish scientist who stayed for six weeks working in our Cryo Lab. The Repository had five visitors from Chile. A teacher and fourteen students toured our facility for their horticultural experience. We also had numerous visiting scientists from all over the world including China, the United Kingdom, Slovakia, Thailand, South Africa, Korea, Botswana, Japan, Ethiopia, New Zealand, Germany, Canada, and Russia.

Germplasm Collections and Research

In Vitro Culture and Cryopreservation

By Barbara Reed

In Vitro Collection Status as of December 24, 2003

<i>Genus</i>	<i>Total in vitro</i>	<i>Meristems Cryopreserved</i>	<i>Axes/Pollen Cryopreserved</i>
<i>Corylus</i> (Hazelnut)	48	0	6 axes/63 pollen
<i>Fragaria</i> (Strawberry)	157	0	
<i>Humulus</i> (Hops)	79	32	12 pollen
<i>Mentha</i> (Mint)	146	0	
<i>Pycnanthemum</i> (Mountain Mint)	18	0	
<i>Pyrus</i> (Pear)	164	106	36 pollen
<i>Ribes</i> (Currant, Gooseberry)	41	4	
	167	47	
<i>Rubus</i> (Raspberry, Blackberry)	109	0	
<i>Vaccinium</i> (Blueberry, Cranberry)			
Total	929	189	6 axes/111 pollen

Tissue Culture:

The tissue culture lab continues to initiate, multiply, store, and maintain cultures of many accessions in vitro. Accessions are added to the collection as time permits. We are sending accessions to NCGRP for backup in vitro storage and for cryopreservation. Janine de Paz added about 500 accessions to the collections, including replacing many that had been in culture for over 10 years. Laura Schumacher assisted in the lab April to July. Technician Carolyn Paynter was out on sick leave for most of the year

The total number of accessions in each genus decreased due to several factors. First we did additional screening to eliminate plantlets with latent contaminants. This eliminated quite a few *Vaccinium* accessions as well as some from other genera. Second, we discarded cultures that

were not thriving. We will be recollecting accessions from both these groups next year. This gives us greater assurance that the plants we keep, as well as the plants we send, are free of bacteria and actively growing. The health of the source plants is very important to the vigor of plants in vitro, so we will continue to selectively collect from the healthier plant collections and wait for improvement in less vigorous or diseased plants.

Cryopreservation:

We are working with NCGRP and they are cryopreserving *Mentha*, *Fragaria*, *Rubus*, and *Pyrus* accessions from our in-vitro-stored backup collections. Dr. Reed is advising them and assisting with troubleshooting of the cryopreservation procedures.

We assisted John Henning with the storage of *Humulus* pollen in August. We suggested an improved protocol for sample collection for 2004 as there was little or no initial germination for many of the samples.

We are collaborating with the laboratory of Dr. E.E. Benson at the University of Abertay in Dundee Scotland on a *Ribes* cryopreservation project. In this project 18 genotypes of 9 species were cryopreserved in a pilot-project long-term genebank at the University of Abertay. All but 4 of the 22 genotypes had good recovery from the cryopreservation procedure used. Laura Schumacher is assisting in finishing the experimental portions this project and adding to the cryostored NCGR *Ribes*.



Storage Dewars for grass and hops germplasm

A special international project on the cryopreservation of *Ribes* was initiated in 2001 with funding from the USDA Foreign Agricultural Service. Drs. Reed and Benson visited scientists from Kazakhstan, Germany and Poland in September to evaluate the final stages of the project.

Collaboration on the in vitro storage and cryopreservation of fruit germplasm with the Kazakh Institute of Horticulture and Viticulture was initiated in 2002. Barbara Reed is assisting Institute scientists in learning and implementing cryopreservation techniques and storing native germplasm. Dr. Svetlana Kushnarenko spent 5 weeks at NCGR training in cryopreservation techniques. Dr. Irena Kovalchuk visited for a week to review the project. Dr. Reed visited Kazakhstan in September to further assist with the project.

