

NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1998

I. PROJECT TITLE: NC-7 "Plant Germplasm and Information Management and Utilization."

II. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

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| <p>A. <u>Administrative Advisor</u></p> <p>B. <u>Regional Coordinator</u></p> <p>C. <u>State Experiment Stations Representatives</u></p> | <p>D.A. Topel, Iowa</p> <p>*M.P. Widrlechner, Iowa</p> |
| <p>1. Illinois *T. Hymowitz</p> <p>2. Indiana *J. Janick</p> <p>3. Iowa *C. Brummer, Secy.</p> <p>4. Kansas *C. Rife</p> <p>5. Michigan *A. Iezzoni</p> <p>6. Minnesota *H. Pellett</p> | <p>7. Missouri *P. Beuselinck</p> <p>8. Nebraska *D. Baltensperger</p> <p>9. N. Dakota *J. Franckowiak</p> <p>10. Ohio *K. Campbell, Chmn.</p> <p>11. S. Dakota *A. Boe</p> <p>12. Wisconsin *W. Tracy</p> |

*Voting members

D. U. S. Department of Agriculture

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| <p>1. ARS National Program Staff, Plant Germplasm</p> <p>2. ARS Plant Exchange Office</p> <p>3. ARS Area Director, Midwest Area</p> <p>4. Cooperative State Research, Education and Extension Service</p> <p>5. Natural Resources Conservation Service</p> <p>6. National Center for Agric. Util. Research</p> <p>7. National Seed Storage Laboratory</p> | <p>*P. Bretting</p> <p>*E. Garvey</p> <p>R. Dunkle</p> <p>M. Stanton</p> <p>*P. Koch</p> <p>*T. Abbott</p> <p>*S. Eberhart</p> |
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E. North Central Regional Plant Introduction Station, Ames, Iowa

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| <p>1. USDA-ARS Staff</p> <p> a. Research Leader/Coordinator (Acting)</p> <p> Supervisory Program Support Assistant</p> <p> Office Automation Clerk</p> <p> Office Automation Clerk</p> <p> Biological Science Technician</p> <p> b. Horticulturist</p> <p> Agricultural Research Technician</p> <p> Agricultural Research Technician</p> <p> Biological Science Lab Technician</p> <p> Germplasm Program Assistant</p> <p> c. Research Entomologist</p> <p> Agricultural Research Technician</p> <p> Entomologist</p> <p> d. Geneticist</p> <p> Agricultural Research Technician</p> <p> Biological Science Technician</p> | <p>M. Widrlechner</p> <p>L. Wilson-Voss</p> <p>B. Henry</p> <p>A. Nixon</p> <p>Vacant</p> <p>M. Widrlechner</p> <p>P. Ovrom</p> <p>D. Kovach</p> <p>L. Burke</p> <p>R. Stebbins</p> <p>R. Wilson</p> <p>S. McClurg</p> <p>Vacant</p> <p>M. Brothers</p> <p>J. Van Roekel</p> <p>I. Larsen</p> |
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| 2. Iowa State University Staff | |
| a. Research Station Superintendent II | L. Lockhart |
| Farm Equipment Operator III | L. Crim |
| Field-Lab Technician II | J. Scheuermann |
| Clerk Typist II | L. Minor |
| b. Curator III (Maize) | M. Millard |
| Field-Lab Technician II | T. Ladjahasan |
| Field-Lab Technician II | G. Crim |
| c. Asst. Scientist II (Plant Pathology) | C. Block |
| d. Curator III (<u>Brassica</u> , Grasses) | R. Luhman |
| e. Curator III (Vegetables) | K. Reitsma |
| Field Lab Technician II | B. Roberts |
| f. Curator III (Amaranth) | D. Brenner |

III. PROGRESS OF WORK (P.K. Bretting, M.P. Widrlechner)

The year 1998 marks a milestone in the development of the North Central Regional Plant Introduction Station. From its modest beginnings 50 years ago in 1948, the Station has become one of the world's leading institutions for the management of agricultural plant biodiversity. This could not have happened without the faith and enduring commitments of our supporters in the USDA, the State Agricultural Experiment Stations in the North Central Region, and Iowa State University, nor without the devoted efforts and creativity of our past and present staff.

In celebration of our 50th anniversary, we organized a series of national meetings, a special symposium on plant germplasm management, and tours of our facilities. The celebration was much more than an event of joyful recognition. Through the help of USDA-ARS and Iowa State University, we were able to publicize our ongoing programs and mission to a wide audience and to demonstrate what our supporters' investments have built.

As we begin our next half century, we possess world-class collections, unique and specialized facilities, and many years of expertise managing plant germplasm, insect pollinators, and associated data. But perhaps even more importantly, our staff has a zeal for service and improvement that should serve us well in meeting our customers' needs and new challenges in the dynamic times ahead.

Personnel changes:

Resignations and retirements: Peter Bretting, Research Leader, Jeanne Edwards, Biological Science Technician, Rose Schroeder, Office Automation Clerk, Craig Abel, Entomologist, and Linda Hintch, Field Lab Technician, vacated their positions during 1998.

Hirings: April Nixon was hired as Office Automation Clerk, Brett Roberts and Gaylan Crim were hired as Field Lab Technicians, and Lloyd Crim was hired as Equipment Operator III.

Promotions and reclassifications: Barb Henry was promoted to GS-4 Office Automation Clerk, Robert Stebbins was promoted to GS-6 Germplasm Program Assistant, Mary Brothers was promoted to GS-11 Geneticist and Craig Abel was promoted to GS-11 Entomologist. All the curators were promoted to Curator III.

Construction:

1. Reglazed a farm greenhouse and replaced two shade house coverings.
2. Remodeled a large room at the farm for corn processing.
3. Replaced floor tile in farm headquarters main hallway.
4. Installed an automated weather data collection system.

Equipment:

1. Furnished the corn processing room.

2. Purchased four vehicles and a skidsteer loader.
3. Purchased 12 personal computers and other computer hardware and software as outlined in Section V.

IV. PROGRESS IN GERmplasm AND INFORMATION MANAGEMENT, RESEARCH, AND EDUCATION (P. K. Bretting, L. Wilson-Voss, B. Henry, M.P. Widrechner)

(IV. summarizes the accomplishments and progress presented in greater detail in the individual staff reports later in the document.)

Acquisition:

1. More than 5600 germplasm accessions were acquired by the NCRPIS during 1998 (details listed under the germplasm program assistant's and the curators' reports).
2. Significant acquisitions included more than 2800 accessions of Linum, more than 1700 accessions of maize, and more than 200 accessions of ornamentals.
3. More than 160 accessions were inactivated and their seeds placed in archival storage.

Maintenance:

1. More than 46,000 accessions representing more than 300 genera and 1,800 species are now maintained at the NCRPIS. More than 1,300 accessions were "backed-up" in long-term storage at the National Seed Storage Laboratory (NSSL).
2. More than 3,300 lots of original seed were placed in long-term (-18°C) storage.
3. Inventories of more than 6,400 seed lots were reviewed to verify that the seed amounts were correctly recorded.

Regeneration:

1. About 1,700 accessions were cultivated for regeneration in Ames, St. Croix, and Salinas, CA during field seasons, which at Ames incorporated nearly 650 insect cages for controlled germplasm pollination.
 - a. The NCRPIS's germplasm regeneration program received valuable assistance from seed companies. Seminis and SunSeeds regenerated carrot accessions.
 - b. A group led by Mr. M. Linder of Sakata Seeds, and Dr. E. Ryder, USDA/ARS, Salinas, continued to regenerate Spinacia germplasm in positive pressure chambers at the USDA/ARS research site in Salinas, CA.

Distribution:

1. More than 16,000 seed packets were distributed to researchers in the U. S. (ca. 58% of the total) and abroad (the remaining 42%).
2. Forty-five plants and 98 cuttings were distributed to meet general ornamental germplasm requests. Thirteen accessions of landscape plants were distributed for long-term evaluation at 29 sites in the North Central Region, resulting in the distribution of over 800 plants.

Testing germplasm's germination, viability, and health:

1. More than 3,800 accessions were assayed for their germination/viability percentages.
2. Maize, sunflower, squash, cucumber, melon, amaranth, crucifers, and ornamental germplasm regeneration plantings were inspected for pathogens.
3. Accessions of Cucurbita pepo were assayed via ELISA for squash mosaic virus (SqMV) before planting. Living SqMV was detected in 49 year-old seeds, the

- oldest seed from which viable SqMV has been recovered.
4. Sixty accessions of maize and teosinte were assayed via ELISA for presence of Stewart's bacterial wilt.
 5. Experiments were conducted to determine the sensitivity of commercial kits that use ELISA to detect Stewart's wilt.
 6. Research is being conducted on the seeds of Cuzco maize, Angelica, and Ocimum to study seed longevity and dormancy.

Information management and computers:

1. Extensive additions were made to information management capabilities at the NCRPIS, with the purchase of 12 PC's, ten hard drives, a tape library, bar coding equipment, two digital cameras, and considerable software.
2. The NCRPIS computer staff continued to cooperate with other NPGS sites to refine the new version (GRIN3) of the Germplasm Resources Information Network.
3. More than 380 accessions were assigned Plant Introduction numbers.
4. "One-year", "Five-year" and "Ten-year" Performance Report forms were distributed to trial site cooperators for the NC-7 Regional Ornamental Trials.
5. An Intranet has been established on our network server to facilitate communications among our staff members.

Characterization:

1. Morphological characterization data were recorded for more than 2,200 accessions of maize, Cichorium, brassicas, millets, amaranths, cucurbits, sunflowers, Cuphea, ornamentals, and other crops.
2. The first comprehensive taxonomic study of Rubus (blackberries, raspberries) in Iowa was published and related studies of the Rubus of Minnesota and Wisconsin, as part of larger floristic projects, are now underway.
3. To date, color images of more than 3,000 maize accessions have been captured on digital files for curatorial reference.

Insect management:

1. Studies of the effectiveness of two species of Osmia bees on Brassica germplasm continued.
2. A pilot study was conducted to determine whether honey bee pollination can increase seed yields in amaranth.

Evaluation:

1. More than 2,300 accessions were evaluated in total at the NCRPIS in 1998. Accessions of maize, millets, brassicas, Cuphea, sunflowers, and potential ornamentals were evaluated for general agronomic or horticultural merit.
2. Three maize accessions were evaluated for host-plant resistance (in silks) to corn earworm feeding. Five hundred maize accessions were evaluated for host-plant resistance to first generation European Corn Borer, and 200 accessions were evaluated for host-plant resistance to second generation European Corn Borer.
3. Forty-seven sunflower accessions were assayed for host-plant resistance to sunflower moth.
4. A multi-year evaluation of brassicas for host-plant resistance to aphids continued, and incorporated field trials in Hermiston, OR. Some resistance to cabbage aphid was noted in 35 accessions.
5. Forty-six maize accessions were evaluated in replicated field trials for resistance to gray leaf spot, northern leaf blight, and eyespot.
6. An evaluation of the adaptation of Japanese landscape plants to the North Central Region was published. Multiple regression models related climatic factors at trial sites to plant survival.
7. More than 31,000 evaluation data points were entered into GRIN for nearly

3,100 sunflower accessions.

Enhancement:

1. A long-term recurrent phenotypic selection project to develop a composite population of wild sunflowers (*H. annuus*) with host-plant resistance to both Alternaria and Septoria leaf blights was broadened to include resistance to powdery mildew.
2. The biological mechanisms for non-DIMBOA-based host plant resistance to European corn borer in Peruvian maize were categorized, while work continued to transfer this resistance to elite Corn Belt inbred lines.
3. Genetic enhancement and characterization of non-seed shattering accessions of Amaranthus continued.

Health, safety, teamwork and EEO progress:

1. Many of the NCRPIS staff attended seminars regarding Hazardous Waste, Pesticide Applicator, and Tractor Safety. Several staff members attended seminars regarding, Respirator Training, CPR and First Aid Training, Workplace Violence, Worker's Compensation Supervisor's Training, Electrical Safety, and Dust Mask Training. All field workers received training in the proper use of dust masks. Several NCRPIS staff members served as members of the ARS Campus Safety Committee.
2. The NCRPIS continued extensive efforts to document training received by various staff.
3. NCRPIS staff members attended various seminars regarding supervisory training, civil rights, workplace communications, project management, conflict management, and ethics.
4. The Assistant Scientist II (Plant Pathology) served as a panel member for reviewing USDA/CSREES Capacity Building Grants for 1890 Land-grant Universities.

Outreach:

1. A site on the World Wide Web for the NCRPIS was established during 1996 at <http://www.ars-grin.gov/ars/MidWest/Ames/index.html> which has attracted much interest. During 1998, 2,000 visits to the site were recorded.
2. About 350 visitors toured the NCRPIS during 1998. Informational brochures describing the NCRPIS and its activities were distributed to all visitors, and to relevant offices at the national, regional, and local levels. Special tours were arranged for a World Bank training session on Sustainable Agriculture and for researchers from 1890 Land Grant Institutions.
3. Several staff members visited local elementary schools to teach students about the NCRPIS and its work.
4. Several staff members serve on advisory boards for various germplasm-related projects or organizations. The amaranth curator was elected President of the Amaranth Institute.
5. The Ornamental Horticulture program distributed various planting and performance reports to trial site cooperators.
6. NCRPIS staff travelled extensively in the U.S. and internationally (Ukraine and Mexico) to present lectures, attend workshops, serve on advisory committees, and review panels or establish contacts with foreign germplasm researchers.
7. The Supervisory Program Support Assistant traveled to East Lansing, MI to train administrative support personnel. Also helped organize "Positive Attitude to Strive for Teamwork and Growth (PASTG)," the first meeting held exclusively for Secretarial/Clerical Employees within the Midwest Area.
8. In 1998, an internship program was established to give Iowa State University students more intensive research and training experiences. The first two interns was assigned to Horticulture and computer/telecommunications projects. The internships focused on applications of integrated pest management in our greenhouses and the establishment and maintenance of a local area network.
9. David Spence, a post-entry quarantine officer from Queensland, Australia

- visited the NCRPIS in June to learn about relationships between germplasm maintenance and international exchange.
10. The NCRPIS staff widely publicized meetings held during the week of July 21, 1998 to celebrate the 50th anniversary of the station's establishment. More than 200 researchers and germplasm managers participated in these meetings, which included meetings of the Plant Germplasm Operations Committee, Sunflower Crop Germplasm Committee, four Technical Advisory Committees, the Crop Germplasm Committee chairs, and the GRIN Advisory Committee, in addition to a commemorative symposium.

V. INDIVIDUAL PROGRESS REPORTS

A. Entomology (R. Wilson, S. McClurg)

Progress:

Field

Maize - Corn earworm evaluation: Three maize accessions were planted in the field in Ames to obtain silks for evaluation in the laboratory. Silks were collected and frozen, but diets have not been prepared to date. Silk material from five accessions was shipped to Peoria, IL, for chemical analysis by Mark Berhow.

European corn borer evaluation: Five-hundred one maize accessions were evaluated for leaf feeding resistance to first generation European corn borer. Forty-seven rated resistant. Two-hundred maize accessions were evaluated in the field for second generation European corn borer resistance. Nineteen accessions rated resistant.

European corn borer oviposition preference was tested in field cages on 20 backcross populations of maize. No significant differences were noted for numbers of eggs oviposited. However, the number of eggs laid on two backcross populations was nearly the same as the number laid on the resistant inbred, 'CI31A'.

Sunflower - Work continued on the sunflower moth evaluation of both cultivated and wild-type sunflowers. Thirty-six accessions of cultivated sunflowers were planted in the field and infested with sunflower moth. Ten accessions of wild-type sunflowers were planted in the field in cages and infested with sunflower moth. All heads have been harvested but processing and data analysis are not yet finished. Data were analyzed for 1996 field tests in which three of 50 accessions rated resistant.

Brassica - A replicated field cage test was run to compare two species of Osmia bees for pollination efficiency on four selected Brassica accessions. There was a bee-x-accession interaction, but in all cases there were no significant differences between the two Osmia species.

