NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1996

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

II. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

A. Administrative Advisor — D.A. Topel, Iowa

B. Regional Coordinator — *P.K. Bretting, Iowa

C. State Experiment Stations Representatives

1. Illinois	*T. Hymowitz, Chmn.	7.	Missouri	*P. Beuselinck
2. Indiana	*J. Janick	8.	Nebraska	*D. Baltensperger
3. Iowa	*C. Brummer	9.	N. Dakota	*J. Franckowiak
4. Kansas	*J. Pair	10.	Ohio	*K. Campbell
5. Michigan	*A. Iezzoni	11.	S. Dakota	*A. Boe
6. Minnesota	*H. Pellett	12.	Wisconsin	*W. Tracy, Secy.

*Voting members

D. U. S. Department of Agriculture

1. ARS National Program Staff, Plant Germplasm	*Vacant (Shands)
2. ARS Plant Exchange Office	*E. Garvey
3. ARS Area Director, Midwest Area	R. Dunkle
4. Cooperative State Research Education and Extension Service	M. Fitzner
5. Natural Resources Conservation Service	*Vacant
6. National Center for Agric. Util. Research	*T. Abbott
7. National Seed Storage Laboratory	*S. Eberhart

E. North Central Regional Plant Introduction Station, Ames, Iowa

1. USDA-ARS Staff	
a. Research Leader/Coordinator	P. Bretting
Supervisory Program Support Assistant	L. Wilson-Voss
Office Automation Clerk	L. Wells
Office Automation Clerk	C. Brewer
Biological Science Technician	C. Dill
b. Horticulturist	M. Widrlechner
Agricultural Research Technician	P. Ovrom
Biological Science Technician	J. Edwards
Agricultural Research Technician	J. Van Roekel
Agricultural Research Technician	D. Kovach
Biological Science Lab Technician	L. Burke
Germplasm Program Assistant	R. Stebbins
c. Research Entomologist	R. Wilson
Agricultural Research Technician	S. McClurg
Entomologist	C. Abel
Biological Science Technician	R. Schweppe
d. Geneticist	M. Brothers
Biological Science Technician	I. Larsen

2. Iowa State University Staff

a.	Research Station Superintendent II	L. Lockhart
	Field-Lab Technician III	M. Czajkowski
	Field-Lab Technician II	J. Scheuermann
	Clerk Typist II	L. Minor
b.	Curator II	M. Millard
	Field-Lab Technician II	T. Ladjahasan
c.	Asst. Scientist II (Plant Pathology)	C. Block
d.	Curator II (Brassica, Grasses)	R. Luhman
	System Support Specialist II	Vacant
e.	Curator II (Vegetables)	K. Reitsma
f.	Curator II (Amaranth)	D. Brenner

III. PROGRESS OF WORK (P. K. Bretting)

Personnel changes:

Resignations: R. Jeffryes, Germplasm Program Assistant, T. Le, System Support Specialist, and L. Copeland, Office Automation Clerk vacated their positions during 1996.
Hirings: R. Stebbins was hired as a Germplasm Program Assistant, C. Brewer as an Office Automation Clerk, and C. Dill as a Biological Research Technician.
Promotions and reclassifications: L. Wilson-Voss was re-classified as a GS-7 Supervisory Program Support Assistant, S. McClurg as a GS-8 Agricultural Research Technician, I. Larsen as a GS-5 Agricultural Research Technician, and D. Kovach as a GS-9 Agricultural Research Technician.

Construction:

1. Fire suppression/detection systems were installed in the entomology building and machine shed/shop.
2. New 6" water mains were installed to supply water to the preceding fire suppression systems.
3. The first stage of a multistage effort to renovate the drainage tile system on NCRPIS farmland was completed.
4. Fiber optic and copper cables were installed between the NCRPIS Farm and the ISU campus telephone system and campus computer network.
5. The seed processing room floor was refinished with ceramic tiles.

Equipment:

1. Two vertical laminar flow hoods were purchased to replace existing horizontal flow hoods, as recommended by ARS safety officers.
2. An ELISA plate reader was purchased to bolster the seed pathology and genetic marker programs.
3. Laboratory equipment for the seed pathology and genetic marker laboratories was purchased.
4. A new germinator was purchased for the seed science and curatorial programs.
5. A new telephone system was installed at the NCRPIS Farm in conjunction with the establishment of a fiber optic-copper cable link with the ISU campus.
6. Six new Pentium computers, a server backup system, and several single computer backup systems were purchased.

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

IV. PROGRESS IN GERMPLASM AND INFORMATION MANAGEMENT, RESEARCH, AND EDUCATIO L. Wells)

Acquisition:

1. More than 1300 germplasm accessions were acquired by the NCRPIS during 1996 (details listed under the germplasm program assistant's and the curators' reports).
2. Significant acquisitions included more than 500 accessions of maize, more than 100 accessions of ornamentals and amaranths, and assorted accessions of umbels, Euphorbia, and crucifers.

Maintenance:

1. More than 40,000 accessions representing more than 300 genera and 1600 species are now maintained at the NCRPIS.
2. More than 4,500 accessions were "backed-up" in long-term storage at the National Seed Storage Laboratory (NSSL), a 100% increase as compared to 1995.
3. More than 10,500 lots of original seed were placed in long-term (-18 °C) storage at the NCRPIS.