Janne Normann Hansen of The Royal Veterinary and Agricultural University, Department of Agricultural Science, Taastrup, Denmark trained in cryopreservation techniques for 3 weeks. The University is interested in cryopreserving unique apple cultivars from Denmark.

We continued a project funded by the Hop Research Council to cryopreserve 15 additional core *Humulus* accessions in 2002-2003. Dr. Barbara Reed, Jeff D'Achino and Dr. Nese Okut worked on this project. Core accessions were initiated as needed, multiplied, cold acclimated, tested and cryopreserved by slow cooling. A poster was presented on this work and a manuscript was

accepted by CryoLetters. Laura Schumacher began working on the storage of additional hops accessions in November.

Molecular Genetics

By Nahla Bassil

The new laboratory technician Barb Gilmore is routinely extracting and quantitating DNA in 96-well plates. DNA is sequenced in the genetics lab using Beckman CEQ 8000. Christine Neou, a student intern, is evaluating EST-SSR primers for fingerprinting European and Japanese pear accessions. Peter Boches, an MS graduate student, has developed 36 EST-SSRs in *Vaccinium* and is evaluating them for cross-species amplification and for identification of highbush blueberry cultivars. We continue to develop and evaluate microsatellite primers in order to generate reliable molecular markers for fingerprinting accessions from various genera.

- **Laboratory establishment.** A Beckman CEQ 8000 capillary electrophoresis system was purchased and is used for DNA sequencing and fragment analysis. We now use Victor V Multilabel Reader to quantitate DNA in a 96-well plate format. Joseph Postman is using Victor V for viral detection following ELISA assays.
- **DNA extraction.** A high throughput method for DNA extraction was developed and is currently used to extract DNA from *Actinidia*, *Corylus*, *Cydonia*, *Fragaria*, *Humulus*, *Mespilus*, *Pyrus*, *Ribes*, *Sorbus*, and *Vaccinium* accessions.
- **Microsatellite analysis.**

Corylus

We have developed 35 SSRs from a microsatellite-enriched library in the hazelnut. Tufan Gokirmak, a graduate student in Horticulture, is using some of these markers to identify duplicate hazelnut accessions. The SSRs will be used to develop genetic fingerprints for core genotypes and to assess genetic variability in the collection.

We continue to collaborate with Dr. Shawn Mehlenbacher and Dr. Roberto Botta on developing additional microsatellite loci to use in construction of a hazelnut linkage map.

Fragaria

Twenty-five EST-SSR primer pairs were designed and tested for cross-species amplification in twelve accessions of strawberry: two *F. vesca*, one *F. iinumae*, two *F. chiloensis*, two *F. virginiana* and five *F. x ananassa*. We are evaluating single-locus polymorphic SSRs for their ability to fingerprint the supercore collection.

We collaborated with Dr. Kim Lewers on testing these primers and additional strawberry primers developed in her lab for cross-species amplification in parents of two strawberry mapping populations and in six *Rubus* accessions.

Pyrus

Primer pairs were designed for 18 pear EST sequences obtained from GenBank and the optimum annealing temperature was determined by gradient PCR. The SSR primers amplified a product in eight cultivars of *P. communis*, three cultivars of *P. pyrifolia* and one *Pyrus* hybrid. Out of 15 primer pairs that amplified fragments of the expected size, 10 are polymorphic. We are using these 10 polymorphic SSRs to fingerprint 60 accessions of pear.

We are collaborating with Lobke Vanwynsberghe in using microsatellite markers to study genetic diversity in the Malaceae family.

Humulus

Sixteen EST-SSR primer pairs were designed in hops and they will be used to study genetic diversity in 48 accessions of wild American hops.

Vaccinium

Graduate Student Project (Peter Boches). In 2003, 2,000 *Vaccinium* ESTs provided by Jeannie Rowland were screened for microsatellites. Incorrectly sized amplicons from previously designed primers were cloned and sequenced. From these sources, 41 additional primer pairs were designed and tested in diverse species of *Vaccinium*. Of these, 28 (68%) amplified a fragment of the expected size and 21 (51%) were polymorphic in *Vaccinium* species. Ten new EST-SSR loci are sufficiently robust and polymorphic to use for plant identification which brings the total number of available EST-SSRs to 15.