Five-hundred Brassica accessions were planted in the field at Hermiston, OR. The plants were tested for host-plant resistance to natural populations of cabbage aphid. Possible aphid resistance was noted in 35 accessions.

Amaranth - Twenty-two amaranth accessions were planted in the field to be evaluated for lygus bug resistance. Individual heads of 14 accessions were bagged and infested with ten lygus bugs each. Heads were harvested and data are being analyzed.

The amaranth cultivar, 'Plainsman', was planted in field cages to test for, pollination efficiency of honey bees. Total seed weight per cage was higher using honey bees than from cages without honey bees. One-thousand seed weights are being calculated to compare seed quality from pollinated vs. unpollinated plants.

Cucumis - Work was started on developing a technique for evaluating Cucumis accessions for resistance to cucumber beetle. It was determined that the testing should be done in the greenhouse or in field cages in order to exclude other insect pests commonly found in the field.

Laboratory

Rearing - A colony of sunflower moths is being maintained in order to provide sufficient numbers of insects for our field evaluation program.

A colony of green peach aphids is being maintained in the greenhouse and growth chamber in order to provide sufficient numbers of insects for greenhouse evaluation of Brassica.

A temporary colony of cabbage aphids was started so that Brassica accessions could be evaluated in the greenhouse. The colony is not being permanently maintained.

Maize - Ted Wilson (M.S. graduate student, Entomology) developed a laboratory technique to evaluate maize leaf extracts in diets to aid in finding non-DIMBOA sources of European corn borer resistance. The three primary extracts being tested were water, methanol, and methylene chloride solutions. Data were analyzed and are recorded in his thesis.

Greenhouse - We retested 22 Brassica accessions in the greenhouse for resistance to green peach aphid and cabbage aphid.

Four accessions of chicory were tested for green peach aphid response in the greenhouse. The same procedure used for Brassica greenhouse evaluation was used and found to be sufficient.

Miscellaneous

Submitted a grant proposal that was funded for \$2,700 for evaluation of Brassica spp. for resistance to cabbage aphid. Funding source: National Plant Germplasm System.

Manuscript review:

During 1997, Richard Wilson peer-reviewed several manuscripts for colleagues and reviewed manuscripts for the editors of the Journal of Economic Entomology, Journal of Agricultural Research, and the Journal of the Kansas Entomological Society.

Cooperative research:

We cooperated with Bill Wiseman (Retired: ARS, Tifton, GA) on evaluation of maize for corn earworm resistance.

We are cooperating with Bill Van Roekel and Steve Hanlin (NCRPIS) on a Cuphea pollination study.

We worked with Rick Luhman and former employee, Craig Abel (ARS, Stoneville, MS) on a Brassica pollination study. New cooperator replacing Craig Abel will be Steve Hanlin (NCRPIS).

We are cooperating with Brad Binder (ARS, Ames, IA) on chemical analysis of maize leaf material with resistance to European corn borer oviposition.

We are cooperating with Gary Reed (OSU, Hermiston, OR) to evaluate Brassica for resistance to cabbage aphid.

EEO activities:

1. Attended "Against the Odds: The Artists of the Harlem Renaissance" video at NSTL, Feb. 5, 1998. (RLW and SGM)
2. Attended "Miles of Smiles, Years of Struggles" video at NSTL, Feb. 19, 1998. (RLW and SGM)
3. Attended "That Rhythm, Those Blues" video at NSTL, Feb. 24, 1998. (RLW and SGM)
4. Attended "Telling Our Stories, Saving Our Lives" video at PI Farm, Mar. 25, 1998. (RLW)
5. Attended Civil Rights Training, at NSTL, Ames, IA, June 2, 1998. (RLW)
6. Attended "Chili Cookoff" (ethnic food appreciation day) at PI Farm, Mar. 24, 1998. (RLW and SGM)
7. Attended "Massachusetts 54th Colored Infantry" video at PI Farm, Feb. 12, 1998. (SGM)
8. Helped develop an "Equality Survey" for Women's Equality Day which was distributed to all Ames area ARS employees. Tabulated results that were posted on Ames EEO/Civil Rights web site, July and Aug. 1998. (SGM)
9. Attended videos "Moving On" and "Moving On Too" at PI Farm, Oct. 22, 1998. (SGM)

Entomology and Agronomy Department activities:

Richard Wilson regularly attends faculty meetings held in both departments.

At present, Richard Wilson serves on the Agronomy Department Building Committee, Plant Breeding Panel, Greenhouse Committee, and Awards Committee.

At present, Richard Wilson serves on the following NCRPIS committees: Communication Committee, Computer Committee, Extension Committee, and sporadically on selection committees for screening and evaluating applicants for vacant positions.

Richard Wilson served as major advisor for one M.S. student (Ted Wilson, graduated December 1998) in Entomology at Iowa State University. Also currently serves on one M.S. student graduate committee in the Agronomy Department.

Meetings attended:

1. Attended Plant Science Lecture Series, Iowa State University, Ames, IA, Jan. 8 - 9, 1998.
2. Attended ESA North Central Branch annual meeting, Sioux Falls, SD, Mar. 8 - 11, 1998.
3. Attended International Plant Resistance to Insects workshop, Memphis, TN, Mar. 15 - 18, 1998.
4. Attended Sunflower Insect Workshop, Fargo, ND, Apr. 15 - 16, 1998.
5. Iowa Academy of Science annual meeting, Mason City, IA, Apr. 24 - 25, 1998.

Served as judge for Iowa Junior Academy of Science posters.

6. Attended Iowa Honey Producers annual meeting, Des Moines, IA, Nov. 13-14, 1998.
7. Attended Amaranth Institute annual meeting, Sidney, NE, Aug. 7-8, 1998.

Short courses/training:

1. Attended seminar "How to Interview and Hire Winners," Des Moines, IA, Aug. 10, 1998. (RLW)
2. Attended "Tractor Safety" training at ISU, Ames, IA, Feb. 25, 1998. (RLW and SGM)
3. Attended seminar "Microsoft Office," Des Moines, IA, Dec. 3, 1998. (RLW)
4. Attended Dust Mask Training, PI Farm, March 30, 1998. (SGM)
5. Attended Half Mask Respirator training, ISU-EHS, March 11, 1998. (SGM)
6. Attended Commercial Ag Pesticide Applicators Continuing Education, ISU, Feb. 18 and Dec. 9, 1998. (SGM)

Papers and posters presented at meetings:

7. At ESA North Central Branch meeting in Sioux Falls, SD, "Enhancement of Peruvian maize resistance to European corn borer," Craig A. Abel, Richard L. Wilson, and Linda M. Pollak. Mar. 8 - 11, 1998. (Poster)
2. At ESA North Central Branch meeting in Sioux Falls, SD, "Laboratory techniques for bioassay of European corn borer, Ostrinia nubilalis (Hubner)," Ted A. Wilson and Richard L. Wilson. Mar. 8 - 11, 1998. (Poster)
3. At International Plant Resistance to Insects Workshop in Memphis, TN, "European corn borer resistant maize from Peru," Craig A. Abel and Richard L. Wilson. Mar. 15 - 18, 1998. (Poster)
4. At Sunflower Insect Workshop, Fargo, ND, "Using Bees to Control Pollinate Sunflowers in Field Cages," Richard L. Wilson. Apr. 16 - 17, 1998. (Talk)
5. At Amaranth Institute meeting, Sidney, NE, "Lygus Bugs on Amaranth," Richard L. Wilson. Aug. 7, 1998. (Poster)
6. At PI Station 50th anniversary and NPGS meetings, Ames, IA, "Insect Pollinators at the North Central Regional Plant Introduction Station," Richard L. Wilson, Craig A. Abel, and Sharon G. McClurg. July 21-23, 1998. (Poster)
7. At the NC7 RTAC meeting, Ames, IA, "Entomology Program Update," Richard L. Wilson, Craig A. Abel, and Sharon G. McClurg. July 21, 1998. (Talk)

Other:

Richard Wilson serves as the primary resource person for entomological problems on amaranth in the United States. Growers and researchers contact him and request information regarding insect problems they encounter on amaranth.

Participated in hosting Agronomy 522 class visit to NCRPIS, July 14, 1998.

Traveled to Hermiston, OR, to collect field data for cooperative Brassica test,

July 7-10, 1998.

Visited public schools (7th grade, 4th grade, and Kindergarten) to talk about insects, especially pollinators.

Plans for 1999:

Field

Evaluate 500 maize accessions for resistance to leaf feeding by European corn borer.

Evaluate 200 maize accessions for resistance to second generation European corn borer.

Evaluate 20 amaranth accessions for resistance to tarnished plant bug and continue work on developing a better technique for evaluation.

Cooperate with Charlie Block to evaluate selected insect-resistant maize accessions for resistance to common maize pathogens.

Evaluate 50 sunflower (cultivated type) and ten (wild type) accessions for resistance to sunflower moth.

Cooperate with Kathy Reitsma to evaluate Cucumis for striped cucumber beetle resistance.

Cooperate with Bill Van Roekel and Steve Hanlin to evaluate pollination efficiency of Osmia bees on Cuphea.

Evaluate selected Brassica accessions in Oregon for resistance to natural infestations of cabbage aphids.

Laboratory

Cooperate with Brad Binder (ARS, Ames) to identify chemicals causing ovipositional resistance to European corn borer.

Continue rearing sunflower moths.

Continue rearing a colony of green peach aphids and cabbage aphids in the greenhouse and in a growth chamber.

Because sunflower moth larvae feed on pollen, we plan to incorporate chemical extracts of sunflower pollen into sunflower moth diets to see if resistant pollen could be used as a first line of defense against this insect.

Conduct Osmia bee diapause studies.

Miscellaneous:

Continue active participation in the Departments of Agronomy and Entomology.

Continue to attend professional meetings and present research results.

Continue working with graduate students.

Continue to develop cooperative research projects.

Publications:

Binder, B.F., J.C. Robbins, R.L. Wilson, C.A. Abel, and P.N. Hinz (1999). Effects

of Peruvian maize extracts on growth, development, and fecundity of the European corn borer. *Journal of Chemical Ecology* (In press).

Wilson, R.L., C.A. Abel, and S.G. McClurg (1999). *Osmia* spp. reared in artificial nesting sites in a backyard environment. *Journal of the Iowa Academy of Science* (In press).

Wilson, R.L. (1999). Insects. In *Amaranth Production Guide*. Amaranth Institute (In press).

Wilson, R.L. (1998). Using bees to control pollinate sunflowers in field cages. *Proc. Great Plains Sunflower Insect Workshop*. Fargo, ND. p. 7-8.

Wilson, R.L. (1998). Iowa Report. *Plant Resistance to Insects Newsletter*.

Wilson, R.L., C.A. Abel (1999). The use of diverse plant species for increasing *Osmia cornifrons* (Hymenoptera: Megachilidae) in field cages. *Journal of the Kansas Entomological Society* (In press).

B. Horticulture (M.P. Widrlechner, P. Ovrom, J. Edwards)

Germplasm Collections

Acquisition:

Two-hundred ten new accessions of ornamentals and eight accessions of mint-family plants were received during 1998. The majority of these accessions resulted from a special project to salvage seed collections being stored at the National Center for Agricultural Utilization Research, Peoria, IL.

Maintenance:

Available for distribution:

Ornamentals (NC-7 priority site) 846/2073 (41%) (126 genera)
Ornamentals (For trials or transfers) 92/200 (46%) (74 genera)
Mint-family Plants 57/111 (51%) (13 genera)

The availability of these crops increased considerably in 1998 (from 899 accessions in 1997 to 995 accessions in 1998).

Distribution:

Forty-five plants, 98 cuttings and 308 seed packets of ornamentals were distributed to meet germplasm requests, and 806 plants were distributed as part of the NC-7 Trials. Requests for ornamental germplasm were higher than typical but did not meet the record levels of 1997. Eighty-five seed packets of mint-family plants were distributed in 1998, a record-high level of demand.

Duplicated at NSSL and other NPGS sites

Ornamentals (NC-7 Priority Site) 747/2073 (36%)
Ornamentals (For trials or transfers) 47/200 (24%)
Mint-family Plants 55/111 (50%)

The percentage of ornamental accessions backed-up improved slightly in 1998. We expect that more progress will be made early in 1999 because of the high number of successful regenerations. GRIN is now designed to document back-ups at NPGS sites other than NSSL, such as the National Arboretum. Many of the 47 "trial/transfer" accessions serve as temporary back-up for the National Arboretum or for transfers recently made to Miami.

Regenerated

Ornamentals (NC-7 Priority Site) 146/2073 (7%)*
Ornamentals (For trials or transfers) 12/200 (6%)
Mint-family Plants 2/111 (2%)

* This includes 107 successful cage increases, 28 woody ornamental seed increases, 9 woody plant grow-outs, and 1 isolation increase.

Tested for Germinability/Viability in 1998

Ornamentals (all accessions held as seed) 87/2006 (4%)
Mint-family Plants 4/111 (4%)

Significant Progress

The four most notable areas of progress in ornamental germplasm management involved accession inactivation, acquisition (especially from the National Center for Agricultural Utilization Research), transfer of tropical and subtropical accessions to Miami, and the completion of a project to regenerate Leucanthemum accessions with low seed viability. We continued a project from 1997 to inactivate all accessions with zero inventory on hand that could not be reobtained. This resulted in the inactivation of 74 ornamental accessions in 1998. During the late summer, all accessions of Solenostemon and a few other genera of tropical and subtropical ornamentals that we were maintaining under glass were transferred to the Repository in Miami. And 47 accessions of Leucanthemum, most already known to be of low viability, were regenerated in cages. In 1998, more than 100 accessions were regenerated in cages.

Characterization/taxonomy:

During 1998, there were no large-scale characterization/taxonomy projects on the crops that we curate. However, all herbaceous ornamentals in the cage-increase field and many tree and shrub accessions being regenerated were checked to verify identifications. In all, 15 accessions were re-identified.

Evaluation:

There were no in-house evaluation projects conducted on the crops that we curate in 1998. However, Mark Widrlechner was a co-PI on two grant proposals prepared with William Graves of Iowa State University to evaluate germination techniques and stress adaptation in Alnus and Betula germplasm. It is expected that a proposal submitted to the Horticultural Research Institute will be funded early in 1999.

Enhancement:

There was no major progress to report with enhancement activities in 1998.

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - In 1998, 681 plants of thirteen accessions were distributed for evaluation to 29 sites, with an additional 125 plants of these accessions provided to arboreta and botanical gardens.

Computer-generated "One-, Five-, and Ten-year Performance Report" forms were distributed to trial site cooperators this spring. Paul Ovrom has made considerable progress in refining a homepage to post trial results, images of trial plants and other information about the trials on the Internet. Evaluation results for plants distributed in 1984-86 are now available through the homepage, and results for plants distributed in 1987 will be posted early in 1999.

Five newsletter updates were sent to trial site cooperators in 1998, to inform them about current developments at Ames and throughout the program. Late in 1998, this mailing list was converted into an email list to reduce paper and postage costs.

Research on the floristics, soils, plant communities, and climates of Ukraine continues with the help of Dr. Robert Schutzki at Michigan State University and collaborators in the Forestry Department of the National Agricultural University of Ukraine in Kiev. A plant exploration proposal to support an expedition to collect landscape tree and shrub seeds from the forest-steppe transition zone during September, 1999 was submitted during the summer and notification was received at year's end that it will be fully funded. Mark Widrlechner was able to spend a week at the National Agricultural University of Ukraine in September to meet collaborators and assess logistics for the trip.

Paul Ovrom and Mark Widrlechner visited NC-7 trial sites in Nebraska, South Dakota, North Dakota, and Minnesota as part of a spring plant delivery trip; they also visited the trial site at Iowa State University.