Regeneration:

1. More than 2100 accessions were cultivated for regeneration in Ames, Puerto Rico, St. Croix, and Salinas, CA during field seasons, employing more than 660 insect cages for controlled germplasm pollination at Ames.
   a. The NCRPIS's germplasm regeneration program received valuable assistance from seed companies. Asgrow-Seminis and SunSeeds regenerated carrot accessions, and Pioneer Hi-Bred International regenerated sunflowers.
   b. A group led by Mr. J. Kojima 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 17,000 seed packets were distributed to researchers in the U. S. (ca. 68% of the total) and abroad (the remaining 32%). This total is about 9% higher than our five-year mean for distribution.
2. Accessions of spinach germplasm, now available to requestors after many years of unavailability, were distributed for immediate evaluation for host-plant resistance to a new race of downy mildew, which is devastating greenhouse production of spinach.
3. More than 100 vegetative cuttings were distributed. Seven accessions of landscape plants were distributed for long-term evaluation at 28 sites in the North Central Region.

Testing germplasm's germination, viability, and health:

1. More than 2000 accessions were assayed for their germination/viability percentages.
2. Maize, sunflower, squash, cucumber, melon, amaranth, Chenopodium, brassicas, and ornamental germplasm regeneration plantings were inspected for pathogens.
3. Accessions of Cucurbita pepo were assayed via ELISA for squash mosaic virus before planting.
4. Further research was conducted to characterize a seedborne bacterial disease of melons and to develop a protocol for disinfecting seeds.
5. Research conducted on the frequency that Stewart's bacterial wilt is transmitted through maize kernels was completed. Research on the longevity of the causal bacterium in seeds stored at various temperatures was initiated.

Information management:

1. The position of germplasm program assistant established in 1995 continued to

augment the NCRPIS's information management capabilities.
2. Personal computers (see "Equipment") and specialized software (Oracle, Cheyenne ARCServer) were purchased to improve the efficiency and reliability of information management at the NCRPIS.
3. The NCRPIS computer staff continued to cooperate with other NPGS sites to refine the new version of the Germplasm Resources Information Network (GRIN3).
4. A committee continued to reorganize, file, and consolidate the large amount of paper archival material on file at the NCRPIS.
5. Passport data were updated for more than 1300 accessions of vegetable crops.
6. "Five-year" and "Ten-year" Performance Report forms were distributed to trial site cooperators for the NC-7 Regional Ornamental Trials.
7. Sunflower characterization/evaluation data from 1990-96 were entered into GRIN for more than 1700 accessions.

Characterization:

1. Morphological characterization data were recorded for maize, brassicas, millets, carrots, amaranths, cucurbits, Cuphea, ornamentals, and other crops.
2. The NCRPIS-ISU Seed Science Center's joint project for developing an integrated, computerized image acquisition and management system progressed to the point where the system was incorporated into our daily maize germplasm management effort. To date, images of more than 300 accessions have been captured with a novel method incorporating a flat bed scanner. Images of more than 3,000 maize accessions have been digitally catalogued.
3. Isozyme analyses of several maize inbred lines regenerated at the NCRPIS were conducted to assess trueness-to-type and genetic purity. The results of these analyses assisted the maize curatorial program with making several managerial decisions.
4. The most extensive molecular marker (isozyme) characterization to date (more than 140 accessions) of domesticated and wild Helianthus annuus (sunflower) germplasm was completed and the data made available on the World Wide Web.

Evaluation:

1. More than 3,100 accessions were evaluated in total at the NCRPIS in 1996. Accessions of maize, millets, brassicas, Cuphea, mints, and potential ornamentals were evaluated for general agronomic or horticultural merit.
2. More than 100 maize accessions were evaluated for host-plant resistance (in silks) to corn earworm feeding. More than 940 maize accessions were evaluated for host-plant resistance to 1st generation European Corn Borer, and more than 190 accessions were evaluated for host-plant resistance to 2nd generation European Corn Borer.
3. More than forty sunflower accessions were assayed for host-plant resistance to sunflower moth.
4. A multi-year evaluation of Brassica for host-plant resistance to green peach aphid continued.
5. Research continued with seed transmission and disease etiology of Erwinia stewartii, the causal agent for Stewart's wilt of maize. Research on a diagnostic test for Goss's wilt, another seedborne disease of maize, was initiated.

Enhancement:

1. A long-term recurrent phenotypic selection project continued to develop a composite population of wild sunflowers (H. annuus) with host-plant resistance to both Alternaria and Septoria leaf blights.
2. Genetic enhancement and characterization of non-seed shattering accessions of Amaranthus continued.

Health, safety, and EEO progress:

1. Many of the NCRPIS staff attended seminars regarding Worker Right-to-Know

Laws, Hazardous Waste, Pesticide Applicator, and Tractor Safety. Several staff members attended seminars regarding supervision, OSHA Laboratory Training, Respirator Training, CPR and First Aid Training, Forklift Training, Bloodborne Diseases, Lockout-Tagout, Workplace Violence, Worker's Compensation Supervisor's Training, and Electrical Safety. All field workers received training in the proper use of dust masks. Several NCRPIS staff members serve on the ARS Campus Safety Committee.

2. The NCRPIS continued extensive efforts to document training received by our staff.
3. NCRPIS staff members attended various seminars regarding civil rights, preventing sexual harassment, gender diversity, and ethics.
4. The extensive training program by The Leadership Training Center regarding improving teamwork culture was completed, and was considered to have yielded mixed results.
5. Several NCRPIS staff arranged an "Diversity" dinner which featured indigenous cuisine from a variety of cultures.
6. The Horticulturist 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. To date, more than 1,000 "visits" to the site have been recorded. Informational brochures describing the NCRPIS and its activities were distributed to all visitors, and to relevant offices at the national, regional, and local levels.
2. More than 210 visitors toured the NCRPIS during 1996.
3. Dr. Rafael Ortega Paczka, Universidad Autónoma de Chapingo, Mexico, spent four months at the NCRPIS learning germplasm management techniques and conducting research.
4. Several staff members visited local elementary schools to teach students about the NCRPIS and its work.
5. Several staff members serve on advisory boards for various germplasm-related projects or organizations.
6. The Ornamental Horticulture program distributed various planting and performance reports and activity updates to trial site cooperators.
7. NCRPIS staff members travelled extensively in the U. S. and internationally (Mexico) to present lectures, attend workshops, serve on advisory committees, and establish contacts with domestic and foreign germplasm researchers.