We evaluated cross-species amplification in nine taxonomic sections of the genus *Vaccinium* using 36 EST-SSR primer pairs. EST-SSR loci originating in *V. corymbosum* were most easily amplified in section *Cyanococcus* and least easily amplified in section *Oxycoccus*.

We plan to continue our collaboration with Jeannie Rowland to generate a universal linkage map in *V. corymbosum*. We are collaborating with Jennifer Park to establish markers for resistance to Sudden Oak Death (*Phytophthora ramorum*). We are also collaborating with Suann Yang (University of Washington) in using SSR-ESTs to determine clonal population structure and seed dispersal in wild *V. membranaceum* populations.

Tree Collections and Plant Pathology

By Joseph Postman

New Accessions in 2003:

Corylus – 50 new accessions – Seedlings were established from seedlots of *C. avellana* from Sweden, and *C. heterophylla* and *C. sieboldiana* var. *mandshurica* from the Russian Far East. Fifteen *C. avellana* cultivars and selections were received from the Oregon State University breeding program.

Cydonia – 4 seedlots were received from the Armenia Ministry of Agriculture. Seedling populations were established from several of these for field evaluation. Five quince cultivars were provisionally released from quarantine in Beltsville including 3 from Turkmenistan and 2 from the Middle East.

Mespilus – One medlar clone was obtained from an old tree on the grounds of the National Cathedral in Washington D.C.

Pyrus – 81 new inventory records (74 clones, 7 seedlots). The seedlots were all donated by Samvel Gasparian from the Armenia Ministry of Agriculture, whom we met during our collecting expedition in 2002. Clonal accessions received in 2003 include 4 Asian cultivars and 4 low-chill selections adapted to southern Gulf States. Additional clones include 58 seedlings of wild collected *Pyrus* species from Armenia, China, Kyrgyzstan, Macedonia and Russia. We have begun to establish seedling populations for a new field collection to represent global diversity of wild pear species.

***Pyrus* Evaluations and Observations**

We continued the ongoing evaluation of core pear clones for susceptibility to powdery mildew (*Podosphaera leucotricha*) and scab (*Venturia pirina*) in collaboration with

Robert Spotts at OSU Hood River. Manuscripts reporting on the results of these evaluations were prepared for presentation at the international pear symposium in early 2004.

The identities of 177 pear trees were verified by visual comparison of fruit and tree characters with published descriptions. Six misidentified trees were identified and removed from the collection, and 19 duplicate cultivars were flagged for elimination.

Summary of clonal collections and virus status – updated 1 May 2004.

	Total Plants	Change Since Last Year	Percent Virus Tested	Percent Virus Infected	Core Plants	Percent Virus Tested Core	Percent Virus Infected Core
<i>Corylus</i> plants:	625	+41	87.8	.8	172	100.0	0.0
<i>Cydonia</i> plants:	84	+1	16.2	4.0	45	28.9	8.9
<i>Fragaria</i> plants:	1239	+41	60.9	23.2	507	79.5	13.8
<i>Humulus</i> plants:	474	+4	28.9	6.7	90	91.1	5.6
<i>Mentha</i> plants:	428	+11	3.0	3.9	50	14.0	2.0
<i>Mespilus</i> plants:	23	0	52.2	30.4	16	50.0	43.8
<i>Pyrus</i> plants:	1633	-25	81.1	9.1	202	89.6	8.4
<i>Ribes</i> plants:	753	+140	3.9	9.4	208	4.8	13.0
<i>Rubus</i> plants:	718	+46	83.0	8.1	267	83.9	9.4
<i>Vaccinium</i> plants:	634	-4	72.1	0.2	234	91.4	0.0