Performance data for about 20 accessions of landscape plants collected in northern Japan in 1982 and distributed for testing in the NC-7 trials in 1984 and 1985 were statistically analyzed to describe the roles that climatic factors play in landscape plant survival in the North Central Region. This analysis concluded that northern Japanese plants are poorly adapted to drought stress typical of the North Central Region, and a set of criteria was established to help focus future plant exploration in northeastern Asia. In 1998, this study was published in the Journal of Environmental Horticulture.

Additional studies to evaluate the suitability of the flora, soils, and climates of northeastern Asia and locate appropriate regions for plant exploration were initiated early in 1998, but little progress was made because of commitments resulting from Mark Widrlechner's temporary assignment as Acting Research Leader / Coordinator for the NCRPIS beginning in April.

Germplasm activities in crops other than those curated:

Five requests for accessions with special horticultural or agronomic characteristics were handled by Mark Widrlechner, resulting in the distribution of 591 packets of seed. In 1998, he also responded to nine general information requests regarding germplasm and its management.

With the help of Germplasm Program Assistant, Robert Stebbins, Mark Widrlechner coordinated the Station's acquisition of new germplasm from Indices Seminum and from the USDA-NRCS Plant Materials Centers, as well as the salvage of seed collections held by the USDA-ARS National Center for Agricultural Utilization Research in Peoria, IL.

Until May, when these responsibilities were transferred to Mary Brothers, Mark Widrlechner continued to oversee Bill Van Roekel's curation of Cuphea and Euphorbia. He advised Bill on germplasm acquisition and regeneration, verification of taxonomic identity, and the maintenance of accessions in the greenhouse. Further information about this project is contained in Bill's chapter of the annual report.

Mark Widrlechner assisted Kathleen Reitsma with the preparation of a poster for the 27th International Carrot Conference, held in Madison, WI, in August and with the design of a carrot demonstration planting at the Station, which was visited by carrot researchers on a post-conference tour from the Carrot Conference.

Mark Widrlechner assisted David Brenner by co-authoring a paper describing the results of experiments to test the efficacy of plastic tents for amaranth seed regeneration. This paper was recently published in the FAO/IPGRI Plant Genetic

Resources Newsletter.

Other research and training activities:

Research on the taxonomy of Rubus in Iowa resulted in the publication of a manuscript entitled, "The Genus Rubus in Iowa," in Castanea in 1998. The manuscript contains keys for field identification of those Rubus taxa that occur in Iowa, and also includes distribution maps, synonymy, and morphological descriptions. Biosystematic hypotheses that can be tested via cytogenetic and molecular approaches are also proposed. This project continues through Mark Widrlechner's assistance of Welby Smith in Minnesota and Ted Cochrane in Wisconsin as part of their statewide floristic studies.

In 1998, with the assistance of Rex Heer, an ISU graphic designer, Mark Widrlechner produced a color winter-hardiness zone map for Ukraine.

Mark Widrlechner continued to collaborate with Roger Fuentes-Granados to produce publications from his doctoral dissertation on the genetic control of essential oils and isozymes in Agastache. A general review paper and a report on the genetic control of isozymes appeared in print in 1998; a report on the genetic control of essential oil production is nearing completion.

Mark Widrlechner became co-major professor for Amalio Santacruz-Varela, a doctoral candidate in Plant Breeding. Amalio is researching patterns of morphological and genetic variation among New World popcorns.

Another important aspect of training for the Horticulture project is the coursework for keeping pesticide applicator's licenses current. Paul Ovrom and Mark Widrlechner attended training sessions in October. In addition, Paul, Mark, and Jeanne Edwards attended the pesticide certification sessions of the Shade Tree Short Course in March.

Paul Ovrom gained valuable experience by participating in the following training activities during 1998: short courses on the use of ARCView software for GIS analysis and Access software for database applications and a special supervisory training series offered by Iowa State University.

The NC7 horticulture project employed its first intern in 1998. Stephanie Bruner, a senior in horticulture at Iowa State University, completed a two-semester internship (May through December) under guidance from Mark Widrlechner and Paul Ovrom. Ms. Bruner's internship program focused on developing integrated pest management (IPM) methods for ornamental germplasm held in our greenhouses. Her work included investigating and employing cultural practices, chemical practices, such as insecticidal soaps and organic sprays, and biological controls, including the use of predatory mites, to control plant pests. Monitoring pest populations, collecting data on pest control practices, and a written report of her findings also were integral parts of her internship. Ms. Bruner received two credit hours from Iowa State University for successfully completing her internship. Through Ms. Bruner's internship, we gained valuable knowledge on applying IPM in greenhouse settings. The Station plans to continue building upon the practical knowledge this internship brought to light.

Meetings attended:

January: ARCView Short Course (Ames, IA) APO
March: Shade Tree Short Course (Ames, IA) MPW, APO, JCE
April: Minorities in Agriculture, Natural Resources and Related Sciences
 (MANRRS) Conference and Career Fair (Des Moines, IA) MPW
June: AABGA Annual Meeting and Woody Landscape Plant CGC (Philadelphia, PA)
 MPW
July: Herbaceous Ornamental CGC (Columbus, OH) MPW

NC-7 Regional Technical Advisory Committee, Plant Germplasm Operations Committee, and 50th Anniversary Celebration of the NCRPIS (Ames, IA) MPW

August: International Carrot Congress (Madison, WI) MPW

September: Floral and Nursery Crops Research Unit In-depth Review (Beltsville, MD) MPW;
Symposium Celebrating the 100th Anniversary of the National Agricultural University of Ukraine (Kiev) MPW;
METRIA and LPDC Symposium (St. Louis, MO) APO;
IPM Fact-finding Trip and Minneapolis Hort Expo Trade Show (Minneapolis, MN) JCE, APO

Sept.-Dec.: ISU 12+ Supervisory Training Series (Ames, IA) APO

October: Pesticide applicator's training for greenhouses (Ames, IA) MPW, APO;
Microsoft Access Training (Des Moines, IA) APO

November: New Crops Symposium and New Crops CGC (Phoenix, AZ) MPW

December: Midwest Area Research Leaders' Meeting (Peoria, IL) MPW; Ethics Training (Ames, IA) MPW

MPW - Mark Widrlechner; APO - Paul Ovrom, JCE - Jeanne Edwards

Posters, Presentations and seminars:

Reitsma, Kathleen R. and Mark P. Widrlechner. 1998. Daucus and Apiaceae in the USDA germplasm collection. Poster presented to the 27th International Carrot Conference, Madison, WI, 24-25 August 1998.

Widrlechner, Mark P. 1998. Plant Introduction Station: USDA and ISU working together. Invited presentation to the Iowa State University Reiman Gardens Brown Bag Lunch Seminar Series, 17 September 1998.

Widrlechner, Mark P. 1998. An overview of the United States National Plant Germplasm System: An important resource for agricultural research and education. Invited presentation to Globalizing Agricultural Higher Education and Science, a conference celebrating the 100th anniversary of the National Agricultural University of Ukraine, Kiev, 29 September 1998.

Publications which appeared in print in 1998:

Brenner, D.M. and M.P. Widrlechner. 1998. Amaranthus seed regeneration in plastic tents in greenhouses. Plant Genetic Resources Newsletter 116:1-4.

Fuentes-Granados, R.G., M.P. Widrlechner, and L.A. Wilson. 1998. Allozyme inheritance in anise hyssop [Agastache foeniculum (Pursh) Kuntze] (Lamiaceae). J. Amer. Soc. Hort. Sci. 123: 868-874.

Fuentes-Granados, R.G., M.P. Widrlechner, and L.A. Wilson. 1998. An overview of Agastache research. J. Herbs, Spices & Med. Plants 6(1): 69-97.

Ovrom, P. 1998. NCR Plant Introduction Station conserving & distributing plant germplasm, The Iowa Horticulturist 14(4): 10-11.

Widrlechner, M.P. 1997. Managerial tools for seed regeneration. Plant Varieties & Seeds 10: 185-193. (Published in 1998)

Widrlechner, M.P. 1998. Hardiness zones in China. (black and white version of this map). Temperate Bamboo Quarterly 3(2): 75.

Widrlechner, M.P. 1998. An overview of the United States National Plant Germplasm System: An important resource for agricultural research and education. Proceedings of the National Agricultural University of Ukraine (Kyiv) 8: 279-287.

Widrlechner, M.P. 1998. The genus Rubus L. in Iowa. Castanea 63:415-465.

Widrechner, M.P., J.B. Hebel, D.E. Herman, J.K. Iles, G.J. Kling, A.P. Ovrom, J.C. Pair, E.T. Pappozzi, S.R. Poppe, N. Rose, R.E. Schutzki, C. Tubesing, and D.K. Wildung. 1998. Performance of landscape plants from northern Japan in the north central United States. *J. Environ. Hort.* 16:27-32.

Widrechner, M.P. and A.P. Ovrom. 1998. Germination reports of uncommonly cultivated woody plants from the North Central Regional Plant Introduction Station, 1984-1996. *North American Regions Plant Propagator* 10(1):15-19.

Conclusions:

Curation

1998 was a very productive year in terms of seed regeneration with the number of regenerations at record-high levels, and in terms of providing samples to meet users' requests. There are still backlogs that decrease the efficiency of curation, such as the number of accessions requiring inactivation and those that have never been tested for viability or backed up (often because of small sample size), but significant progress was made in reducing the inactivation and regeneration backlogs.

Regeneration activity for herbaceous ornamentals in 1998 reflected priorities resulting from the results of a demand analysis conducted for 1991-1995 and reported at the 1996 ASHS meeting. It included certain annuals, such as Calendula and Zinnia, and perennials, such as Dianthus, Delphinium, Gypsophila, Echinacea, and Tanacetum. Recent germination tests also identified about 50 accessions of Leucanthemum that required regeneration. In 1999, major emphasis will be placed on the regeneration of Echinacea samples collected in 1997-98 and other genera of perennials that require a three-year field planting to achieve sufficient seed production.

Research

Mark Widrechner's level of publication activity in 1998 approximated that of 1997. For 1999, there are two papers that should be published from manuscripts submitted in previous years and three manuscripts in progress or in press as of January, 1999. The works in progress include a project to evaluate the climates, soils, and vegetation of northeastern Asia to identify candidate regions for future exploration, an analysis of the control of essential oil production in Agastache foeniculum, and a report co-authored with David Kovach analyzing techniques to promote germination in Cuphea.

Other research plans for 1999 include assistance to Amalio Santacruz-Varela in his analysis of patterns of genetic diversity among New World popcorn landraces and to Mary Brothers in her investigation of isozyme polymorphisms among cultivated sunflowers, continued participation in a study of the flora of Ames to investigate long-term changes in plant habitats, collecting patterns and introduced species, and in taxonomic studies of the genus Rubus, especially within the flora of the North Central Region.

C. Plant Pathology (C. Block)

RESEARCH NOTES:

Multiple disease and insect resistant maize evaluations:

Thirty-five accessions from the Eldredge popcorn collection and 11 Peruvian accessions were evaluated in replicated field trials for resistance to gray leaf spot (GLS), northern leaf blight (NLB), and eyespot. Popcorn accessions PI 340870, 340871, and 340872 showed excellent resistance to NLB. PIs 340870 and 340872 and Peru maize line A-10623 had eyespot resistance equal to the most

resistant check, Pioneer 3335. Five Peru maize lines, A-10623, PIs 503720, 503725, 503731, and 503764, and popcorn PIs 340869, 340871, and 340872 had GLS resistance equal to the most resistant check, GH 2390. Accessions with multiple disease and insect resistance included popcorn lines PI 340870 and 340871, which showed NLB, GLS, and corn earworm resistance; Peru maize line A-10623 which showed GLS, eyespot, corn earworm and ECB2 resistance; and Peru maize line PI 503720 which showed GLS, western corn rootworm and ECB2 resistance. Insect resistance was assessed in earlier evaluations.

Sunflower genetic enhancement:

A third cycle of recurrent selection was conducted in two populations of wild Helianthus annuus to develop breeding populations with resistance to both Alternaria helianthi and Septoria helianthi. In 1998, powdery mildew resistance was added to the selection criteria for this and future selection cycles.

Sensitivity of the Erwinia stewartii ELISA kit:

Experiments were conducted to determine the detection sensitivity of the commercial AGDIA, Inc. (Elkhart, IN) Erwinia stewartii ELISA kit. The detection sensitivity has not been established, although the kit is commonly used in seed health testing. The lower limit of detection sensitivity, as measured by an ELISA plate reader, was a bacterial concentration of about 1×10^5 CFU/ml. We found that the human eye was less sensitive than the plate reader. A faintly-visible color occurred at a bacterial concentration of about 2.5×10^5 CFU/ml and clearly visible reactions were evident at concentrations of 5×10^5 CFU/ml or higher.

Disease notes on seed increase germplasm:

Brassica and related genera: seed-increase notes:

Ninety-eight accessions of Brassicaceae were inspected for disease problems during 1999. Black rot (Xanthomonas campestris pv. campestris) infection was identified in one of 17 Brassica accessions, PI 169077; one of five Crambe accessions, A-23114; three of four Eruca accessions, PIs 388804, 388804, and 426658; and two of ten Sinapis accessions, A-19270 and A-21449. No other diseases were confirmed among these accessions. No diseases were identified among 20 Erysimum accessions or among five Thlaspi accessions, although two Thlaspi perfoliatum accessions, A-22569 and A-23187, had purplish, necrotic leaves of unknown cause. One of 14 Lepidium accessions, Lepidium alluaudii A-21377, was co-infected by the white rust fungus (Albugo candida) and by downy mildew (Peronospora parasitica), but the other Lepidium accessions were healthy. No diseases were noted among accessions of Alyssum, Berteroa, Biscutella, Erucastrum, Hesperis, Isatis, and Matthiola.

Cucurbita pepo seed increase notes:

Greenhouse seedlings of 39 Cucurbita pepo accessions were tested for squash mosaic virus (SqMV) before transplanting to the field. Results are summarized below:

Number of accessions tested: 39
Number of plants tested: 606
Accessions with one or more infected plants: 17
Total number of infected plants: 52
% infected plants: 8.6%

The incidence of SqMV-infected plants (8.6%) was considerably higher than in previous years. From 1994-97, the average incidence of infected plants ranged from 0.9% to 2.4%. Two accessions accounted for 22 of the 52 infected plants, A-10712 92ncai01 (11 of 27 plants) and PI 267664 59ncni01 (11 of 15 plants). Seed transmission was detected from three PIs, all grown from 1949 seed lots, the

longest survival time yet recorded for SqMV.

Cucumis sativus and C. melo seed increase notes:

Two-hundred four seed increase cage plots were inspected for anthracnose, powdery mildew and bacterial leaf blight, caused by the watermelon fruit blotch (WFB) pathogen, Acidovorax avenae ssp. citrulli. Two cucumber accessions, A-7735 and A-7736 (Asgrow Gyn1 and Gyn2), and five melon accessions; A-20746 (C. melo ssp. agrestis USM344, India); A-21762 (Cai melon, China); A-23235 (local melon, Albania); PI 176934 (Kara Dumanli melon, Turkey); and PI 531530 (Cor4, Israel) showed potential disease resistance, as defined by zero or only trace amounts of disease in the plot.

Fifty-nine of 161 Cucumis melo accessions had bacterial leaf blight symptoms. ELISA tests were conducted on fresh, symptomatic leaf tissue from ten accessions, using the Agdia WFB test kit. Only three accessions tested positive. Similarly, leaves from three heavily infected accessions were tested in the field using Agrichex (Hydros, Inc., Falmouth, MA) rapid test kits for WFB, but all tested negative. Our tentative conclusion was that either the WFB pathogen was present in very low numbers or that the symptoms were being caused by another pathogen. We later found that the ELISA WFB kit is not highly reliable for detecting the WFB pathogen from plant tissue.