V. INDIVIDUAL PROGRESS REPORTS

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

Progress:

Field

Corn - Corn earworm evaluation: One-hundred twelve maize PI accessions were planted in the field in Ames and in Tifton, GA, to obtain silks for evaluation in the laboratory. Silks were collected and frozen but diets have not been prepared to date. Silks were collected, frozen, and shipped to Athens, GA for chemical analysis. Fourteen selected maize accessions were sent to Hermiston, OR, for field evaluation of corn earworm resistance. Ten accessions had a rating of 7 or less, where 1 is immune and 10 completely susceptible.

European corn borer evaluation: Nine-hundred forty-six maize accessions were evaluated for leaf feeding resistance to first generation European corn borer. Twenty-seven rated resistant. One-hundred ninety-five maize accessions were evaluated in the field for second generation European corn borer resistance. Four rated resistant.

Laboratory diets were made from leaf material taken from the Peruvian accessions found resistant to European corn borer. All of the diets from the Peruvian accessions produced significantly smaller larvae than did the standard or the WF9 diets.

Sunflower - Work continued on refining the sunflower moth evaluation technique for both cultivated and wild-type sunflowers. Forty-eight cultivated sunflowers were planted in the field and infested with sunflower moth. Ten 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 still underway.

Brassica - A replicated field-cage test was conducted for a second year to compare Osmia bees, honey bees, and alfalfa leafcutting bees for pollination efficiency of two Brassica accessions. There were no significant differences between the three bee species. Osmia bees will be used in 2/3 of the 1997 Brassica seed increases because they are more economical to use than are traditional honey bees.

Cucumis - A replicated field cage study with C. melo and C. sativus was conducted to compare Osmia bees, honey bees, and alfalfa leafcutting bees for seed produced per cage. Data are still being collected (germination data) and are not analyzed to date.

Laboratory

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

A longterm colony of corn earworms is being maintained to supply sufficient numbers of insects for comparison with earworms obtained from the rearing colony in Tifton, GA.

A colony of green peach aphids is being maintained in the greenhouse and growth chamber to supply sufficient numbers of insects for use in our greenhouse evaluation of host-plant resistance in Brassica.

Sunflower - A study was conducted to determine if ethanol or water extracts of sunflower pollen would affect oviposition (number of eggs laid on cloth pads) by sunflower moth. There were no significant differences detected between ethanol and water extracts.

Greenhouse - A total of 708 Brassica accessions were evaluated in the greenhouse for resistance to green peach aphid. We will retest 57 accessions in a replicated study in early 1997.

Miscellaneous

Richard Wilson serves as major advisor for one M.S. student and one Ph.D. candidate in the Department of Entomology and on one M.S. graduate student POS Committee in the Department of Entomology.

Manuscript review:

During 1996, Richard Wilson peer-reviewed several manuscripts.

Richard Wilson reviewed manuscripts for the editors of the Journal of Economic Entomology and the Journal of the Kansas Entomological Society.

Cooperative research:

We cooperated with Bill Wiseman (ARS, Tifton, GA) and Maurice Snook (ARS, Athens, GA) on evaluation of maize for corn earworm resistance.

We are cooperating with Bill Van Roekel and Craig Abel (ARS, Ames, Plant Intro. Station) on a Cuphea pollination study.

We worked with Rick Luhman and Craig Abel (ISU, ARS, Ames, Plant Intro. Station) on a Brassica pollination study.

We are cooperating with Brad Binder (ARS, Ames, IA) on chemical analysis of corn silks causing resistance to corn earworm and analysis of sunflower pollen for resistance to larval feeding and adult oviposition by sunflower moths.

We are cooperating with Kathy Reitsma and Craig Abel(ISU, ARS, Ames, Plant Intro. Station) on a cucurbit pollination study.

We are cooperating with Mary Brothers and Craig Abel (ARS, Ames, Plant Intro. Station) on a sunflower pollination study.

EEO activities:

Viewed EEO film “Martin Luther King” at PI Farm, Jan. 16, 1996.

Viewed Stephen Covey video at PI Farm, Feb. 9, 1996.

Viewed HRM film at PI Farm, May 22, 1996.

Entomology and Agronomy Department activities:

Richard Wilson regularly attends faculty meetings held in both departments.

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

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

Meetings attended:

Iowa Academy of Science annual meeting, Indianola, IA, April 26-27, 1996.

12th Biennial meeting of Plant Resistance to Insects Workshop, Savannah, GA, Feb. 26-28, 1996.

Entomological Society of America annual meeting, Louisville, KY, Dec. 8-12, 1996.

Internet Seminar, Des Moines, IA, Jan. 11, 1996.

Iowa Academy of Science Student Programs Committee meeting, Ames, IA, Dec. 14, 1996.

Internet Training, Des Moines, IA, May 6, 1996.

Meeting with GAO personnel, Ames, IA, Aug. 15, 1996.

"Everybody wants the cream, but nobody wants to milk the cow" seminar at NADC, Mar. 5, 1996.