Plant Pathology

- *Corylus* - In 2003 the disease Eastern Filbert Blight caused by the fungus *Anisogramma anomala* was discovered at two locations uncomfortably close to Corvallis. The nearest orchard, about 15 miles to the northeast, had only a few infected trees and was to be removed last winter. A large infection center was also found about 20 miles south of the Repository. Prophylactic fungicide sprays are being applied according to recommendations of OSU plant pathologists, and the NCGR orchard is being visually monitored for symptoms. Appearance of this disease may eliminate our ability to distribute *Corylus* germplasm outside of the United States. During 2003, 65 *Corylus* accessions were tested for apple mosaic virus, including 27 which had not been previously tested. All tests were negative except positive controls. All apple mosaic infected *Corylus* plants have been removed from the NCGR field collection.
- *Fragaria* – During 2003, 461 samples were tested by ELISA. Tests included strawberry mild yellow edge, tobacco streak and tomato ringspot viruses. All tests were negative.
- *Pyrus* - During 2003, 280 graft assays were performed using indicator plants *Malus micromalus*, *P. communis* ‘Nouveau Poiteau’ and *Pyronia veitchii*. Twenty one accessions tested positive for common latent viruses. Apple stem grooving virus was the most frequently detected virus.
- *Rubus* – During 2003, 1800 samples were tested by ELISA. Tests included apple mosaic, raspberry bushy dwarf, tomato ringspot and tobacco streak viruses.

- *Vaccinium* – Blueberry shock ilarvirus was detected for the first time in the NCGR *Vaccinium* field collection during 2003. Two cultivars were found by ELISA to be infected with the shock virus, and one additional infected plant was detected in a nearby blueberry plot on the OSU farm. This virus has been present for several years in commercial and backyard fields in the Corvallis area, and it was inevitable that this pollen-borne virus would reach our germplasm collection. Efforts have been intensified to increase the number of *Vaccinium* clones that are kept under screen, but there is not room to represent the entire clonal *Vaccinium* collection in a greenhouse. We will continue to assay the entire field collection twice annually and cull infected plants, until the disease becomes more widely established.

Field Operations for 2003

By Joe Snead

Most of the field plantings at the Repository are mature plantings. The *Pyrus* field is over twenty years old and the *Vaccinium* and *Corylus* fields are nearly as old. In each planting, younger plants are mixed in. The challenge is to keep the planting vigorous and healthy for evaluations and propagation material production in such a varied age collection. Over the years different strategies have been employed in each field with varying results. One of the strategies is to reduce pesticide use. The results have been successful. This last year herbicide use has been greatly reduced by use of other cultural methods in the plantings. We are using new reduced risk fungicides and insecticides as effective control measures. Pheromones have been used for attract and kill or male confusion strategies in two plantings for insect control. Just as old problems are solved new insect or disease pressures arise. The field management strategy is to use Integrated Pest Management along with more sustainable agriculture practices to meet new farming challenges.

***Corylus*:** The policy over the last several years has been to hedge one side or the top of the trees each year. Last spring the last side was hedged in a three year cycle. This was done to invigorate scionwood production. Scionwood production has not been what was expected. The hedging on the sides takes at least two years to recover. The tops have remained vigorous. Some of the trees are much smaller than they were before. In the future the hedging will be done on an as needed basis. Increased irrigation was applied in the summer according current research recommendations. For a number of years Eastern Filbert Blight has been reported at least 40 miles away from the Repository. Now it has been found all around the Willamette Valley. All permanent field personnel have been trained in the detection of the disease. The system has been developed for effective monitoring for outbreaks. A four application spray regimen has been planned that should be effective in combating the disease.

Twenty seven new accessions were planted in the orchard in 2003 in a new section of the field.

Fallow Ground & Land Renovation: Clean up has continued on fallow ground previously used by the USDA Small Fruits Breeding Program. There are several acres between the *Vaccinium* and *Corylus* fields. A little less than an acre has been returned to OSU Horticulture for a variety trial of 100 new peony varieties from China. The rest of the plot will be for expansion of the *Vaccinium* and *Corylus* fields.

***Vaccinium*:** This last year a greater effort was put to disease suppression in the *Vaccinium* field. Blueberry shock which is transmitted by aphids was of the most concern. The field was scouted in mid-May and the first treatment applied soon afterwards. Three more treatments were applied throughout the season. The plants were tested twice during the growing season with good results. Five new accessions were planted in the field this year. A large group of plants were planted in the second plant space.