To minimize the risk of storing any WFB-infected seed, all seeds harvested from infected accessions were treated with a 1% hydrochloric acid (HCl) seed soak for 15 minutes, then rinsed and dried. To judge the effectiveness of the HCl seed treatment, 200-seed samples were taken from 20 accessions and assayed for total bacteria, both before and after HCl treatment. Average bacterial counts were reduced from 1,000,000/seed to 150/seed in the first group of ten accessions tested, and from 500,000/seed to zero in the second group. No bacteria resembling WFB were detected from any of the 20 accessions tested. All of the bacterial isolates were from the family Enterobacteriaceae, and all were saprophytes except for Erwinia carotovora pv. carotovora, a soft rot pathogen.

Zea mays seed increase notes:

Two-hundred seventy-four maize seed-increase plots were rated in late August and early September for five diseases: common rust, common smut, northern corn leaf blight, Stewart's bacterial wilt, and gray leaf spot. No other diseases were observed except for bacterial blight, caused by Acidovorax avenae ssp. avenae (syn. Pseudomonas avenae). This is the first known discovery of bacterial blight of corn in Iowa. The disease caused some initial damage, but essentially ceased development about mid-July, when the frequent rains stopped. Only 13 plots were affected.

Seed samples from 50 maize accessions and ten teosinte accessions were tested by ELISA for Erwinia stewartii. Infected seed was found in only one of the 60 seed lots.

Sunflower seed increase notes:

Because of previous problems with seedling downy mildew infection and the need to rogue infected plants, all sunflower seeds were treated with Allegiance (metalaxyl) fungicide. No downy mildew was observed during the 1998 growing season on any sunflowers grown at the station. Apical chlorosis, caused by Pseudomonas syringae pv. tagetis, was detected on a few accessions in the seed increase field. The disease was quite striking during late June through mid-July, but the symptoms disappeared quickly with the onset of hot and dry weather. We suspect the source of the pathogen was from weed hosts. Alternaria leaf blight was common early in the season, but the severity diminished with the dry weather in July and August.

Amaranthus seed increase notes:

All of the amaranth seed increases were conducted in the greenhouse. No disease problems were observed.

Meetings/presentations:

Plant Science Lecture Series, ISU, 1/98

Sunflower Research Workshop, Fargo, ND 1/98

20th Annual Seed Technology Conference, Ames, 2/98; presented two posters on seed-borne diseases in corn.

Attended the NCR-25 Corn and Sorghum Diseases committee meeting at Ames, 2/98.

50th Anniversary Celebration at NCRPIS, 7/98

NC-7 Technical Committee meeting, Ames, 7/98

APS National Meeting at Las Vegas, NV. 11/98. Made a joint presentation with Dr. Wilson on "Multiple disease and insect resistance in selected maize germplasm."

Committee memberships:

Internship Committee - NCRPIS

Greenhouse and Growth Chamber Committee - Agronomy Dept.

Computer Committee - NCRPIS

Vegetable technician hiring committee - NCRPIS

Corn technician hiring committee -NCRPIS

Training Sessions:

Tractor Safety 2/98

Respirator Fit Training 2/98

Dust Musk Training 10/98

Publications:

Block, C.C., McGee, D.C., and Hill, J.H. 1998. Seed transmission of Pantoea stewartii in field and sweet corn. Plant Dis. 82:775-780.

Other:

Served as a grant review panelist for CSREES on 1890 Institutions' Capacity Building Grants, Washington, D.C. 4/13 to 4/15/98.

Met with visiting scientist David Spence of Queensland, Australia (post-entry quarantine), on subjects of seed health testing and quarantine; hosted his visit to the seed-health testing lab at the ISU Seed Science Center; a visit to Pioneer Hi-Bred International to discuss quarantine issues; and a visit with phytosanitary regulatory officials at the Iowa Department of Agriculture and Land Stewardship, 6/11 to 6/12/98.

We obtained a high-speed (13,500 rpm) benchtop centrifuge for the laboratory.

D. Farm (L. Lockhart, L. Crim, J. Scheuermann)

General:

We supervised and coordinated daily operations at the NCRPIS farm. This includes

management of all facilities, fields, and greenhouse space. We supervised or conducted 60 pesticide applications in the field and/or greenhouses. This number was down about ten percent from previous years. In part we credit that to an increase in IPM practices. We responded to 120 maintenance requests from staff members at the farm and the campus location. We coordinated and scheduled the student labor force of 20.0 FTE's. We coordinated facility construction and upgrades.

Labor:

During 1998, 113 applications for hourly employment were received and reviewed. There were 62 interviews resulting in 57 hourly employees hired. Two employees were dismissed for poor work performance and one for habitual tardiness. Currently there are 35 (16.1 FTE) part-time hourly employees working at the NCRPIS.

NCRPIS Farm Crew:

Lloyd Crim joined the staff March 16, 1998 and assumed the duties that were formerly Mike Czajkowski's. Lloyd has talents and skills that match very well with the required duties. He is responsible for field equipment operation and facility maintenance.

Jerry Scheuermann is responsible for general farm equipment and vehicle maintenance. He successfully designed and constructed a steel post puller and blade for a skid-steer loader. He overhauled two engines saving the NCRPIS several thousand dollars in repair costs. Jerry also completed all repairs reported on the annual vehicle inspections.

Maintenance projects:

Reglazed Greenhouse #1
Remodeled and retrofitted corn processing room
Tile was removed and replaced in the headquarters main hallway
Paving of main entry road and south parking lot
Installed greenhouse ebb and flow benches in greenhouse #1
Planned Computer room renovation to be completed as funding allows
Installed a computer automated weather data collection system
Replaced shade house coverings

Tours:

This past year Larry Lockhart organized and conducted 17 tours. There were approximately 350 visitors to the NCRPIS during 1998. Nearly 100 persons participated in a farm tour held as part of our 50th anniversary.

Conferences, training, etc. attended:

American Society of Agronomy Conference, Baltimore MD
Respirator Training Certification, EH&S, ISU
CPR Training, ISU

Staff Training:

We conducted four Disposable Dust Mask training sessions.
We conducted three Tractor Safety Training sessions.

Committees:

Larry Lockhart served as Chairman of the NCRPIS Extension Committee. The

extension committee was actively involved in planning and preparing materials for the 50th anniversary celebration in July 1998.

The committee also revised and printed an updated NCRPIS informational brochure. Larry also served on the 98 Planning Committee and on three hiring committees.

Purchasing:

Larry Lockhart coordinated all purchasing for the NCRPIS farm: this task included gathering and summarizing requests, writing specs, and obtaining supplies for the farm. Major purchases included furniture for the corn processing laboratory, four vehicles, skidsteer loader and polycarbonate covering for greenhouse #3.

E. Controlled insect pollination program (B. Roberts, S. Hanlin and C. Abel)

Progress:

Cage pollination: Six-hundred forty-eight cages were supplied with pollinators for controlled pollination of 735 plant germplasm accessions. Honey bees were used to control pollinate 565 accessions in the field. Bombus bimaculatus was used to control pollinate one Antirrhinum accession and two accessions of Amaranthus. Osmia spp. were used to control pollinate 85 Brassicaceae accessions.

Beekeeping: Honey bees were successfully over-wintered in the indoor wintering facility. This winter, we placed 125 parent colonies and 112 nucleus colonies in that facility. We will purchase 51 package bees from Texas this spring. A superior queen will be selected to add to our breeding stock.

Varroa mite infestations within our parent colonies surpassed economically damaging levels again this spring. All hives were treated with Apistan strips. A random sample of 24 hives were tested to detect Varroa mite levels in the hives. Mite population levels were then found to be below economically important levels.

Tracheal mite infestations were <1%. No miticide treatment has been necessary for this pest during the past five years.

Bombus: Twenty-four Bombus bimaculatus colonies were reared in the laboratory this spring. Two colonies were suitable for pollination. Possible reasons for the decline in colonies were a period of unfavorable weather and possible disease problems.

Megachile rotundata: No alfalfa leafcutting bees (ALC) were used this year to regenerate plant germplasm accessions.

Osmia cornifrons/Osmia lignaria: Osmia spp. were used to pollinate all Brassicaceae seed increase plots.

Last year's "increase stock" was evidently of a lower quality than past Osmia supplies. The poor stock which was used caused a lower number of straws to be filled and a decrease in numbers overwintered for the 1999 season.

Personnel:

Brett Roberts has worked for the pollinator management program for the past five years. Brett accepted a position with Kathy Reitsma as a vegetable germplasm technician the end of December. Brett's skilled labor and foresight on the job have been impressive. Some of Brett's new ideas have been the "driving force" in implementing and advancing the use of alternative pollinators at the NCPIS.

Mike Lund has worked for the pollinator management program for the past three years. His good work ethic and technical contributions to the program have aided

in the continuing success of controlled insect pollination at the NCRPIS.

Future plans:

Investigation of domicile preference of Osmia.

Continue seeking advice on storing newly mated, diapausing, Bombus bimaculatus

Investigate the use of Eumegachile pugnata for use in sunflower pollinator studies.

Continue research on pasture plantings for rearing Osmia spp.

Investigate other possible pollinators for the crops maintained at the PI station.

F. Zea Curation (M. Millard, T. Ladjahasan, G. Crim)

Activities

Curatorial Information

Significant events

The corn processing room was renovated to provide more efficient use of space and a more ergonomically friendly workplace. David Kovach helped design the room based on the design he worked out in the seed storage room. Much of the work was performed by the farm maintenance staff led by Larry Lockhart. There are now ten lab-type workbenches. Eight of these benches have two workstations each. A personal computer will be located on each bench for data entry. A false ceiling, floor tiling, and drywall were installed making the room soundproof enough to hold meetings. Lighting was increased significantly so that ear and kernel characteristics are easier to observe. Germinators and other equipment were walled off from the main work area providing better climate control for both areas.

A second field-lab technician was hired expanding the permanent maize staff. Ms. Gaylan Crim who has worked with Iowa State corn geneticist, Dr. Peter A. Peterson, for fourteen years joined the staff November 2, 1998. This addition will greatly enhance the productivity of the maize program.

The NCRPIS had a successful celebration of its 50th anniversary during July 1998. The new corn processing room was displayed during that time to a large number of individuals in NPGS and to many NPGS customers. During the celebration, the National Germplasm Resources Information Network (GRIN) advisory committee met in the new processing room demonstrating its versatility.

The maize curator obtained a new Gateway Pentium II GP6-400 computer with 128 megabytes of memory and a 9-gigabyte hard drive. This computer as well as many at the NCRPIS are running on the NT operating system. This operating system seems to be much more stable than the previously used Windows 95 system. The NCRPIS server was converted from the Novell operating system to NT server. Iowa State has a special pricing system for NT, and the NCRPIS has more support from ISU for this server operating system than for the Novell system. Now, all three permanent maize crew staff have Pentium computers.

The maize program at the NCRPIS had a very good regeneration nursery in Ames in 1998. We were able to maintain the number of regenerations done at the station at the number performed in the last few years. The weather allowed us to produce good quality seed.

A new Oracle Forms based germination program developed by David Kovach was put into full use in 1998 by the maize program. The Oracle program utilizes bar code readers as the lone data entry source. The staff doing the test enters the data into the computer as the germinating seedlings are counted using the readers. The program also has built in data verification routines looking for incorrect data entry or unusual germination results. The data go directly via an Internet link to the GRIN computer in Beltsville, Maryland where they are automatically backed up. The program processes the raw data and loads them into the GRIN database for use by all germplasm staff in the U.S. As an example of its usefulness, the NSSL is utilizing these data as it receives backup seed from the NCRPIS making their retesting of these materials unnecessary.

Acquisition:

New accessions received

During 1998, 1686 new Zea accessions were acquired. Most of the accessions received in 1998 came from more than 1650 accessions from Pioneer Hi-Bred International, Inc. These are accessions previously increased by Dr. Wilfredo Salhuana for CIMMYT while working for Pioneer. The samples are balanced samples of 500-1000 kernels. Most of these samples represent accessions already at NSSL as backups of CIMMYT's collection, but 1500 accessions are new to the NCRPIS. I plan to review whether to permanently hold all of these accessions. The collection had several accessions from Guatemala, Costa Rica, Nicaragua, Panama, and Brazil. The NCRPIS collection has very few accessions from these countries. Other major groups received so far in 1998 are 49 inbreds from the old Michigan State maize breeding program, a group of old Crop Science registrations from Iowa not previously entered into the active collection, and 51 new Crop Science registrations.

Maintenance and distribution:

#/% available for distribution--64% (10,580) of the 16,649 accessions held in December 1998 were available for distribution. This represents a slight increase in the number of accessions available over 1997 (10,567), and a reduction in percent available due to the influx of the previously mentioned Pioneer collection which has not yet completed processing. The number of new accessions of maize grew by 11%. Otherwise the number of available accessions indicates the stability of available accessions caused by balancing the number of regenerations against the receipt of new accessions and new unavailable accessions generated by distributions and seed deterioration. No progress in increasing this number can be foreseen without the influx of additional funding to the NCRPIS.

#/% distributed--We distributed 3297 packets of Zea seed in 1998. This represents (13%) 2187 of all Zea accessions held at the NCRPIS. We distributed these packets to 136 cooperators in 179 orders. Last year the figures were 5036 packets distributed to 161 cooperators in 204 orders. Packet number was down because we didn't have an order like last year's request for 2000 accessions for smut screening by the University of Illinois. These figures represent completed orders. We received some orders from overseas which require lengthy and expensive tests to meet phytopathological tests. Some of these requests will be filled in 1999, but we did have to deny seed to a couple of countries. These requirements continue to become more restrictive, and the NCRPIS will have to invest more resources than in the past to meet them.

#/% duplicated at NSSL--NSSL has 71% (11,858) of the Zea accessions held at the NCRPIS: **11,415 of the 12,287 (93%) of the accessions with permanent PI numbers are backed up at NSSL.** Only a small shipment of 59 Zea accessions was made to NSSL in 1998. In 1998, as in the previous few years, the NCRPIS emphasized backing up other crops with a much lower percentage of accessions duplicated at NSSL. We plan to review approximately 1000 accessions of Zea for PI-number assignment in 1999. PI assignment before shipment to NSSL increases the

efficiency of the entire backup process.

#/% accessions regenerated--In 1998, 296 maize accessions were planted for regeneration in NCRPIS-managed nurseries as compared to 521 accession in 1997 and 659 in 1996. This represents 1.8% of the total *Zea* collection. The reduction in accession regenerations was caused by the absence of a Puerto Rico nursery and the planting of a larger number of original seeds on fewer accessions on St. Croix. It is obvious that these regeneration numbers are far below the 3.3% necessary to regenerate accessions on a 30-year cycle for maintenance, let alone to catch up on the backlog of accessions needing regeneration to be available.

There were 174 accession regenerations attempted in the field in Ames in 1998. We could not have had a better year for regenerations. The season was long with very few stress days. My only regret was not planting more late-season accessions in order to take advantage of the unusually long season. Heavy rains late in the planting season and difficulties hiring temporary help deterred planting a planned, later nursery. The largest portion of the Ames planting consisted of the last of the Minnesota inbreds received in 1996 from the University of Minnesota.

Sixteen accessions were regenerated in the greenhouse in Ames during the winter of 1997-98. Six of these are from the Mangelsdorf-Galinat collection. The seed was collected in 1948 by J.C. Hawkes in Colombia. Nine of the accessions regenerated in the greenhouse were *Zea perennis* from the Iltis teosinte collection. The last accession regenerated in the greenhouse was PI 587154 (W153R) which is the last of the PVP reference lines. We have been having difficulty with off types in this inbred, and we decided to grow plants which were verified with isozymes before pollination. The resulting seed was planted in the field in Ames in 1998 and it finally seems that all the PVP reference lines can now be made fully available to the maize community.

No accessions were planted in Puerto Rico in 1998, and this represents the biggest decline in the NCRPIS regeneration efforts. The effort at the federal station at Isabela, Puerto Rico was redirected, and new arrangements need to be made with other institutions either in Puerto Rico or Hawaii. I am currently developing plans to start up a new tropical nursery late in 1999 or early 2000 with the Illinois Crop Improvement Program near Ponce, Puerto Rico. This year I decided to catch up on processing regenerations previously performed before starting this new effort. Usually we regenerated approximately 100 accessions per year at Isabela.