Short courses/training:

Training session on "Workplace Violence" at NADC, Aug. 27, 1996.

"Tractor Safety" training at ISU, Feb. 21, 1996.

"Dust Mask" training at PI farm, March 26, 1996.

"Worker's Compensation Supervisor's Training" at NADC, Ames, IA, Sept. 10, 1996.

Papers presented at meetings:

"Sunflower Moth", Sunflower Insect Workshop at Fargo, ND, April 18-19, 1996.

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.

Richard Wilson was guest lecturer for Entomology 110 class at ISU, Oct. 17, 1996.

Richard Wilson judged FFA Agriscience Fair, Des Moines, IA, Mar. 16, 1996.

Richard Wilson currently serves on the board of directors of the Amaranth Institute for a three-year term.

Richard Wilson served as chair of Section Fa during 1996 and conducted business meeting at ESA Annual meeting in Louisville, KY, Dec. 1996.

Richard Wilson is a member of Iowa Academy of Science Student Programs Committee.

Plans:

<u>Field</u>

Evaluate 200 maize PI accessions for corn earworm silk feeding resistance.

Evaluate 800 maize PI accessions for resistance to leaf feeding by European corn borer.

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

Evaluate 20 amaranth PI accessions for resistance to tarnished plant bug and

develop a better technique for evaluation.

Participate in cooperative research project to field test earworm-resistant maize in Georgia (Bill Wiseman) and in Oregon (Gary Reed) and to analyze corn silks for chemicals causing resistance (Maurice Snook).

Evaluate 50 sunflower (cultivated) and 10 (wild-type) PI accessions for resistance to sunflower moth.

Cooperate with Kathy Reitsma, Linda Hintch and Craig Abel on using Osmia bees to pollinate Cucumis and Coriandrum in cages.

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

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

Laboratory

Prepare corn earworm evaluation diets from field-collected silks.

Cooperate with Brad Binder (ARS, Ames) to identify chemicals causing resistance to European corn borer and corn earworm on corn and to identify chemicals in sunflower pollen that affect oviposition and larval feeding of sunflower moth.

Continue rearing sunflower moth.

Continue rearing corn earworm.

Continue rearing a colony of green peach 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 test if resistant pollen could be used as a first line of defense against this insect.

Continue Osmia bee diapause studies.

Greenhouse

Cooperate with Rick Luhman to evaluate Brassica for resistance to green peach aphid.

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:

Wilson, R.L. 1996. The Sunflower Moth. Proc. Ninth Great Plains Sunflower Ins. Wrkshp.: 60-66.

Wilson, R.L. 1996. Another amaranth pest: blister beetles. Legacy 9: 9-10.

Wilson, R.L. and C.A. Abel. 1996. Storage conditions for maintaining Osmia cornifrons (Hymenoptera: Megachilidae) for use in germplasm pollination. J. Kan. Entomol. Soc. 69: 270-272.

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

Germplasm Collections

Acquisition:

One-hundred thirty-nine new accessions of ornamentals and four accessions of mint-family plants were received during 1996. Most of these accessions came from Indices Seminum and collection trips to China and Mongolia.

Maintenance:

Available for distribution:

Ornamentals (NCRPIS priority site) 790/1791 (44%) (130 genera).
Ornamentals (For trials or transfers) 73/218 (33%) (79 genera).
Mint-family Plants 62/134 (46%) (16 genera).

The availability of these crops increased significantly in 1996 (from 671 accessions in 1995 to 925 accessions in 1996). Much of this increase resulted from the completion of a detailed inventory of ornamental seed packets conducted in 1996.

Distribution:

Two plants, seven cuttings and 163 seed packets of ornamentals were distributed to meet germplasm requests, and 534 plants were distributed as part of the NC-7 Trials. Requests for seed of ornamental germplasm were as numerous as in 1995. Twelve seed packets of mint-family plants were distributed in 1996.

Duplicated at NSSL

Ornamentals (NCRPIS Priority Site) 409/1791 (23%)*
Mint-family Plants 49/134 (37%)**

* This is no change from 1995. There are 59 accessions that will be shipped in February, 1997 that had been pending PI number assignment. A larger number of accessions should be backed-up after the next storage cycle, which is scheduled for March, 1997. This does not include ornamental accessions which we back-up for National Arboretum.

** This does not include 11 accessions of Pycnanthemum which we back-up for Corvallis.

Regenerated

Ornamentals (NCRPIS Priority Site) 114/1791 (6%)*
Ornamentals (For trials or transfers) 1/218 (<1%)
Mint-family Plants 8/134 (6%)**

* This includes 61 successful cage increases, 27 woody ornamental seed increases, 19 woody plant grow-outs, and 8 miscellaneous (tent or isolation) increases.

** Regeneration activity for this group was revived in 1995-96, with the establishment of a two-year field increase plot.

Tested for Germinability/Viability

Ornamentals (all accessions held as seed) 351/1791 (20%)*
Mint-family Plants 54/134 (40%)

* These data are cumulative and do include tests conducted in December 1996.

Significant Progress

A detailed count of about 800 ornamental seed samples, which was conducted throughout most of 1996, combined with an update of the ornamental seed and plant inventories, resulted in major improvements in availability of accessions as compared to 1995. Favorable growing conditions led to seed and plant regenerations in 1996 that were also particularly successful, though the quality of the regenerated seed samples remains to be tested.

Characterization/taxonomy:

During 1996, there were no large-scale characterization/taxonomy projects for the crops that we curate. However, all herbaceous ornamentals in the cage-increase field and all accessions of Sorbaria being regenerated were checked to verify identifications. In all, 31 accessions were re-identified. The largest group was of Zinnia, including both accessions originally held the NCRPIS and those recently received from NSSL.