Pyrus: The *Pyrus* field is the largest field and is usually in some state of change. Planting space in the cultivar field is limited. This last year around fifty duplicate trees were cut down in the field. Many of the stumps were removed with the backhoe. About fifty other stumps were also removed to make room for new plants. Seventy-six new trees were planted this year. Hedging one side of the tree row continued this last year. The trees were getting dense with lots of branches from repeated hedging. Last winter the whole cultivar block was hand thinned from the ground and pruning tower. This treatment has produced an abundance of scionwood. For the second year an attract and kill pheromone insecticide was used for codling moth control. Three applications of the gel were applied and there was a successful control level. Disease pressure was light last spring so no control measures were used. Weed control techniques included weed burning, tillage and spraying. At the end of summer about mid harvest the Repository had its first ever Pear Field Day for the general public. The field was in excellent shape because of the previously mentioned work.

North Farm: The development of the North Farm continues on several fronts. The fence line renovation continued along the northern property line. The eastern property line was surveyed and marked so that fence can be moved onto the property line. The beginning of a buffer planting was planted along the northern property line. The buffer is meant to reduce pesticide drift and dust.

An additional acre of planting ground has been cleared of brush and stumps and will be planted in the fall of 2004. A new piece of ground about an acre in size is being cleared at the north end of the farm and could be ready for planting by fall 2005. Butternuts may go into that location.

A Farm map was produced on the computer. It is not to scale, but it is proportionally correct. What became apparent from the map is how full the farm is. There is limited new planting ground. Clearing the rest of the old forest area will only gain an additional half acre or so. This last year the repository implemented land use plans for plot ground on the north farm. The plans include preplant planning aspects, details of the plot use and post use renovation plans. These plans will enable better use of the plots and coordination of the users.

Tractor barn improvements include a vehicle lift installed to aid in servicing. The air compressor now has a pipe system installed on the walls with several outlets around the shop.

Minor Genera: A new minor genera field was laid out and the beginning of a new quince collection was planted into it. The old planting had outgrown its space. The move will take several years to complete. The minor genera are of big interest to visitors on the North Farm

Actinida: The hardy kiwi collection plants grew well this year. Frost protection was installed in the field for flower bud protect in early May. The thermostat is set to turn on at 34 degrees. The system worked well several times during some unusually cold frosts. Many of the accessions had their first small crop. Data was collected on flowering season. Later fruit was evaluated for flavor and average fruit weight was recorded.

Ribes: Currant cane borer has been a problem in the field. Individual plants were sampled to determine population level. A new slow release pheromone was used for male confusion in the field. The field was sampled this last winter to see if the pheromone had a positive effect.

***Pyrus* Species**: On the North Farm the new *Pyrus* species block is still progressing. All the land was planted to turf. The plot was surveyed and the row ends marked off.

***Rubus*, Raspberry Cultivar Block**: A site was selected for a new raspberry cultivar planting. Blueberries were in the block previously and cleanup started in the fall. The plot will have raised beds that will undergo solarization in the summer of 2004 to control weeds and disease.