One-hundred quarantine accessions were regenerated on St. Croix in 1998 as compared to 227 accessions attempted in 1997. The reduction in numbers resulted from our desire to employ larger regeneration population sizes. St. Croix has room for 800-1000 twenty-plant rows for maize again in 1998.

Significant progress--The number of regenerations at Ames was maintained at average levels for the last few years despite budget difficulties. Six accessions were regenerated from 50 year old seed collected in Colombia by J.C. Hawkes. Six accessions with good pollination control was received from the Beltsville quarantine facilities. It has been several years since this many accessions were regenerated there.

Challenges--The number of available accessions has remained stable while the number of unavailable accessions has increased drastically. More regenerations need to be performed soon or the number of available accessions will fall. The regeneration program at Isabela, Puerto Rico was terminated. Arrangements must be made for tropical regenerations with other facilities on Puerto Rico or elsewhere.

#/% tested for viability--We tested the viability on 9.6% (1595) of the *Zea* collection in 1998. This compares with 1.8% (268 of 14,923) and 2.2% (326 of

14,804) of the collection in 1997 and 1996 respectively. Notably, the long slowdown in maize germinations has come to a close as the new Oracle germination program is put into use.

#/% of collection with permanent PI accession numbers--74% (12,287) of the total Zea collection has PI numbers. Few temporary-numbered accessions were assigned PI numbers in 1998. The Germplasm Program Assistant, who will assist the maize staff in performing this work, was busy with other NCRPIS tasks this year. Zea will become a priority crop for assigning permanent numbers in 1999.

Characterization/taxonomy:

#/% characterized/classified--The accessions grown in 1998 were characterized in a cursory fashion. Little progress was made in computerizing old characterization data. Efforts continued on obtaining high-quality images for future data acquisition. There were over 1671 images obtained on 1081 lots of 875 accessions. In 1997, over 3339 images of 2041 lots representing 1433 accessions were obtained. To date, 18% (3009) of the collection has been digitally imaged.

At the request of a cooperator wishing to know which landrace accessions belong to the races of maize described in the U.S. and Canada for a future project, I reviewed 779 accessions from the U.S. and Canada using images, field notes, seed and ears in the seed jars, and passport data and added 589 new racial designations to GRIN. These new designations were primarily for dent accessions from the U.S. and Canada. These of course will need further verification as further data on groups of accessions from each race are obtained.

Significant progress--As mentioned earlier, many accessions have been imaged with a color flatbed scanner. These images were used to designate a large portion of the landraces from the U.S. and Canada to race. In the future, these digital images can be used for precise characterization of ear and kernel traits.

Evaluation:

#/% evaluated--75% (12,513) of the accessions in the Zea collection have at least one observation either of the characterization or evaluation type. In 1998, 1310 observation records were added to GRIN on 1293 accessions. Listed below are a few examples of evaluation data covering a high percentage of the collection.

To date, 69% (11,415) of the accessions in the Zea collection have been evaluated for resistance to first-generation European Corn Borer. This descriptor has been determined for more accessions than any other. These data are collected by our entomology project.

To date, 17% (2912) of the accessions in the collection have been evaluated for resistance to second-generation European Corn Borer. These data are also collected by our entomology project.

During the last eight years, the Assistant Scientist II (Plant Pathology) has screened our increase plots for diseases which are important for seed export into some countries. To date, no sorghum downy mildew has been observed. Common corn smut, common rust, and leaf blights always occur, and we cannot certify that our maize grown in Ames is free of these diseases. Stewart's wilt has also been observed in the field, but when it is present or if the seed comes from an accession which was not observed in the field, seed ELISA tests are performed. To date, 487 observations have been performed on 475 accessions. Eight accessions have been positive for the disease organism. These ELISA data are entered into GRIN and maintained by Linda Minor and are available to NCRPIS staff working with orders.

Significant progress--The first-generation European Corn Borer observation represents the highest percentage of the corn collection evaluated for a

characteristic. This evaluation is performed here at the NCRPIS. All Stewart's wilt ELISA test data are in GRIN, available to order processing staff.

Enhancement and/or utilization:

#/% enhanced--No enhancement program has been undertaken by the Zea staff at the NCRPIS. The NCRPIS is providing seed storage for the intermediate stages of the GEM project, headed by Dr. Linda Pollak, which is enhancing landraces from the collection with elite germplasm from the seed industry. The products of this enhancement program will be deposited in the collection within three years. Dr. Craig Abel who previously was an NCRPIS entomologist, completed his Ph.D. thesis in 1998. Part of the thesis dealt with moving European Corn borer resistance from Peruvian accessions into adapted cornbelt inbreds through backcrossing.

Significant progress--The GEM project has sparked continued interest in those landraces used in the enhancement program. Soon, enhanced materials from the GEM project and Dr. Abel's thesis will be available from the active collection at the NCRPIS.

Support/administrative personnel:

Significant accomplishments--We were able to hire a second maize technician with 14 years of maize pollinating experience. She is eager to learn new computer skills. The current Zea technician continues to become more proficient with computers. This year he performed much computer inventory work independently, taking on one of the duties which the curator usually has performed.

Challenges--Maintaining the level of regenerations at past levels continues to be difficult as temporary staff is cut. Hopefully, the additional permanent staff will be able to absorb some of this work, through their experience and through their learning of more computer automation techniques.

Travel and Meetings attended:

I attended the 1998 Maize CGC meeting at the American Seed Trade Association meetings in December in Chicago. I presented a written report on Zea curatorial activities. The group approved sending U.S. and Canadian landrace accessions to CIMMYT as mentioned below. The CGC also recommend exchanging written reports via email at least two weeks prior to the meeting to encourage informed discussion.

I attended the NCR-167 meetings held in Des Moines in February. Through that meeting I obtained 49 inbreds from the Michigan State program which is no longer active.

I attended a meeting at CIMMYT of the LAMP principal investigators. I observed reports of this group who also discussed the curation activities in several Latin American banks. I proposed sending CIMMYT U.S. and Canadian landraces in the NCRPIS collection to help put the U.S. on an equal footing with other national banks who have a large percentage of their accessions at CIMMYT. I also visited with Dr. Taba Suketoshi, the curator there, and his excellent facility. The design and operations of CIMMYT cold storage used many of the ideas conveyed from the NCRPIS and NSSL locations.

Conclusions:

State of the program

The past year could be classified as a year of capital investment in the maize program. Facilities and staff were greatly improved. Hopefully these investments will result in better progress in future years. The maize program kept up with accession maintenance tasks, but again in 1998, as in several previous years, we must say: "barely." The number of maize accession regenerated

must be increased. If we do not get more funding then it is likely that the number of available accessions will decrease for the first time in this curator's career in the near future. We must improve the data for those accessions in the GRIN database. Selection of accessions for seed orders is still hindered by a lack of rapidly accessible data and the lack of certain accessions representing key components of genetic variability in maize.

Strengths and weaknesses: what facilitated or hindered progress

The maize program is becoming one of the most automated curatorial efforts at the NCRPIS. Only further automation will help to overcome the limited number of people assigned to the project. This has been done at the permanent maize staff level, but needs to be done at the temporary staff level, by obtaining six to eight Pentium class computers for the maize processing room. Additional Oracle forms need to be developed for imaging, ear description and processing, and other data handling tasks.

The maize collection now has three permanent staff assigned to it; however, it is the largest collection at the NCRPIS and there is much hand pollination work required to regenerate accessions. Temporary staff levels need to be maintained or increased in order to perform the pollinations required to maintain the collection at or better than its current condition.

While being one of the most distributed collections in the NPGS, little NPGS funding goes toward characterization and evaluation of the collection. Data from such projects would be very helpful in making the collection more valuable to cooperators.

Future plans:

Regenerations in Ames are expected to continue at about the 200 accession level in 1999. Resources must be increased to enable 300-400 accessions to be increased annually. A tropical nursery program will be restarted in 1999-2000 with the number of rows being determined by available funding.

Germinations will be resumed in 1999 at even higher levels than in 1998, with a goal of germinating 3000 seed lots. Better knowledge of seed deterioration will help us prioritize future regenerations.

The current St. Croix permit must be reviewed with APHIS to determine if it might be expanded to enable seed to be grown from countries currently prohibited. We are currently not actively seeking germplasm from many countries in Southeast Asia because there is little capability for regenerating populations at the 100-ear level.

Back-up of the last of the Goodman tropical increases may be completed in 1999.

Further exchanges of accessions contained in our collection, but not in CIMMYT's collection, will occur in 1999.

The Minnesota and Michigan collections have been deposited in the NCRPIS and are being regenerated or reviewed for regeneration. A complete review of the Iowa holdings was made in 1998 and seed was exchanged with ISU. Contacts were made with the Illinois sweetcorn program and the old breeding programs at Arizona, New Jersey, and Kansas. We expect to obtain germplasm from all of these projects in 1999. Further work is needed to review NSSL and NCRPIS holdings of other U.S. public materials and then existing projects need to be queried to fill in gaps.

The NCRPIS must procure more Caribbean accessions and representatives of races of maize not currently in the NCRPIS.

Dr. Bill Tracy has requested that he again review the accessions held by NSSL of the Crookham sweet corn collection now in NSSL for permanent long term preservation. We will assist him with this and try to obtain accessions for regeneration in 1999.

Travel

I plan to attend the NCR-167 meetings in Ames in February, 1999. Again my interest this year is in procuring old publicly-released inbred lines.

Tropical regenerations in Isabela, Puerto Rico have been terminated. Trips to Puerto Rico, St. Croix, or other locations may be necessary to arrange and provide oversight of new tropical nurseries. Travel by one or two of the Zea staff may be required to accomplish hand pollinations.

I will attend the American Seed Trade Association, the Maize Crop Germplasm Committee, and the Sweetcorn Breeders' meetings in December, 1999.

G. Vegetables (K. Reitsma)

Activities--General Summary

Acquisition and Status:

Statistics concerning acquisition, availability, backup, regeneration, and distribution of the vegetable collections at the NCRPIS have been summarized in the following two tables. Information about maintenance, characterization/taxonomy, evaluation and enhancement follows the tables under the "Specific Crop Summaries." During 1998, one umbel, 287 Cucumis melo, 158 Cucumis sativus, 25 Cucurbita and 29 Ocimum were backed up at NSSL. A substantial number of Cucumis sativus accessions will be sent to NSSL for back up after the re-inventory of the collection is completed in 1999.

Table 1: Status of NCRPIS Vegetable collections for 1998.

Genus	New Accessions	PI Numbers	Ames Numbers	NSSL Numbers	Total Accessions	Available #/%	Backed up at NSSL #/%
Cichorium	21	62	178	0	240	92/38	67/28
Cucumis melo	3	2398	635	3	3036	2130/70	1870/62
Cucumis sativus	4	1121	223	1	1345	1203/89	962/72
Cucumis wilds	2	277	72	0	349	115/33	113/32
Cucurbita	17	840	174	4	1018	704/69	626/61
Daucus	77	569	223	0	792	538/68	594/75
Ocimum	7	70	15	2	87	70/80	70/80
Umbels	153	340	582	1	923	148/16	201/22
TOTALS	284	5677	2102	11	7790	5000/64	4503/58

Table 2: Distribution of NCRPIS vegetable collections for 1998.

Genus	Orders	Total Packets	Domestic Packets	Foreign Packets	Total Accessions	%Collection Distributed
Cichorium	4	76	41	35	39	16
Cucumis melo	29	1203	1039	164	715	24
Cucumis sativus	17	271	163	108	225	17
Cucumis wilds	12	111	62	49	56	16
Cucurbita	12	114	98	16	98	10
Daucus	16	922	268	654	525	66
Ocimum	4	211	49	162	70	80
Umbels	7	127	36	91	116	13
TOTALS	101	3035	1756	1279	1844	24

Viability Testing: (General Statement)

Germination data for the 1997 cucurbit regenerations (592 accessions) were loaded into GRIN in May 1998. Germination tests for the 1998 regeneration seed lots scheduled for the summer of 1998 had to be deferred to 1999 due to insufficient temporary summer help. Seeds of several genera have been pulled for five-year germination tests to monitor the viability of distribution lots. These tests will be done during the summer of 1999.

David Kovach has begun to investigate germination protocols for Ocimum and Angelica to determine the optimum conditions for germinating seeds of these species to achieve a more uniform germination rate and plant population for regenerations.

Evaluation and Enhancement: (General Statement)

All evaluation data received in 1998 for the vegetable crops are listed in the specific crop summaries. At present, there is no enhancement program for the vegetable collections at the NCRPIS.

Activities--Specific Crop Summaries

ASPARAGUS

Maintenance and distribution:

The Asparagus collection was transferred to the USDA-ARS-Plant Genetic Resources, Geneva, NY on July 13, 1998. One domestic seed order for 11 accessions of A. officinalis was distributed before the collection's transfer.

CICHORIUM

Maintenance and distribution:

One-hundred Cichorium accessions were planted in the greenhouse in January for regeneration in summer field cages. Eight of the 82 accessions harvested will need to be regenerated again due to low seed quantities or insufficient representation of the population (i.e., a small percentage of plants bolted and set seed).

Characterization/taxonomy:

Some flowering and leaf characterization notes were recorded for accessions in the regeneration cages.

CUCUMIS

Maintenance and distribution:

Fruits were harvested from 42 of 45 Cucumis sativus and 153 of 169 Cucumis melo accessions regenerated in cages in 1998. Actual results of the 1998 increases will not be known until germination tests have been performed in March and the crops are stored in September 1999.

Many unavailable accessions of C. sativus and the wild Cucumis species are "hard-to-handle" because they require photoperiod manipulation, growth-regulator treatment, or a longer growing season to initiate flower and fruit production. This work must be done in the greenhouse, using hand pollination, as time permits, as it is very labor-intensive work. Charlie Block visually inspects cucurbit seedlings before they are transplanted to the field for regeneration, and he inspects the plants periodically during the growing season. This inspection process enables the pathologist to provide the "additional declaration" statements sometimes required with phytosanitary certificates for foreign distribution of cucurbit seeds.

Characterization/taxonomy:

Basic notes for taxonomic identification and accession characterization data are recorded from harvested fruits. Work continues on updating passport data for collector and donor records, secondary identifiers, and habitat information, including attempts to determine latitude and longitude for collection sites. Twelve C. sativus and 20 C. melo accessions were inactivated. Ten C. sativus were re-identified to C. melo, and seven C. melo were re-identified to C. sativus.

Evaluation and Enhancement:

Dr. C. Thomas, U.S. Vegetable Laboratory, Charleston, SC, submitted data from his ongoing evaluation of newly available NPGS Cucumis melo accessions for downy mildew resistance.

CUCURBITA

Maintenance and distribution:

Fruits were harvested from 18 of 35 accessions regenerated in 1998. Thirty-one accessions were transplanted to the field (ten for hand pollination, 16 for bee pollination in cages). Actual results of the 1998 increases will not be known until germination tests have been performed in March and the crops are stored in September 1999.

Characterization/taxonomy:

Basic notes for taxonomic identification and accession characterization are taken on harvested fruits. Work continues on updating passport data for collector and donor records, secondary identifiers, and habitat information, including attempts to determine latitude and longitude for collection sites.

Thirteen accessions of Cucurbita maxima originally held at Geneva, NY were re-identified to C. pepo and transferred to the NCRPIS for maintenance. Charlie Block visually inspects cucurbit seedlings before they are transplanted to the field for regeneration each year. Because of the increasing concern about seed borne diseases in the cucurbits, we have begun to screen all Cucurbita seedlings for virus infection with an ELISA protocol before transplant.

DAUCUS

Maintenance and distribution:

Thirty-eight accessions were planted in the greenhouse for regeneration in summer field cages in 1999. Fifteen accessions were sent to Roger Freeman, Sun Seeds, Brooks, OR, and 24 accessions to Larry Baker, Seminis Vegetable Seeds, DeForest, Wisconsin for regeneration in 1999.