Evaluation:

In 1996, Roger Fuentes-Granados, a Ph.D. candidate under Mark Widrlechner's joint direction (along with Lester Wilson of the ISU Food Science Department), continued his analysis of Agastache seedlings from controlled crosses and maintained a field planting of hybrids and parental populations to evaluate the inheritance of isozymes analyzed in his M.S. research and of genes controlling the production of essential oils. He has been working to establish protocols for RFLP analysis during the past year. A publication on the inheritance of corolla color and a polymorphic enzyme system in Agastache rugosa was accepted for publication in HortScience at the close of 1996.

Enhancement:

There was no major progress to report with enhancement activities in 1996.

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - In 1996, 429 plants of seven accessions were distributed for evaluation to 25 sites, with an additional 105 plants of these accessions provided to arboreta and botanical gardens.

Computer-generated "Five-year Performance Report" and "Ten-year Performance Report" forms were distributed to trial site cooperators this spring. The backlog of evaluation data received from trial sites since 1994 has been eliminated.

Three newsletter updates and a special letter were sent to trial site cooperators in 1996 to inform them about current developments at Ames and throughout the program.

Research on the floristics, soils, plant communities, and climates of Eastern Europe (especially of Ukraine and neighboring states) continues with help of Dr. Sergei Mosyakin of the Kholodny Institute of Botany in Kiev. He is serving as a liaison with Ukrainian researchers who have been studying the role of climatic adaptation in Ukrainian landscape-plant introduction, with the goal of preparing a joint exploration to be conducted during Fall, 1998.

Mark Widrlechner is working with Gary Kling, the cooperator from the University of Illinois, to prepare a manuscript featuring landscape plant accessions that have performed particularly well in Urbana, for possible publication in the American Nurseryman.

Paul Ovrom and Mark Widrlechner visited NC-7 trial sites in Missouri, Illinois, and Indiana as part of a spring plant delivery trip; they also visited the trial site at the Minnesota Landscape Arboretum. Mark Widrlechner visited trial sites in Nebraska and Ohio during the course of other travels in 1996.

Germplasm activities in crops other than those curated:

Eight requests for accessions with special horticultural characteristics were handled by Mark Widrlechner, resulting in the distribution of 139 packets of seed. In 1996, he also responded to seventeen general information requests regarding germplasm and its curation.

In October, Robert Stebbins was hired as an ARS Germplasm Program Assistant, responsible for the entry and proofing of passport and other data associated with NCRPIS accessions. During 1996, Mark Widrlechner worked with Ryan Jeffryes (Mr. Stebbins' predecessor) and Robert Stebbins to collaborate with our curatorial team to analyze and to set priorities for passport-data proofing and updating. This process has been particularly valuable in forging a good working relationship between Robert Stebbins and the curators in the early stages of his career here.

Mark Widrlechner continues to oversee Bill Van Roekel's curation of Cuphea and Euphorbia. He has consulted and/or 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.

Other research and training activities:

Research on the taxonomy of Rubus in Iowa has been completed with the preparation of a manuscript which will be submitted to Castanea for publication early in 1997. 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.

Early in 1996, a final meeting brought our Station's training with the Leadership Development Center to a close. All members of the Horticulture project participated fully in this training and have been working to apply the concepts and recommendations presented in that training to improving our workplace.

Another important aspect of training for the Horticulture project are the courses taken to keep pesticide applicator's licenses current. All three members of the project attended training sessions in October and November. In addition, Paul Ovrom and Jeanne Edwards attended a Fred Pryor Seminar on project management in July.

Meetings attended:

March: Shade Tree Short Course (Ames, IA) MPW, APO
May: AABGA Annual Meeting and Woody Landscape Plant CGC (Saint Louis, MO) MPW
June: NC-7 Regional Technical Committee (East Lansing, MI) MPW; Symposium on Landscape Plants (Bloomington, MN) MPW, APO
July: How to Manage Multiple Projects, Meet Deadlines, and Achieve Objectives (Des Moines, IA) APO, JCE
October: ASHS Annual Meeting, including Leafy Vegetable CGC, Root & Bulb Vegetable CGC, Herbaceous Ornamental CGC (Lexington, KY) MPW; Eastern Region Annual Meeting of the International Plant Propagators' Society (Cincinnati, OH) MPW, APO; Pesticide applicator's training for greenhouse crops (Ames, IA) MPW, APO, JCE
November: Pesticide applicator's training from ornamentals and turf (Ames, IA) MPW, APO, JCE

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

Presentations and seminars:

June: Presentation entitled "Chinese Forestry - Relationships Worth Cultivating," given to the Symposium on Landscape Plants: Exploration, Breeding, Evaluation.
October: Poster entitled "Demand for Herbaceous Ornamental Germplasm from the North Central Regional Plant Introduction Station," presented to the 1996 Annual Meeting of the American Society for Horticultural Science.
October: Presentation entitled "Ornamental Seed Production in Field Cages with Insect Pollinators," (co-authors Craig A. Abel and Richard L. Wilson) given to the 1996 Annual Meeting of the Eastern Region of the International Plant Propagators' Society.

Publications which appeared in print in 1996:

Lewers, K.S., S.K. St. Martin, B.R. Hedges, M.P. Widrlechner, and R.G. Palmer. 1996. Hybrid soybean seed production: comparison of three methods. Crop Science 36:1560-1567.

Schutzki, R.E. and M.P. Widrlechner. 1996. New plants on trial. Amer. Nurs. 183(9):38-46.