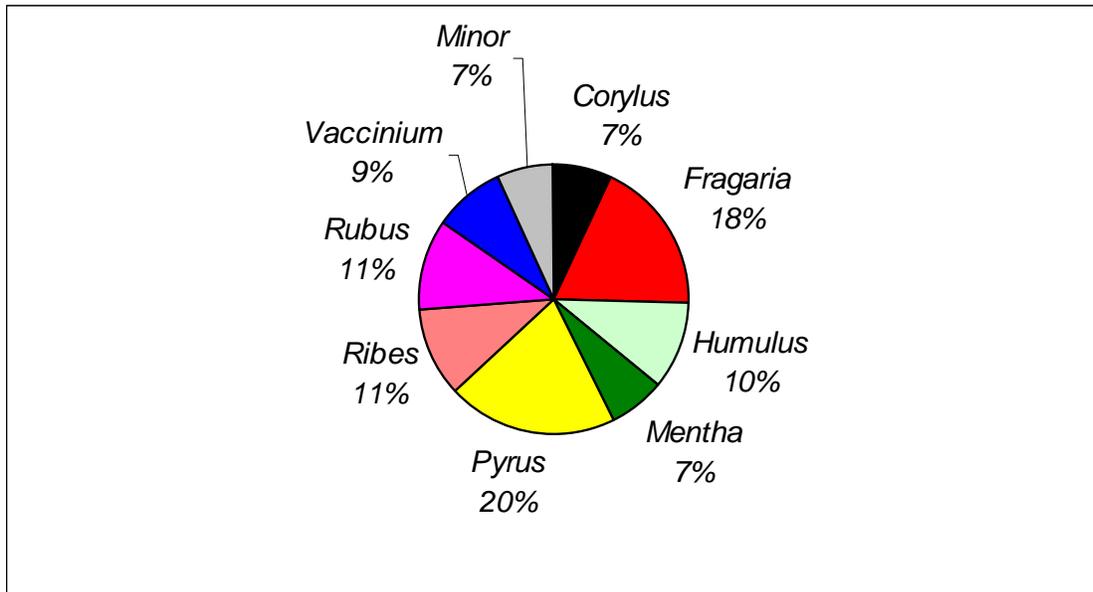
Plant Distribution

By Bruce R. Bartlett

Domestic and international shipping costs were higher in CY 2002 due to the use of Federal Express (Priority Overnight) domestically instead of USPS Priority and USPS Global Express Mail Service for international packages instead of USPS international airmail.

The total postage paid for domestic and international shipping was \$1,356.71. The total cost for Federal Express was \$1,706.89 and the total paid to the Oregon Department of Agriculture for 50 Phytosanitary Certificates was \$500.00. Four genera, *Fragaria*, *Pyrus*, *Ribes* and *Rubus* accounted for 60% of all distributions.

Plant Distribution 2003: breakdown by genus



Screenhouse/Greenhouse Collections

By Jim Oliphant

- Propagation and regeneration of 1740 accessions, especially *Fragaria* and *Rubus*.
- Development of a water action plan to reduce water alkalinity and stabilize soil pH.
- Successful control of root weevil and cyclamen mite infestations through a sustained IPM plan.

Actinidia: Our plan is to maintain a back-up collection in the screenhouse at least until the field plants are established. Of the 124 clones received 96 are established in the screenhouse.

Corylus: Temporary back-up trees of all new young field trees and virus infected clones of *Corylus* are maintained under screen. Before a new accession can be planted in the field it must be grafted and layered until the scion is on its own roots. Scionwood of core clones is also grafted and maintained in a greenhouse as needed for tissue-culture source material. Currently, 146 accessions are being maintained, 7 are in quarantine, 37 are for tissue culture, and 93 are recent quarantine releases being self layered for field planting.

Fragaria: All clonal accessions of *Fragaria* are maintained under screen. An additional backup set of Supercore is maintained in the greenhouse. We are continuing our 3-year repropagation cycle using runners. In 2003, 200 accessions were runner propagated, hot water treated, and replaced in the collection. Currently, only 103 accessions with crowns older than 3-years remain to be runner propagated. Crown divisions of these 103 at risk accessions were made and are now beginning to runner.

Humulus: All virus-free core clonal accessions of *Humulus* are maintained in the screenhouse. In addition to the 147 virus-tested clones, we have 48 infected clones and 58 wild American seedlings. All of the collection was repropagated for a planned increase to 2 pots per accession.

Mentha: All clonal accessions of *Mentha* are maintained under screen. We are continuing our 3-year repropagation cycle via cuttings. In 2003, 156 accessions were propagated and replaced in the collection.

Pyrus: Permanent back-up trees of all non-hardy clones, pome fruit virus collection, and temporary back-up trees of all new young field trees of *Pyrus* are maintained under screen. Of the 113 clones in the screenhouse, 41 are non-hardy and 70 are virus isolates.

Ribes: All core or non-hardy clonal accessions of *Ribes* are maintained under screen. To date, 207 of the 218 core accessions are established in the screenhouse.