Germination tests will be performed on the 1997 regeneration seed lots.

Characterization/taxonomy:

Work continues on updating passport data for collector and donor records, secondary identifiers, and habitat information, including attempts to determine latitude and longitude for collection sites. Also, two accessions were inactivated due to duplication.

Evaluation and Enhancement:

No new evaluation data were received in 1998.

OCIMUM

Maintenance and distribution:

No accessions were regenerated in 1998.

Characterization/taxonomy:

Two accessions of Ocimum sp. were identified to species in a greenhouse grow-out.

Work continues on updating passport data for collector and donor records, secondary identifiers, and habitat information, including attempts to determine latitude and longitude for collection sites.

UMBELS

Maintenance and distribution:

Two accessions of Pastinaca were regenerated in field cages in the summer of 1998. These accessions had low plant populations and will need to be regenerated again before the accessions can be made available for distribution.

Twenty-seven accessions each of Eryngium and Petroselinum were planted in the greenhouse in November 1998 for regeneration in field cages in the summer of 1999.

Seventeen accessions of Angelica were germinated by David Kovach, fifteen of which were found to be inviable. Eighteen accessions of Angelica and one accession of Eryngium were inactivated.

Characterization/taxonomy:

There are a number of misidentifications in this sitecrop. Herbarium specimens will be prepared when accessions are regenerated and sent to Beltsville, MD for reidentification, if the Horticulturist and I are unable to identify the accessions ourselves.

Work continues on updating passport data for collector and donor records, secondary identifiers, and habitat information, including attempts to determine latitude and longitude for collection sites.

Conclusions:

Training:

March 12, I attended "Franklin Time Quest Day Planner Seminar" in Ames, IA.

Mandatory dust mask and tractor safety training.

Meetings attended:

July 12-15, I attended the following meetings held in conjunction with the American Society for Horticultural Science (ASHS), in Charlotte, NC:

- Root and Bulb Vegetable Crop Germplasm Committee
- Cucurbit Genetics Cooperative
- Squash Breeders Working Group
- Vegetable Breeders Working Group
- Working Group Chairs and Chairs-elect Meeting
- Genetics and Germplasm Working Group (I served as Chair of this working group for 1998, and will also serve as Chair in 1999.)

July 20-24, I participated in the meetings, tours and activities associated with the 1998 Plant Genetic Resource Management Meetings in Ames, IA for the NCRPIS's 50th anniversary celebration.

-August 24-25, Attended the 27th International Carrot Conference, Madison, WI. Presented a poster: Daucus and Apiaceae in the USDA Germplasm Collection, Kathleen R. Reitsma and Mark P. Widrlechner, North Central Regional Plant Introduction Station, Iowa State University, Ames, IA.

-August 26, 16 people (representing six countries) attending the 27th International Carrot Conference in Madison, Wisconsin traveled to Ames, IA to tour our facilities and a special Daucus demonstration garden.

November 30-December 4, I attended the following meetings held in conjunction with the Cucurbitaceae '98 Conference in Pacific Grove, CA:

- Cucurbit Genetics Cooperative, Business Meeting
- Cucurbit Crop Germplasm Committee
- National Muskmelon Research Group, Business Meeting
- Squash Breeders, Business Meeting
- Pickling Cucumber Improvement Committee, Business Meeting

I am serving or have served on the following committees:

- Curators' Committee (Ongoing)
- Archive Committee (Ongoing)
- Participated in interviews of Research Leader candidates (August)
- Vegetable Field/Lab Technician Search Committee (July)

H. Crucifers and Grasses (R. Luhman)

Acquisition:

Thirty-eight accessions of Brassica, 153 accessions of miscellaneous crucifers, three accessions of Echinochloa, four accessions of Setaria, four accessions of miscellaneous grasses, and 14 accessions of wild Linum were received and logged into the GRIN database in 1998.

Maintenance and distribution:

Available for distribution:

About 62% (down 2% from 1997) of the accessions that I maintain have Plant Introduction numbers and about 58% (identical to 1997) are available for distribution (Table 1). One-thousand three-hundred thirty-one Brassica accessions received from the National Center for Agricultural Utilization Research (NCAUR) in Peoria, IL in 1988 lack Plant Introduction numbers. Oil analyses for these accessions have now been received from the NCAUR. We will use this information along with 1998 field notes to make decisions about formal entry of these accessions into the NPGS.

Table 1: NCRPIS Crucifer and Millet Germplasm.

GENUS	TOTAL ACCESSIONS	ACCESSIONS WITH PI NUMBERS	PERCENT ACCESSIONS WITH PI NUMBERS	AVAILABLE ACCESSIONS	PERCENT AVAILABLE ACCESSIONS
<u>Brassica</u>	3179	1573	49	1558	49
<u>Echinochloa</u>	224	160	71	141	63
<u>Linum</u>	147	75	51	16	11
<u>Panicum</u>	982	911	93	857	87
<u>Setaria</u>	993	950	96	856	86
Other Crucifers	1169	525	45	587	50
Other Grasses	116	43	37	13	11
TOTAL	6810	4237	62	4028	59

Distribution:

In 1998 we distributed seed from ten of the 33 genera that I curate. Thirty-two domestic and 27 foreign orders were shipped, representing 765 and 1332 packets of seed, respectively (Table 2).

Table 2: 1998 Distributions.

GENUS	TOTAL ACCESSIONS	DOMESTIC PACKETS DISTRIBUTED	FOREIGN PACKETS DISTRIBUTED	DOMESTIC ACCESSIONS DISTRIBUTED	FOREIGN ACCESSIONS DISTRIBUTED
<u>Brassica</u>	3179	634	926	553	756
<u>Echinochloa</u>	224	49	3	46	3
<u>Linum</u>	147	1	18	1	18
<u>Panicum</u>	982	15	19	15	19
<u>Setaria</u>	993	53	4	48	4
Other Crucifers	1169	43	360	41	287
Other Grasses	116	9	2	8	2
TOTAL	6810	804	1332	712	1089

GENUS	TOTAL ACCESSIONS	TOTAL PACKETS DISTRIBUTED	TOTAL ACCESSIONS DISTRIBUTED	PERCENT ACCESSIONS DISTRIBUTED
<u>Brassica</u>	3179	1560	1201	38
<u>Echinochloa</u>	224	52	46	21
<u>Linum</u>	147	19	19	13
<u>Panicum</u>	982	34	34	3
<u>Setaria</u>	993	57	51	5
Other Crucifers	1169	403	303	26
Other Grasses	116	11	9	8
TOTAL	6810	2136	1663	24

Backed Up:

Currently, about 84% of the accessions that I maintain are backed up at the National Seed Storage Laboratory (Table 3).

Table 3: Numbers of Accessions backed up at the National Seed Storage Laboratory.

GENUS	TOTAL ACCESSIONS	ACCESSIONS BACKED UP	PERCENT BACKED UP	# BACKED UP IN 1998
<u>Brassica</u>	3179	3054	96	57
<u>Echinochloa</u>	224	166	74	0
<u>Linum</u>	147	3	2	0
<u>Panicum</u>	982	874	89	0
<u>Setaria</u>	993	912	92	0
Other Crucifers	1169	679	58	28
Other Grasses	116	37	32	1
TOTAL	6810	5725	84	86

Regeneration:

During 1998 we attempted to regenerate 131 accessions (Table 4) and harvested seed from 89 of those accessions. Sixteen miscellaneous crucifer and three Setaria accessions failed to germinate and will be considered for the inactive file. Eighteen accessions were left in the field to overwinter, including 12 accessions that never flowered, four accessions that flowered but did not reach 50% flower or did not set seed, and two accessions that flowered and were harvested. Seven accessions did not survive the field season. Three harvested accessions produced no viable seed.

Table 4: 1998 Regeneration.

GENUS	ATTEMPTED REGENERATIONS (ACCESSIONS)	HARVESTED REGENERATIONS (ACCESSIONS)
<u>Brassica</u>	15	13
<u>Echinochloa</u>	5	5
<u>Linum</u>	1	1
<u>Panicum</u>	0	0
<u>Setaria</u>	10	7
Other Crucifers	100	63
Other Grasses	0	0
Total	131	89

Germination:

Table 5 indicates that 965 germinations (956 accessions) were completed during 1998.

TABLE 5: Germinations performed in 1998.

GENUS	TOTAL ACCESSIONS	GERMINATION TESTS	ACCESSIONS GERMINATED	PERCENT ACCESSIONS GERMINATED
<u>Brassica</u>	3179	72	63	2
<u>Echinochloa</u>	224	0	0	0
<u>Linum</u>	147	0	0	0
<u>Panicum</u>	982	0	0	0
<u>Setaria</u>	993	871	871	88
Other Crucifers	1169	22	22	2
Other Grasses	116	0	0	0
Total	6810	965	956	14

Characterization/taxonomy:

Table 6 shows a breakdown of the observations recorded for the 1998 Brassicaceae regeneration.

Table 6: 1998 Brassicaceae observations:

Observation	Number of Observations
First flower	97
Mid flower	86
Last flower	87
Corolla color	84
Silique arrangement	82
Plant height	87
Harvest dates	101
Number of plants harvested	86
Silique length	79
Silique diameter	79
Silique beak length	56
Locules per silique	74
Seed color	79
Number of seeds per silique	79
Total	1156

One-thousand three-hundred thirty accessions of Brassica from India supplied by the NCAUR were grown in the field for observations. The observations recorded included: Plant heights-1142 observations, First flower-506 observations, mid flower-1057 observations, and last flower-1026 observations. These observation data will be used to help determine how much of this material should be formally entered into GRIN as Plant Introductions.

Seven-thousand two-hundred sixty-one Brassica observations (data for 1766 accessions) and 994 crucifer observations (data for 199 accessions) were entered into GRIN (Table 7).

Table 7: Observations entered into GRIN during 1998.

GENUS	TOTAL ACCESSIONS	NUMBER OF OBSERVATIONS ENTERED	NUMBER OF ACCESSIONS WITH OBSERVATIONS ENTERED	PERCENT OF ACCESSIONS WITH OBSERVATIONS ENTERED
<u>Brassica</u>	3179	7261	1766	56
<u>Echinochloa</u>	224	0	0	0
<u>Linum</u>	147	0	0	0
<u>Panicum</u>	982	0	0	0
<u>Setaria</u>	993	0	0	0
Other Crucifers	1169	994	199	9
Other Grasses	116	0	0	0
Total	6810	8255	1965	29

Forty-one brassicaceae accessions were re-identified in 1998. These reidentifications were based on herbarium specimens that were identified by Neil Harriman, University of Wisconsin, Oshkosh. The new taxonomic identifications were of the species Brassica tournefortii (four accessions), Brassica rapa (four accessions) and Sinapis arvensis (33 accessions).

Meetings attended:

Visual Basic Training (May 1998)
 Crucifer Genetics Workshop (October 1998)
 American Society of Agronomy (October 1998)

Other Activities:

1. I estimate that 40% of my time has been spent supporting the computer project at the NCRPIS. Various duties included:
 - A. Supervised a Computer Intern
 - B. Switched our server software from NetWare 4.11 to Microsoft Windows NT
 - C. Assisted with installation of backup system software and hardware
 - D. Installed software for NCRPIS workstations
 - E. Server day-to-day maintenance

2. I served on the following committees:
 - A. Computer Committee
 - B. Communications Committee
 - C. Curator Committee
 - D. Extension Committee
 - E. Research Leader search committee
 - F. Entomologist search committee

Future Activities:

The 1998 crucifer regenerations will be stored.

Further work will be done on the Brassica accessions received from the NCAUR in 1988.

The 1998 field regeneration will include ca. 150 Brassicaceae accessions.

I will check the Brassica and millet Plant Introduction records to ensure that the appropriate and proper information is entered into GRIN. Additionally, I will be working closely with the Crop Germplasm Committees to determine what additional material should be included in the collections.

Computer-related tasks as needed.

I. Amaranthus, Celosia, Chenopodium, Coronilla, Dalea, Galega, Marina, Melilotus, Perilla and Spinacia (D. Brenner)

AMARANTHUS: 3305 accessions.

Acquisition and inactivation:

Eighty accessions were acquired, and five accessions were inactivated or merged due to duplication within the collection.

Maintenance and distribution:

1998	#	% of collection
Accessions available for distribution	2436	72
Seed orders	63	NA
Cooperators that received seed orders	57	NA
Packets distributed	2746	NA
Accessions distributed	1800	53
Accessions backed-up at NSSL	2793	83
Accessions planted to regenerate	150	4
Accessions germination tested in 1998	263	8

Three-hundred five accessions were sent for back-up at the NSSL.

One-hundred twenty-four accessions received new PI numbers.

Characterization/taxonomy/evaluation:

Nine-thousand seven-hundred twenty-four observations were loaded into GRIN where the data are publicly available. These data include updated seed weight data from the non-public part of GRIN, and flower color data.

Two-hundred thirty-eight accessions were re-identified. Most of the identifications were based on grow-outs during seed regenerations. Four-hundred twenty-three (13%) of the Amaranthus accessions remain identified only to genus.

The staff of the GRIN Database Management have begun to include photographic images of Amaranthus accessions in the public part of GRIN. Ames 5649 is an example. These images are from a large photographic slide collection that was begun in late 1980's.

GRIN data on latitudes and other accession information, that had been deleted in error in the mid 1990's, for about 200 accessions, were recovered from an old disk, with help from Mark Millard and were re-loaded into GRIN.

Enhancement and/or utilization:

The development of a non-shattering grain line has continued with male-sterility assisted backcrossing of non-shattering into the variety 'Plainsman'.

The 1998 observation field planting included many ornamental and allied accessions. In this un-replicated planting, PI 599683, a wild-type A. tricolor, seemed to be more resistant to Phomopsis (identified by Dr. Charles Block) than other A. tricolor accessions in the same plot. Dr. Block has since expanded his Phomopsis screening research. Finding resistance to the pathogen could aid in the development of improved ornamental and vegetable A. tricolor cultivars.

CELOSIA and **GOMPHRENA**: 50 accessions.

Acquisition: Fourteen new accessions from wild populations were donated by staff at CENRAD in Nigeria.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	12	34
Seed orders	3	NA
Cooperators that received seed orders	3	NA
Packets distributed	6	NA
Accessions distributed	5	6
Accessions backed-up at NSSL	14	40
Accessions planted for regeneration	3	9
Accessions germination tested in 1998	18	51

One accession was sent for back-up at the NSSL.

Two accessions received new PI numbers.

The Gomphrena accessions will be distributed by the NCRPIS, and also by the NSSL, as part of a virus indexing collection which is housed there.

CHENOPODIUM: 230 accessions.

Acquisition and inactivation:

Five accessions were acquired.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	165	72
Seed orders	13	NA
Cooperators that received seed orders	12	NA
Packets distributed	121	NA
Accessions distributed	92	40
Accessions backed-up at NSSL	168	73
Accessions planted for regeneration in 1998	1	.4
Accessions germination tested in 1998	2	.8

Two accessions were sent for backup at the NSSL.

Five accessions received new PI numbers.

CORONILLA, DALEA, GALEGA, MARINA, and SECURIGERA: 223 accessions.

Acquisition:

Two new accessions were acquired. One accession was inactivated.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	93	42
Seed orders	6	NA
Cooperators that received seed orders	5	NA
Packets distributed	34	NA
Accessions distributed	16	7
Accessions backed-up at NSSL	107	48
Accessions planted in 1998	9	4
Accessions germination tested in 1998	0	0

No accessions were sent for back-up at the NSSL.

Characterization/taxonomy/evaluation:

One accession was re-identified taxonomically.

MELILOTUS: 908 accessions.

Acquisition:

Seven accessions were acquired, and five accessions were inactivated or merged due to duplication within the collection.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	659	73
Seed orders	11	NA
Cooperators that received seed orders	6	NA
Packets distributed	213	NA
Accessions distributed	154	17
Accessions backed-up at NSSL	720	79
Accessions planted in 1998	24	3
Accessions germination tested in 1998	0	0

One accessions was sent for back-up at NSSL.