Widrlechner, M.P. 1996. Demand for herbaceous ornamental germplasm from the North Central Regional Plant Introduction Station. (Abstract of a poster presented to the 1996 ASHS Annual Meeting) HortScience 31:650.

Other items:

Mark Widrlechner assisted the USDA/CSREES by serving as a reviewer for Capacity Building Grants for 1890 Land Grant Universities in April, 1996.

Conclusions:

Curation

1996 was a very productive year for making more ornamental germplasm available to requestors. The quality of our inventory data also increased markedly. 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). We will work to address those issues in 1997. Another limitation to the measurement of our effectiveness of regeneration has been the confounding effects of dormancy on germination tests conducted shortly after harvest. On the advice of David Kovach, we are now holding all ornamental seed samples for three months under normal room conditions before placing the samples in medium-term storage. This should allow after-ripening to occur and should increase the accuracy of germination tests conducted on 1996 regenerations.

In February 1996, delivery of steam heat to the campus greenhouses was interrupted. Temperatures in many of the greenhouse rooms were at or near freezing for more than a few hours. Plants suffered chilling and freezing damage and a great deal of effort was expended to restore our collections. Ultimately, fewer than five ornamental accessions were lost, and we have placed our most sensitive plants in two locations.

After a short hiatus, regeneration work resumed on mint-family plants in 1995, with the help of Roger Fuentes-Granados. As a result of the storage of mint-family seeds conducted in January, 1996, many new accessions were backed-up at NSSL. Additional samples produced seeds in the field in 1996. Regeneration work will once again be suspended on the Lamiaceae till the 1999-2000 field cage cycle.

Curatorial plans for 1997 include the regeneration of ornamentals based in part on the results of a demand analysis conducted for 1991-1995 and reported at the ASHS meeting. This will include some annuals, such as Calendula and Zinnia, and perennials, such as Dianthus, Delphinium, Gypsophila, Echinacea, and Tanacetum. Recent germination tests also indicate that there are about 50 accessions of Leucanthemum that require regeneration. At Paul Ovrom's suggestion, the annual and perennial plants will be divided into two separate cage fields for easier management. Initial experiments in 1996 to regenerate Spergula and a few other small, autogamous annuals in plastic tents used primarily for Amaranthus were successful, and ten accessions are being grown under that system this winter. We also plan to verify the locations (and mapping) of permanent plantings of woody ornamentals.

Research

Mark Widrlechner published fewer manuscripts in 1996 than the seven papers and an abstract that appeared in 1995. For 1997, there are three papers that should be published from projects submitted in previous years and three manuscripts are in progress as of February 1997. The works in progress include the treatment of Rubus in Iowa, a summary of seed germination results for unusual woody plants, and an analysis of the performance of plants from northern Japan in the NC-7 trials.

Other research plans for 1997 include helping Kathy Reitsma write an article on umbel germplasm and collaboration with Craig Abel and Dick Wilson on plant-pollinator research.

C. Plant Pathology (C. Block)

Disease notes:

Amaranthus and Chenopodium

No disease problems were observed on the Amaranthus and Chenopodium greenhouse seed increases.

Cucurbita pepo

Greenhouse seedlings of 64 accessions were tested for squash mosaic virus before transplanting to the field. Portions of fully expanded cotyledons were sampled from each plant for ELISA testing. One or more infected plants were detected in six accessions, PI 438711 89ncai01, PI 512793 92ncai01, PI 512851 92ncab01, PI 512870 92ncai01, Ames 13367 94ncai01, and Ames 19041 92ncao01. All infected plants were destroyed.

Cucumis sativus and C. melo

Seed-increase cage plots of 314 accessions were inspected for anthracnose, powdery mildew and bacterial leaf blight (Acidovorax avenae ssp. citrulli). Anthracnose was the most serious problem affecting cucurbit seed increases with 99 of the 314 accessions recorded as highly susceptible.

Zea mays

Two-hundred and thirty-three (233) maize accessions were rated in late August and early September for six diseases: common rust, common smut, northern corn leaf blight, Stewart's bacterial disease, gray leaf spot, and northern leaf spot (carbonum leaf spot). Northern corn leaf blight and northern leaf spot were absent in 1996. Gray leaf spot infection was detectable at low levels on most accessions; 47 accessions had at least 25% of the ear leaf tissue killed. Stewart's disease was present in 89 accessions.

Seed samples from 127 accessions were screened for Erwinia stewartii infection by ELISA-based laboratory testing - infected kernels were detected in three accessions.

Helianthus

The sunflower increase plots were inspected three times during the growing season, primarily for downy mildew, caused by Plasmopara halstedii (Farl.) Berl. and deToni. Infected plants were removed from the field, so that only healthy plants were used for seed production. There was an unusually high incidence of systemic infection of seedlings in 1996, probably because of heavy rains around the time of emergence. Fifty-three plants were removed from the field in 1996, whereas one or two plants are found in most years.

Sclerotinia wilt was identified in two sunflower fields. This is the first confirmed appearance of Sclerotinia wilt at the NCRPIS.

RESEARCH NOTES:

Sunflower Genetic Enhancement:

The objective of this research is to develop a composite population of wild H. annuus with resistance to both Alternaria helianthi and Septoria helianthi through recurrent phenotypic selection from open pollinated plants.

Field evaluation of progeny (plant-to-row) from 91 "resistant" plants collected in 1995 yielded 19 lines with sufficiently high resistance to advance to the next generation of seed increase. Most of the "failures" showed Alternaria resistance, but late-season Septoria susceptibility.