Rubus: All clonal accessions of *Rubus* are maintained under screen. Accessions from tropical, subtropical, and high latitude habitats are maintained in the greenhouse. We are continuing our 3-year repropagation cycle via cuttings, tip layers, or root division. In 2003, 432 accessions were propagated and replaced in the collection. Currently, 84 accessions with crowns older than 3-years remain to be repropagated. These 84 at risk accessions were repotted and are being given special attention.

Vaccinium: Our goal is to maintain all core, named cultivars, and non-hardy clonal blueberry under screen. Additionally, all lingonberry and cranberry accessions are also maintained under screen. Currently, 367 of an estimated 406 accessions are established in the screenhouse.

Clonal Accessions maintained in the Greenhouses and Screenhouses as of May 2004

	Total # Accessions	Core		Available		Single Plants With No Back-Up		Screenhouse Area Occupied		Screenhouse Expansion Space		
		# Ac.	%	# Ac.	%	# Ac.	%	Sq. Ft.	% Total	Sq. Ft.	% Total	# Pots
Actinidia	106	0	0	96	91	21	20	490	2.9	0	0	0
Corylus	146	43	29	129	88	65	44	70	0.4	0	0	0
Fragaria	1297	516	40	1264	98	586	45	5670	33.8	420	3.3	144
Supercore¹	[44]	[44]		[44]		[0]		[104]				
Humulus	253	86	34	243	96	160	63	700	4.2	0	0	0
Mentha	436	51	12	434	100	281	64	1190	7.1	35	0.2	12
Pycnanthemum	32	20	62	32	100	0	0	175	1.0	0	0	0
Pyrus	339	28	8	239	70	163	48	350	2.1	0	0	0
Ribes	382	207	54	320	84	79	21	1085	6.5	175	0.9	60
Rubus	735	253	34	688	94	52	7	3325	19.8	175	1.5	60
Subtropical¹	[119]	[48]		[116]		[3]		[988]				
Vaccinium	391	210	54	374	96	133	34	2625	15.6	140	1.7	48
Other²	151	51	34	107	71	71	47	175	1.0	0	0	0
Screenhouse	4149							15855	94.4	945	5.6	324
Greenhouse	163							1092	82.2	236	17.8	23
Total	4268	1465	34	3906	92	1611	38	16947	93.5	1181	6.5	347

JMO 05-19-04

- 1) includes backup supercore and accessions from tropical, subtropical and high latitude areas
- 2) includes: ASI, CYD, GAY, SAM, SOR, and OTHINV

Quarantined Plants

At this time we have 280 accessions in quarantine.

- 4 *Actinidia* accessions.
- 7 *Corylus* accessions. 5 accessions are in post entry, 2 accessions are being maintained as “in-house quarantine” because of their virus status.
- 248 *Pyrus* accessions: all Provisional Release accessions
- 43 *Ribes* accessions: 10 accessions have not been released, 33 accessions have been released by APHIS but are being maintained as “in-house quarantine” because of their virus status.
- 4 *Rubus* accessions.
- 9 *Vaccinium* accessions.

Quarantined Plants

At this time we have 280 accessions in quarantine.

Genus	Federal	State	In-House
<i>Actinidia</i>	4 Post Entry		
<i>Corylus</i>	4 Post Entry		2 NCGR
<i>Pyrus</i>	248 Provisional Release		
<i>Ribes</i>	10 Post Entry		33 NCGR
<i>Rubus</i>	4 Post Entry		
<i>Vaccinium</i>	9 Post Entry		
Total	280		

Seed Program

By Jack Peters

The new seed testing laboratory was constructed during 2003. The Seed Lab facility officially began operations in early November when Jack Peters was hired as the Seed Scientist. A three phase approach to the operation was established early in the process:

- 1) Get the facility equipped with the necessary seed testing equipment, instruments and accessories.
- 2) Go through the seed accession inventory already on site: Clean samples and assess seed condition, count seeds, repackage, relabel, refile.
- 3) Check seed viability (via TZ test, germination, excised embryo test) especially on 'core' samples and those that are frequently distributed; enter, clean, count, test and store new seed accessions as they arrive at the Repository; initiate a seed increase program for accessions that are dangerously low on germplasm; propagate plant material from seed sources or seed germplasm from plant sources; investigate new and improved methods for germination, breaking seed dormancy, seed storage techniques and seed longevity issues; collecting seed quality data, revising procedures and updating the Seed Collection Management section of the Operations Manual; and producing seed science publications

During November and December of 2003, phase one of the program was implemented. Two thirds of the seed inventory (including the following genera) was checked, cleaned, counted, relabeled, repackaged, and refilled/stored in the seed storage freezers:

<u>Genus</u>	<u>Number of Seed Accessions</u>
<i>Fragaria</i>	319
<i>Humulus</i>	252
<i>Mentha</i>	45
<i>Pyrus</i>	289
<i>Actinidia</i>	19
Minor genera	420

Seed accession inventory remaining to process at the end of 2003: *Ribes*, *Rubus* and *Vaccinium*.

INFORMATION MANAGEMENT: GRIN Records

By: Douglas Cook

This year there were 738 new accessions and other sub-tending data categories added to GRIN (1595 Accession Names, 607 Habitat, 149 Narratives, 479 Pedigree, 4 Quarantine, 2080 Source, 3347 Source Member and 129 Vouchers). There were 1142 new Inventory items, 1364 Inventory Actions and 352 Observations added to GRIN. For Distribution there were 5 Orders, 422 Order Items, 7 Order Actions and 129 Cooperator records add. Among existing accession records, and other sub-categories, modifications were made during the year (378 Accession Name, 4 Annotated Labels, 65 Habitat, 325 Narratives, 3236 Pedigree, 2 Quarantine and 2083 Source). There were 2041 Inventory, 2024 Inventory Action, 33 Cooperator and 1 Pathogen records modified.

Table GRIN Records Activity during CY 2003

<u>GRIN Area</u>	<u>Created</u>	<u>Modified</u>
Accession	8,524	6,124
Inventory	2,506	4,065
Observation/Voucher	481	0
Pathogen	0	1
Distribution	434	0
Cooperator	129	33
<u>Total</u>	<u>12,074</u>	<u>10,222</u>

Hardware and Infrastructure

Improvements for internet security increased last year by disconnecting the T-1 Frame Rely to Oregon State University (OSU). We now connect to the USDA/ARS/HCRL sub-net on campus. This places NCGR's LAN behind a router/firewall separating the ARS from OSU. With the change of equipment we now have better phone service using the T-1 line to carry the signal. Five new computers, two additional Switches and cabling were added to the NCGR LAN. All twenty-seven workstations operate with Pentium (P2) or higher CPU's (with memory at 128 megabytes or higher) operating with Windows® XP-Pro. All workstations are equipped with uninterruptible power, anti-virus and firewall protection. Fileserver backup data are stored on CDs and tape at a secure off-site ARS building. Numerous minor (and critical) computer configurations and repairs took place. New Geographic Information System (GIS) Software named DIVA was added to the resources used by NCGR staff. DIVA is used to analyze the distribution of species, and, to elucidate geographic, economic and genetic patterns kept at NCGR. DIVA was used to plan the wild *Humulus* Plant Expedition of October 2003.

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5. Postman, J.D., Hummer, K.E., Pomper, K.W. Vascular Decline in the Oregon Pawpaw Regional Variety Trial. *HortTechnology*. 2003. 13(3):418-420
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2. Boches, P., Rowland, L.J., Bassil, N.V. Characterization of EST-Derived Microsatellite Markers in Blueberry. *HortScience*. 2003. v.38 (5): Abstract p. 737-738.
3. Boches, P., Rowland, L.J., Bassil, N.V. EST Derived Microsatellites in Blueberry. *Plant Genome Conference Proceedings*. 2003. Poster #258.
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5. Hummer, K.E., Sabitov, A. Differential Infestation of Currant Borer in *Ribes* Cultivars. *HortScience*. 2003. v.38(5): Abstract p. 662