Four accessions received new PI numbers.

Characterization/taxonomy/evaluation:

Eleven accession were re-identified.

PERILLA: 21 accessions.

Acquisition:

None was acquired.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	20	95
Seed orders	1	NA
Cooperators that received seed orders	1	NA
Packets distributed	3	NA
Accessions distributed	3	14
Accessions backed-up at NSSL	20	95
Accessions regenerated in 1998	0	0
Accessions germination tested in 1998	1	5

One accession was sent for back up at NSSL.

One new PI number was assigned.

A new book on Perilla (Yu, He-Ci, Kenichi Kosuna, and Megumi Haga (eds). 1997. Perilla: The genus Perilla. Harwood Academic Publishers, Amsterdam) makes information on the crop more available than ever before.

SPINACIA: 378 accessions.

Acquisition:

No accessions were acquired.

Maintenance and distribution:

1998	#	% of total number of accessions
Accessions available for distribution	291	77
Seed orders	14	NA
Cooperators that received seed orders	12	NA
Packets distributed	1395	NA
Accessions distributed	309	82
Accessions backed-up at NSSL	333	88
Accessions planted in 1998	94	25
Accessions germination tested in 1998	173	46

Ninety-four accessions were sent to Mr. Matt Linder of the Sakata Seed Company in Salinas, CA for regeneration using facilities and labor donated without charge by the Sakata Seed Company and by Dr. Ed Ryder of the USDA-ARS.

Twenty-eight accessions were sent for back-up at NSSL.

Sixteen accessions received new PI numbers.

The recent high demand for seeds in this collection has depleted the inventory so that approximately 130 accessions are now below the critical distribution levels and have become unavailable.

Plans:

Cooperation with the seed regeneration group in Salinas, CA, should be continued.

Enhancement and/or utilization:

Dr. T. Morelock and collaborators at the University of Arkansas found a rare resistance to a new strain of Blue Mold in PI 604780.

Professional meetings attended:

15th Trifolium Conference, Madison, WI, June 10-12, 1998.

Amaranth Institute, Sidney, NE, August 7-8, 1998.

15th International Lettuce Conference and Leafy Vegetable Crops Workshop. Atlantic City, NJ, September 24-26, 1998.

Agronomy Society of America, Baltimore, MD, October 18-22, 1998.

Publications and presentations:

Brenner, D.M. and M.P. Widrlechner. 1998. Amaranthus seed regeneration in plastic tents in greenhouses. FAO/IPGRI Plant Genetic Resources Newsletter 116:1-4.

Yang, S.M. and D. Brenner. 1998. Virulence of Myrothecium verrucaria on species of amaranth (Amaranthus). WSSA Abstracts. 38:43.

April 8, 1998 Plants and People (Bot. 304) class lecture on collecting germplasm in Pakistan. Iowa State University.

August 7, 1998 Breeding for non-shattering amaranths, oral presentation at the Amaranth Institute annual meeting.

Miscellaneous Progress:

I was elected to the Board of the Amaranth Institute, a not-for-profit foundation. After the 1998 meeting, I became President of the Institute for a one-year term.

I prepared three written Progress Reports for Crop Germplasm Committees.

I rescued 728 old germination records that were in key-entry format from the early 1990's, and loaded them into GRIN here or sent them to the Beta project at W6 for GRIN entry.

Acknowledgements:

The students on my crew, Todd Steinlage and Debra Stansberry, helped me through the summer. After they left I have been helped by Antonia Agua.

J. Sunflower and Miscellaneous Asters (M. Brothers, I. Larsen)

Acquisition:

In 1998, 17 Helianthus accessions (ten cultivated Helianthus annuus and seven wild Helianthus species) were received and logged into GRIN.

The cultivated flax (Linum usitatissimum) collection (2803 accessions) was transferred to the NCRPIS in 1998.

Six new miscellaneous asters were received and logged into GRIN: three Vernonia, one Heliopsis, and two unidentified Asteraceae.

Maintenance and distribution:

The status of the Helianthus collection is summarized in Table 1. Permanent PI numbers were assigned to two Helianthus accessions in 1998.

The flax collection continues to be inventoried and repackaged into our uniform storage containers. As of December 31, 1998, 544 accessions (20% of the collection) have been processed.

Eighty-one of the 294 miscellaneous asters (28%) are available for distribution. Sixty-five accessions (22% of the collection) have PI numbers.

#/% distributed-- Sixty-four separate Helianthus germplasm requests (20 foreign and 44 domestic) were received and 2445 packets representing 1360 accessions (37% of the collection) were distributed. Compared to 1997, Helianthus germplasm requests decreased 2% and packet distribution decreased 3%.

In 1998 we received six separate flax requests (four domestic and two foreign) and 46 packets were distributed.

Five separate requests for genera in the miscellaneous asters collection were also received (Vernonia - 3 requests, 127 packets distributed; Arctium - 2 requests, 2 packets distributed).

In addition to germplasm requests, 19 information requests were received for the crops curated.

#/% duplicated at NSSL- Two-hundred sixteen Helianthus accessions were sent to NSSL; 65% (2424 accessions) of the total collection is now duplicated.

Almost the entire cultivated flax collection (2801 of 2803 accessions) is duplicated at NSSL.

Fifty-seven miscellaneous asters (20% of the collection) are duplicated at NSSL.

#/% regenerated--1998 greenhouse regenerations were conducted on 17 cultivated H. annuus accessions with limited original seed quantity or poor seed quality. Hand-pollinated, field increases were attempted on 101 cultivated accessions. Six additional cultivated H. annuus accessions were insect-pollinated in cages. One-hundred seventy-one wild, annual accessions were germinated for regeneration and 102 of these accessions were transplanted into cages for controlled pollinations. Nine perennial Helianthus accessions were germinated and six were transplanted to the field; five perennial accessions were caged for controlled pollinations. Tubers were dug from 12 H. tuberosus accessions and 17 perennial Helianthus sp. plots were relocated.

The past three years we have seen a dramatic increase in the incidence of downy mildew [Plasmopara halstedii (Farl.) Berl. and deToni] infected cultivated sunflower plants. In 1998, cultivated sunflower seeds were treated with Allegiance (metalaxyl) prior to direct seeding. No downy mildew infected plants were observed in the field. Due to the cool, wet weather following seeding there were several plants with apical chlorosis [Pseudomonas syringae pv. tagetis (Hellmers) Young, Dye and Wilkie]. The plants grew out of the apical chlorosis as the weather warmed.

Flax was not grown for regeneration in 1998. Sixteen accessions representing various plant types were grown for observation purposes.

1998 field regenerations were attempted on ten Vernonia accessions. Seven accessions did not germinate and the remaining three accessions were transplanted into pollination cages. Seed was harvested from one accession.

#/% tested for germinability/viability--Three hundred seventy-one Helianthus viability tests were conducted in 1998.

Characterization/taxonomy/evaluation:

Plant and achene characterization data were recorded for all Helianthus increases. Descriptor definitions and GRIN data were reviewed and corrected when necessary. Data for 100-seed weight were moved into the '100SEEDWGT' sunflower descriptor and can now be queried by users accessing the data through the internet or PCGRIN.

Ten accessions of Helianthus debilis ssp. debilis were planted and evaluated by M. Brothers and M. Widrlechner (station Horticulturist) for their potential as a bedding plant. The promising accessions will be evaluated again in 1999.

Five Helianthus accessions were inactivated and ten accessions were re-identified (nine to subspecies and one to a different Helianthus species).

In 1998, Helianthus seed was distributed to evaluate for host-plant resistance to Albugo, rust, downy mildew, Sclerotinia, and sunflower moth. Data sets were received and entered into GRIN for percentage seed oil and Albugo resistance.

In 1998, 31,464 observations were added to GRIN for 3094 Helianthus accessions (83% of the collection).

Professional development (I. Larsen):

Training activities:

Introduction to Supervision, Feb. 23-27, 1998.

Maintained pesticide applicators certification in the following categories:

- 1A - weed control
- 1B - insect control
- 1D - fruit and vegetable pest control
- 3G - greenhouse pest management

USDA Civil Rights Training, July 8, 1998 (Ames, IA).

Meetings/Seminars attended:

Plant Science Lectures, Jan. 8-9, 1998 (Ames, IA).

The 20th Sunflower Research Workshop, Jan. 15-16, 1998 (Fargo, ND).

Association of Laboratory Technicians Symposium, Feb. 10, 1998 (Ames, IA).

Sunflower CGC Meeting, July 20, 1998 (Ames, IA).

NCRPIS 50th Anniversary Celebration July 20-23, 1998.

Served on the Field Lab Technician II (Vegetable Crops) selection committee.

Significant accomplishment:

Adapted an automated seed dispenser for conducting wild Helianthus germination tests; as a result the backlog of initial germination tests for the 1996 wild Helianthus increases has been eliminated.

Professional development (M. Brothers):

Training:

Earned pesticide applicators certification (Apr. 17, 1998) in the following categories:

- 1A - weed control
- 1B - insect control
- 4 - seed treatment

USDA Civil Rights Training, June 11, 1998 (Ames, IA).

Commercial Agricultural Pesticide Applicators Training, Dec. 9, 1998 (Ames, IA).

Meetings/Seminars attended:

Plant Science Lectures, Jan. 8, 1998 (Ames, IA).

The 20th Sunflower Research Workshop, Jan. 15-16, 1998 (Fargo, ND).

57th Flax Institute of the United States, Mar. 26-27, 1998 (Fargo, ND).

Hosted and attended the Sunflower CGC Meeting, July 20, 1998 (Ames, IA).

Hosted and attended the PGOC In Situ Sub-Committee Meeting, July 22, 1998 (Ames, IA).

Regional Technical Advisory committee, NCRPIS 50th Anniversary Celebration, PGOC, July 20-23, 1998 (Ames, IA).

Served on the following: Extension committee, Viability committee, 50th Anniversary Celebration committee, Curators committee, and two NCRPIS personnel selection committees.

Presentations or seminars:

Discussed sunflower curation with numerous groups/individuals who toured the NCRPIS facilities.

Future plans:

Regenerate 20 cultivated Helianthus accessions in the greenhouse and conduct hand-pollinations of 50 cultivated Helianthus accessions and caged increases of 110 wild Helianthus accessions.

In cooperation with Dr. Jim Hammond, North Dakota State University, regenerate 50 flax accessions in North Dakota. The accessions will also be grown at Ames, IA to determine the feasibility of regenerating flax at our station.

Conduct an isozyme evaluation of the 112 cultivated sunflower accessions identified as the cultivated core subset. In addition, 112 randomly selected accessions will also be evaluated to determine the validity of the core and to elucidate further inter- and intra-cluster relationships.

Continue to review Ames-numbered Helianthus accessions for possible assignment of permanent PI numbers.

Table 1. Status of the Helianthus collection (Dec. 31, 1998).

	Accessions	Available accessions		Accessions with PI numbers	
		#	%	#	%
Cultivated accessions	1600	1282	80	997	62
Wild accessions	2120	877	41	1599	75
Total collection	3720	2159	58	2596	70

K. Germplasm management of Cuphea and other new crop species (J.W. Van Roekel)

Cuphea

Acquisition:

Seven accessions of Cuphea were added to the collection.

Maintenance and distribution:

Number and percentage of total number of 805 Cuphea accessions.

1998	# of accessions	% of accessions in collection
Available	450	56
Distributed	16	2
Duplicated at NSSL	537*	67
Regenerated	96**	12
Germinated	348***	na

* Of this total, 34 accessions were sent to NSSL in 1998.

** Accessions grown for seed increase in 1998; seed is being processed at the time of this report.

*** Lots selected for germination testing. Testing will continue into 1999.

Characterization/taxonomy:

Significant progress: Characterization data for 1998-increased accessions have been collected.

The 1998 field-increased accessions have been photographed, and accessions being maintained in the greenhouse will be photographed. Characterization data for the accessions maintained in the greenhouse will be recorded when the plants have matured.

Evaluation/Enhancement:

Field evaluation for possible ornamental use of accessions being regenerated will continue to be performed by Dr. M. Widrlechner.

Collaborated with Craig Abel in an evaluation of pollinators. Continuation of a randomized complete-block experiment with four replications testing three pollinators on two Cuphea spp. was attempted. Due to poor plant stand because of weather conditions and severe insect infestation and to the low supply of some pollinators, the trial was abandoned for this season.

Euphorbia

Acquisition:

One-hundred sixteen accessions of Euphorbia were added to the collection.

Maintenance and distribution:

Number and percentage of total number of 203 Euphorbia accessions.

1998	# of accessions	% of accessions in collection
Available	35	17
Distributed	0	0
Duplicated at NSSL	28	14
Regenerated	48*	24
Germinated	0	0

* Accessions grown for seed increase in 1998; seed is being processed at the time of this report.

Significant progress: In 1998, 49 accessions were germinated for increase.

Characterization/taxonomy:

None.

Evaluation/Enhancement:

None.

Meetings attended:

New Crops and New Uses Symposium, Phoenix, AZ.

New Crops CGC, Phoenix, AZ.

NC-7 Regional Technical Advisory Committee meeting, Ames, IA.

EEO activities:

Black History Month presentations, Feb. 12, 19, and 26, 1998.

Disabilities awareness month presentation by Suzy Mannella, Consultant for The Deaf Services Commission of Iowa, Oct. 7, 1998.

Understanding the Americans with Disabilities Act, Oct. 21, 1998.

Disabilities video presentations, "Movin' On," and "Movin' On Too," Oct. 22, 1998.

Training:

Pesticide Applicator Continuing Education, Cat. 1A, 1B, and 10, Feb. 18, 1998.

Tractor Safety Training, Feb. 24, 1998.

Completed Agronomy 338, Seed Science, Iowa State University, May, 1998.

Civil Rights Training: Introduction to Civil Rights-Sensitivity/Diversity and Civil Rights/EEO Laws and Regulations, June 11, 1998.

Completed Agronomy 421, Plant Breeding, Dec. 1998.

Completed instruction and training in First Aid and CPR, Dec. 16, 1998.

Extension/Outreach:

Gave presentations to fourth grade classes on beekeeping, honeybees, their value in pollination, and their use and importance at NCRPIS.

Representative for NCRPIS at the Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS) Conference and Career Fair, Apr. 1998.

Gave tours of NCRPIS to several groups.

Other activities:

Served on the search committee for the USDA Entomologist.

Plans:

While storing seed from the 1998 harvest, I will be determining those Ames accessions that can be assigned PI numbers and backed up at NSSL, based on the amount of seed harvested. Accessions which have not had germination testing within the last five years will be scheduled for testing.

I am currently enrolled in a weed science course, Agronomy 317, and Crop Quality, Utilization, and Evaluation, Agronomy 220 at Iowa State University. These classes will increase my knowledge and ability to efficiently grow, harvest, process, and store seed.

L. Seed Research, Seed De-treatment, and Computer Application Development (D. Kovach)**Seed Research:**

Research was begun this year on Angelica, Ocimum, and a large-seeded corn landrace, Cuzco.

Angelica plants were started in the greenhouse in order to produce new seed to study its seed biology. Angelica is a biennial plant, therefore seed production is not expected until the latter part of 1999.

Ocimum seed germination experiments were begun in the latter part of 1998. This genus is being studied in order to determine the best way to break seed dormancy. Preliminary results from these experiments have been favorable, yet more experiments will be conducted in 1999 to understand this seed's germination requirements even better.

Research was also begun on several lots of two accessions of Zea mays subsp. mays collected from Cuzco, Peru. One accession was collected in 1958 and showed very poor viability. This seed was treated with methyl bromide when it was first introduced into the NPGS, and was later dusted with DDT when stored at NCRPIS. Both of these treatments probably contributed to its low viability. This accession has been marked for research purposes only and will be the subject of several experiments in hopes of finding a method of recovering low viability seed lots. The other accession was collected around 1984 and has fairly good viability, about 90%. Both lots were germinated and seedlings are being cultivated in a greenhouse for seed increase by the corn crew. Harvest of this seed should occur in the second quarter of 1999. A small portion of the seed from this harvest, as well as the 1984 seed, can serve as checks if a recovery method is found for the 1958 accession.