A second population consisting of 32 accessions (16 plants each) was planted and inoculated with both pathogens. Inflorescences on susceptible plants were pruned to limit pollen contribution. Six heads were harvested from the remaining 78 plants to advance to a plant-to-row evaluation plot in 1997.

Longevity of Erwinia stewartii in maize kernels:

Survival of Erwinia stewartii bacteria in stored kernels was found to be directly related to the storage temperature. After 9 months at 5°C and 32%RH, average populations dropped from 200,000 to 170,000 CFU/kernel. At 15°C and 32%RH, average populations dropped from 200,000 CFU/kernel to 99,000 CFU/kernel. At 25°C and 32%RH, average populations dropped from 200,000 CFU/kernel to 4400 CFU/kernel. At 35°C and 32%RH, average populations dropped from 200,000 CFU/kernel to only 20 CFU/kernel.

Development of a Seed Health Test for Goss' Wilt of Corn:

I have been working closely with a graduate student from the ISU Seed Science Center to develop a selective agar medium for seed health testing for Goss' bacterial wilt. Goss' wilt is becoming an important phytosanitary concern in the international movement of seed corn. There is no reliable seed health test for this pathogen. A promising medium has been developed, and bacterial isolation techniques are being optimized.

We purchased an ELISA plate reader and a Class II Biological Safety Cabinet (vertical laminar flow) for microbiological work.

Meetings/presentations:

February:	Attended 7th International Corn Conference and NCR-25 committee meetings at St. Louis.
February:	Taught two classes on "ELISA techniques for identifying plant pathogens" at the ISU Practical Plant Pathology Workshop.
March:	Presented seminar on Biology of Seed Transmission of Stewart's Bacterial Wilt of Maize to the ISU Plant Pathology Department.
May:	Leadership Development Training Workshop.
August:	Attended the American Phytopathological Society Meeting at Indianapolis, meetings of the Seed Pathology committee and the Watermelon Fruit Blotch Working Group, and a workshop on Rapid Diagnostic Assays for Plant Pathogens.
December:	Gave an invited talk at the ASTA meetings in Chicago - "Assessing Risk of Seed Transmission of Stewart's Wilt."

Committees:

Greenhouse and Growth Chamber Committee (Agronomy Dept.); Strategic Planning Committee for Graduate Education (Agronomy Dept.), Accession Performance Report Committee (Plant Intro.), Computer Committee (Plant Intro.).

Training Sessions:

January:	Sexual Harassment Training
February:	Tractor Safety
March:	Dust Mask Training
May:	Worker Protection Standard Training
October:	Pesticide Applicator Training - seed treatment
October:	Pesticide Applicator Training - greenhouse
December:	Pesticide Applicator Training - 1A, 1B, 1C, 10

Publications:

Biology of Seed Transmission of Erwinia stewartii in Maize, Ph.D. dissertation,

August, 1997.

Plans for 1997:

Phytosanitary inspections of seed increase plots will continue for many crops. Without these inspections, we will be unable to ship seed to many countries without additional lab testing.

ELISA testing programs for squash mosaic virus and Stewart's disease of corn will continue.

The next cycles of evaluation, selection and inter-mating of Helianthus annuus plants will be conducted in the sunflower enhancement project.

The Eldredge popcorn collection (about 35 accessions) and 11 Peruvian corn accessions (resistant to European Corn borer) will be evaluated in replicated field trials for resistance to gray leaf spot, northern leaf blight, eyespot and rust.

The Goss' wilt seed health project will be completed in 1997.

Meetings/presentations:

Attend and present a poster at the 19th Annual Seed Technology Conference at Ames, February, 1997.

Attend the NCR-25 Corn and Sorghum Diseases committee meeting at St. Paul, February, 1997.

Attend the APS National Meeting with a poster or oral presentation at Rochester, NY in August, 1997.

D. Farm (L. Lockhart, M. Czajkowski, 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 80 pesticide applications in the field and/or greenhouses. We responded to 189 maintenance requests from staff members at the farm and the campus location. We coordinated and scheduled the student labor force of 20.0 FTEs. We coordinated facility construction and upgrades.

Labor:

During calendar year 1996, 147 applications for hourly employment were received and reviewed. There were 67 interviews resulting in 56 hourly employees hired. Three employees were dismissed for poor work performance and one for habitual tardiness. Currently there are 33 (14.9 FTEs) part-time hourly employees working at the NCRPIS.

NCRPIS Farm Crew:

We are now in our second year of assigning certain duties to particular staff members to allow each person to focus on areas where his strengths would be the most beneficial to the NCRPIS. This arrangement seems to be working well.

Jerry Scheuermann is handling the general farm equipment and vehicle maintenance. He successfully re-designed and constructed a furrow opener and a sprayer, and overhauled the two engines and a tractor clutch saving the NCRPIS several

thousand dollars in repair costs. Jerry also completed all repairs reported on the annual vehicle inspections.

Mike Czajkowski is handling lab equipment repair and design as well as facility repairs. This includes all electrical trouble-shooting and general facility upkeep. He builds and installs cable for in-house computer network systems. Mike is primarily responsible for pesticide applications in the field and greenhouses. He is also scheduling vehicle inspections and approves all repairs.

Maintenance projects completed:

Fiber optic and copper lines installed from campus to NCRPIS Farm
Completed phase one of field tiling project
Fire Suppression System installed in Entomology and Maintenance Shop/Machinery storage building
Installed Water Mains for Fire Suppression System
. Weatherization of Entomology greenhouse
Repair of headhouse ceiling and roof
Repair of headquarters roof
Installation of Entomology Greenhouse Alarm System
Construction of New Blower for Vegetable Crops
Renovated Hoffman Germinator
Installed Alarm System in Bee Overwintering Building
Painted and waxed various offices
Repair of campus greenhouse light fixtures
Renovated $LiCl_2$ dehumidification System to eliminate condensation problems

Tours:

This past year Larry Lockhart organized and conducted 21 tours. There were approximately 205 visitors to the NCRPIS during 1996.