Manuscript drafts describing a series of experiments testing dormancy-breaking techniques for Cuphea seed were initiated and revised in cooperation with Dr. Mark Widrlechner, the station's Horticulturist, and has been peer-reviewed by three scientists involved in seed research or Cuphea breeding.

Seed De-treatment:

Progress in the design and construction of a 'de-treater' of chemically treated seed was initially hampered by lack of time for the project. The idea of having Iowa State University agricultural engineering and/or agricultural systems technology students work on this project was then considered and proposed to Drs. Steven Mickelson and Manjit Misra of the Agricultural and Biosystems Engineering Department. They were both enthusiastic about the project and initial meetings discussed several ways to approach this. It was agreed that students will develop appropriate designs in 1999.

Computer Application Development:

This past year has led to the development of several more germination data preparation and entry forms, several label-making forms and reports for individuals to print their own barcode and other types of labels, one order summary form and report, and the beginning of a form to assist in determining which accessions need germination tests and/or regeneration. Forms were tested by station personnel and changes and corrections were implemented where needed.

In addition, Oracle 8 Enterprise Edition was purchased and will be installed on the station's server early in 1999.

Committees:

ARS Ames Area Civil Rights Committee member and responsible for AAACRAC website.

Seminars, Trips, and Other Training:

Fred Pryor Seminar: How to manage multiple projects, meet deadlines, and achieve objectives. Jan. 15, 1998. Des Moines, IA.

Fred Pryor Seminar: How to manage conflict, anger, and emotion. Jan. 30, 1998. Des Moines, IA.

Fred Pryor Seminar: How to become a great communicator. Mar. 2, 1998. Des Moines, IA.

USDA Civil Rights Training: Introduction to civil rights. June 18, 1998. Ames, IA.

Fred Pryor Seminar (free): Evelyn Woods reading dynamics for business professionals. June 22, 1998. Des Moines, IA.

M. Information Management: Germplasm Program Assistant (R. Stebbins)

Germplasm Collections

Acquisition:

The NCRPIS acquired a total of 5619 new accessions in 1998. Of these new accessions, 3011 were received from within the National Plant Germplasm System (NPGS). The majority of these came from the Northern Crops Research Laboratory in Fargo, ND, the National Seed Storage Laboratory (NSSL) in Fort Collins, CO, and the Plant Genetic Resources Unit (PGRU) in Geneva, NY. Included in this group were 2801 accessions of Linum usitatissimum and 59 accessions Zea mays subsp. mays.

The remaining 2608 accessions were received from outside the NPGS. Included in this group were 1715 accessions of Zea mays subsp. mays, 210 accessions of ornamentals, 148 accessions of umbels, 133 accessions of crucifers, and 106 accessions of Euphorbia. As new accessions are recorded on the Germplasm Resources Information Network (GRIN), an effort is made to include as much passport information as possible. Typical passport information would include a source history, cooperator records, collection site description, pedigree, secondary identifiers, and any other pertinent information provided by the donor.

Maintenance:

Assistance with curatorial management was provided by processing requests for taxonomic re-identifications and nominations of accessions to the inactive file. In total, 345 accessions received taxonomic re-identifications. Among these were 238 accessions of Amaranthus and 33 accessions of crucifers. Also, 168 accessions were nominated for inactivation. The inactivations included 86 accessions of ornamentals.

Additionally, 381 accessions were assigned PI numbers. Included in this group were 159 accessions of Cucumis sativus, 124 accessions of Amaranthus, and 35 accessions of ornamentals.

Projects:

One of the first steps to obtaining a PI number for an accession is to proof the passport information for accuracy and completeness. Proofing passport information is an ongoing project that is secondary to logging in new material. This project involves locating paper files of accession information, corresponding with collectors and donors, searches of the Internet, and researching maps and GIS databases.

One of my projects involved working with the Horticulturist to prepare 44 accessions of ornamentals and mints for PI number assignment. This required printing accession reports for the curator to proof. Any errors in GRIN were corrected and new reports were printed for a final check before requesting PI numbers.

I updated cooperator records for 34 accessions Cucurbita pepo. These cooperator records were absent or incomplete in GRIN, but were updated after researching and locating the cooperators in Seed Savers Exchange catalogs.

I coordinated communications with 16 foreign seed banks to request seed. The

requests covered many different crops at NCRPIS.

Twenty-three new accessions of Brassica were created, by separating inventory lots which had been taxonomically identified as different from the original.

I worked with curators and seed storage personnel to develop new inventory action codes. These new action codes should simplify the labeling and tracking of procedures, such as renumbering due to duplication and renumbering resulting from PI number assignment.

I served as secretary of the Computer Committee for the entire year. The committee is responsible for maintaining a modern and efficient computer system which includes budgeting, planning, repairing, and purchasing.

On a few occasions, I processed outgoing seed orders. I have received training to accomplish this task when the staff member responsible for this is absent. Twice, this also involved assisting seed storage personnel with the actual filling of seed packets.

In July, one other staff member and myself made a special delivery to the Plant Genetic Resources Unit (PGRU) in Geneva, NY. We transferred the entire Asparagus collection to their site. This involved driving a 15-passenger van filled with seed and plants of all sizes on a four-day trip. The friendly staff of the PGRU rewarded our efforts with a tour of their facilities.

I volunteered to function as the Combined Federal Campaign (CFC) canvasser for the NCRPIS. The duties included the distribution and collection of campaign materials to all federal employees at the station.

Training received:

In January, one other staff member and myself attended a short course at Iowa State University on the basics of using ArcView GIS (geographic information system) software. This is a powerful software package. It can be used to record collection trip information or locate latitudes and longitudes for donated germplasm.

In March, I joined two other staff members at a seminar where we learned to use the Franklin Covey day planner system. We were supplied new day planners and shown how their use would improve our productivity and efficiency. I had never used a day planner before and cannot understand how I survived without one.

I learned how to use an Oracle form, developed by David Kovach, to print barcode labels directly from GRIN. The form is extremely user-friendly and required little training. Compared to the old system, the Oracle form is much faster, more accurate, and more reliable.

Conclusions:

Compared to 1997, new accessions received at NCRPIS were up by 4851 in 1998, an increase of 632%. In maintenance areas, re-identifications were down by 21%, nominations to the inactive file were down by 28%, and PI number assignments were up by 17% compared to their 1997 levels.

1998 was an exceptional year for new acquisitions. I do not foresee this trend to continue in 1999. Unfortunately, some of the larger shipments received in 1998 will keep me and seed storage personnel busy well into 1999.

There were significant improvements in technology at NCRPIS in 1998 which improved overall efficiency. These improvements included an all new computer system, a newer flatbed scanner, and Oracle forms for printing barcode labels.

I plan to begin attending classes at Iowa State University later this year. The subjects will include statistics, library science, and agronomy. I have entered the developmental phase of my position and will undergo formal training in preparation for the next level of advancement.

N. Order processing (L. Minor)

During 1998, there were 772 orders entered into GRIN. A total of 16,132 packets was distributed to requestors and evaluators throughout the world. Of the total packets distributed, 42% of these were sent to foreign requestors.

The first mailing of the revised Initial Performance Report went out in January. Reports continued to go out on a monthly basis throughout the year to those cooperators who had acknowledged receipt of their requested germplasm during 1997. We distributed 331 reports in 1998. By the end of the year, 230 had been returned. The Summary Accession Performance Report form went out to 106 cooperators requesting them. All others are scheduled to be sent at a later date set by the cooperator.

From time to time, it becomes necessary for us to duplicate our efforts. Such was the case in November when all available spinach accessions (292) were sent to Cornell University in response to a request. Notice was received on November 17 that our shipment had arrived, but the box had been crushed and the contents were damp. The box was dry suggesting that someone had tried to dry the package by heating it. Because of our concern that seed quality may have been compromised, the entire order was duplicated, wrapped in watertight packaging and resent to the requestor.

Another example occurred on November 12 when a melon order of 183 accessions left Beltsville bound for Japan. We were notified by the requestor on December 8 that the seed had not arrived so we checked with Beltsville to see if the package could be traced. We were informed that tracking the order was not possible since it was not sent Express Mail International. We had no alternative but to duplicate the order and, on December 17, the seed was shipped from Beltsville via Express Mail International. On December 24, word was received that the package had arrived safely.

Committees:

Accession Performance Report
Archives
Courtesy

Training:

Franklin Time Quest Day Planner Refresher, March 12, 1998

O. Seed Storage (L. Burke)

In 1998, 3505 seed lots were stored, including both newly received lots and those regenerated either at Ames or at remote sites. In the process of storing, 563 new inventory records were created through bulking various lots and splitting original lots for distribution. Inventories of 6453 lots were reviewed to insure correct seed amounts. Re-inventorying of the maize distribution samples continues. We began with the first jar in the collection and will continue bay by bay. New labels are printed for these jars.

In 1998, 3346 original packets for the umbel, spinach, chicory, wild flax, Ocimum and Euphorbia collections were moved into the -20° C freezer.

NCRPIS acquired 5619 new accessions in 1998. This includes the cultivated flax collection (2801 accessions) and a large number of original samples from NCAUR. The material from NCAUR required considerable time cleaning and inventorying. Seed storage personnel with assistance from the brassica and sunflower crews is in the process of cleaning and storing the cultivated flax collection.

The asparagus collection was transferred to NE9. The seed portion of the collection was packaged for transport by seed storage personnel.

In 1998, 361 accessions received taxonomic re-identification. All these seed samples were re-labeled by seed storage personnel. In addition, seed samples of 168 inactivated accessions were removed from the active collection and placed in inactive storage. In 1998, 381 Ames-numbered accessions received PI numbers. New labels were made and cold storage locations and GRIN records were adjusted to reflect the changes. Fifty-one lots were identified as duplicates and appropriate changes were made to the packets and their location and to GRIN.

There were 672 total seed orders (20,834 packets). Seed storage personnel filled 16,132 packets of material for distribution/observation. NSSL received 1358 packets for backup. These include material new for NSSL backup, lots that replace inferior lots or lots that contribute to the lots already at NSSL (Base lot). Other orders filled included germination and regeneration orders.

Three hourly laborers worked in seed storage in 1998.

Training:

Lisa Burke completed the required annual training for the First Responders and also completed an Iowa State University graduate course in Seed Physiology in December of 1998.

P. Computers and Telecommunications: (R. Luhman, M. Millard, C. Block, D. Kovach, R. Stebbins, R. Wilson)

Personnel: Early in 1998 the NCRPIS staff met to discuss a staffing plan for in-house computer support. It was decided at this meeting that R. Luhman would become the first contact for most computer-related duties. Additional assistance in the computer area was offered through a newly created Internship. The NCRPIS Computer Committee met periodically to help determine hardware, software and personnel needs.

R. Luhman attended a session on development of applications using Visual Basic.

Equipment Purchased: desktop PC's (7), laptop PC's (2), Palmtop PC's (3), Hard Drives (7), Ultra Fast SCSI Hard Drives (3), Exabyte Tape Library (1), barcode reader for tape library (1), Handheld symbol Barcode Scanner (1), 32MB Simm's (10), Zebra barcode printer (1), HP Laserjet printer (1), HP scanner (1), cameras (2), memory chip upgrades for digital cameras (2), accessory kits for digital cameras (2), etherlink card (1), processor upgrades (5), CD-Writer (1), intellimouse trackball (1), PCMCIA cards (2), PC stands (2), 25 pack CD-R (1), CD-RW (10), CD label maker (1), Adaptec Ultra-Wide SCSI card (1).

Software: Adobe Acrobat 3.0 (3 copies), Adobe Illustrator (1 copy), Adobe Pagemill (2 copies), Adobe Photoshop (3 copies), Autocad Light (1 copy), Cleansweep Uninstaller (2 copies), First Aid 98 (1 copy), Frontpage 98 (3 copies), Norton Utilities (3 copies), Microsoft Office 97 (6 copies), Opencube Java applets (2 products), Partition Magic (2 copies), PCAnywhere (1 copy), Procomm Plus (4 copies), Reference Manager (1 copy), SigmaPlot (1 copy), Spanish Assistant (1 copy), Via Voice 98 (1 copy), Microsoft Visual Basic (4 copies), Visual Café (1 copy), Visual Interdev (1 copy), Visual J++ (1 copy), Windows 95

Upgrade (2 copies), Windows 98 Upgrade (2 copies), Windows NT 4.0 Workstation (3 copies), Windows NT Server-5 user license (1 copy), Windows NT Server client licenses (45), WordPerfect Suite 8.0 (11 copies).

Progress:

1. Installation of a Windows NT network server and Windows NT workstations has decreased the amount of effort computer staff requires for daily PC maintenance.
2. The tape library with barcode ability has enhanced our backup capabilities.
3. Digital camera technology is proving to be useful, especially in the Plant Pathology and Molecular Marker area.
4. Hardware systems have been checked for year 2000 readiness. All Pentium systems are compliant with the year 2000. On January 1, 2000, 486 machines will need to have their clock set manually. We are in the process of upgrading software to year 2000 compliant patches or versions.
5. The Intranet has been moved to Windows NT platform and continues to facilitate staff communications. The opening page of our Intranet has been enhanced with java scripts to allow for a more professional looking Intranet.
6. Our Internet site has had about 2000 hits during 1998. A section was added describing our internship program. Updates were made to the personnel section, and the opening page has an announcement about our recruitment of a new Research Leader.

Plans: There will be a concerted effort to make sure all systems (hardware and software) are compliant with the year 2000. We are currently working with both Iowa State University and the National Animal Disease Center to insure our year 2000 readiness. The Computer Intern has been assigned to keep up with year 2000 literature and to update software packages whenever needed.

Q. Molecular Marker: (M. Brothers)

In late 1998, Mary Brothers began an isozyme evaluation of the 112-accession sunflower core subset and 112 randomly selected sunflower accessions as discussed in the sunflower curation section.

During 1998 the NCRPIS's molecular marker lab space and equipment have been used by USDA-ARS and Iowa State University scientists for three research projects.

Drs. Kendall Lamkey and Joanne Labate (USDA-ARS, Iowa State University, Department of Agronomy) are amplifying microsatellite loci to measure the genetic diversity in open-pollinated populations of maize germplasm, primarily 'Corn Belt Dent' related material. Their goal is to determine if the U.S. maize crop grown today is as genetically diverse as it was before the predominance of hybrid cultivars. They wish to increase efforts towards conserving currently unexploited, temperately-adapted, maize germplasm and take the first steps necessary towards incorporating it into commercial cultivars. By increasing genetic diversity in the crop, the risk of genetic susceptibility to a variety of environmental factors such as insect pests, fungal pathogens, and global warming will be decreased.

James Watkins and Dr. Don Farrar (Iowa State University, Department of Botany)

have used enzyme electrophoresis to clarify the systematic relationships and evolution of the Western Botrychium complex. This group of ferns exhibits cryptic morphologies which make identification difficult. Little is known regarding the proper taxonomic treatment of many threatened and endangered species growing on federal lands. Approximately 1000 individuals from 20 species have been analyzed and three potentially new species have been identified. This investigation has provided information on the taxonomy of the Western Botrychium complex, polyploid genome evolution, and the effects of gene silencing on fern evolution.

Donald Pratt and Dr. Lynn Clark (Iowa State University, Department of Botany) used enzyme electrophoresis to analyze intra- and inter-populational variation of two dioecious Amaranthus species (A. rudis and A. tuberculatus) and two monoecious Amaranthus species (A. retroflexus and A. hybridus). In collections from fields containing both the monoecious and dioecious species, a rare GOT2 allele, fixed in the monoecious populations, has been introgressed into both of the dioecious species. Phenetic analysis is being conducted to determine whether there is a single, large dioecious species or two smaller dioecious species with hybrid populations in areas of sympatry.