Conferences, training, etc. attended:

Lock-out/Tag-out, EH&S
Electrical Safety, EH&S
Respirator Training Certification, EH&S, ISU
CPR Aid Training, ISU
ASA-CSSA-SSA Annual Meeting

Staff Training:

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

Committees:

NCRPIS Extension: Larry Lockhart served as Chairman. He is currently serving as a member of the ARS Campus Safety Committee.

Purchasing:

Larry Lockhart coordinated purchasing for the NCRPIS farm: this task included gathering and summarizing requests, writing specs, and obtaining supplies for the farm.

E. Controlled insect pollination program (C. Abel, R. Schweppe)

Progress:

Cage pollinations: Six-hundred sixty-two cages were supplied with pollinators for controlled pollination of 730 plant germplasm accessions. Honey bees were used to control pollinate 602 accessions. Osmia cornifrons were used to pollinate 112 Brassicaceae accessions and one accession of Sorbaria. A combination of Osmia cornifrons and honeybees were used to control pollinate 14 Brassicaceae accessions. One accession of Helianthus deserticola was regenerated in the greenhouse using Osmia cornifrons.

Beekeeping: One hundred seventy-two nucs were successfully wintered in the indoor wintering facility. Nuc survival was 56.5%, which is lower than the previous two years (69.0% and 75.4%). A cool spring kept the nuc colonies in the wintering facility until the second week of April. Further cool weather during the spring killed all but 36 of the 172 nucs. This fall, 304 nuc hives are being wintered indoors.

One hundred sixty-five large hives were successfully wintered in the indoor wintering facility. Hive survival was 98.8%. This fall, 180 large hives are being wintered indoors.

Varroa mite infestation rates were above acceptable levels Spring 1996 and Fall 1996. All hives were treated with Apistan after both sampling periods.

Seven-hundred worker honeybees sampled from 35 hives were analyzed for tracheal mite infestation. A 0.6% infestation level was found. No treatment was necessary. Infestation levels have remained <1% for the past five years despite not treating for the mite. We are continuing to select breeder queens from hives which are apparently tracheal-mite resistant.

Bombus: Twenty-four Bombus bimaculatus queens were captured this spring. No colonies were established from those queens. Extended cool weather during the spring months affected our ability to capture queens at the right stage for rearing colonies in the lab.

New two-compartment Bombus rearing domiciles were designed and built. The new domiciles will be easier to feed and will keep the brood nest area of the colony cleaner.

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

Osmia cornifrons: Twenty-two Osmia domiciles were distributed to 15 staff members who contributed to the Osmia rearing effort.

This year we began noticing a large increase of native Osmia lignaria nesting in our Osmia cornifrons nesting straws. From general observations these bees appeared to be as effective in working our Brassicaceae species as are Osmia cornifrons.
Cooperative work with Larry Charlet (Fargo, ND) was performed to determine if Osmia cornifrons are more efficient at pollinating sunflower in a northern climate during the summer. Results are pending.

Pollinator Studies: Honey bees, Bombus bimaculatus, and Osmia cornifrons were tested in Cuphea lanceolata and Cuphea ignia pollinator studies. The study will be performed a second year.

Honey bees, Bombus bimaculatus, and Osmia cornifrons were tested in a Helianthus petiolaris pollinator study. Results are pending.

Data gathered during Brassica regeneration in the field were used to further define the polylectic behavior of Osmia cornifrons.

Data to determine if a correlation existed between straw weight and adult bee number were gathered. If a correlation is found, we can evaluate our straws at the end of the year by taking straw weights rather than by x-raying each straw.

It was determined that the minimum length in the cold (1-4° C) was no greater than 17 weeks for Osmia cornifrons to break diapause. Another study will be performed this winter to further define the diapause requirement for this insect.

Future plans:

Publish research on the polylectic behavior of Osmia cornifrons.

Publish research on the correlation between straw weight and number of diapaused adult Osmia cornifrons contained within nesting straws.

Comparative study of Osmia cornifrons and Osmia lignaria pollination of Brassica napus, Brassica rapa, and Sinapis alba.

Acquire bees and technical advice on the use of Eumegachile pugnata from Vince Tepedino (Logan, UT).

Acquire bees and technical advice on the use of Ceritina spp. from Sharon Parker (Beltsville, MD).

Continue investigating pasture plantings for rearing Osmia cornifrons and other pollinating insects used at the NCRPIS.

Continue research on the diapause requirement for Osmia cornifrons. Publish research next summer.

Comparative study evaluating honey bees, Osmia cornifrons, Bombus bimaculatus, and Alfalfa leafcutting bees as pollinators of dill and coriander.

Miscellaneous:

Gave 12 presentations to visitors of the station.

Hosted six visiting scientists (three international).

Gave information and/or technical advice on 37 occasions to individuals or organizations on various insect pollinator issues.

Attended the 7th International Pollination Symposium in Lethbridge, Alberta, Canada.

Gave invited talk at the 1996 Iowa Honey Producers Association Annual Meeting in Marshalltown, IA titled “Pollination Work At The Plant Introduction Station”.

Filled 22 reprint requests for: Abel, C.A., R.L. Wilson, and J.C. Robbins. 1995. Evaluation of Peruvian maize for resistance to European corn borer (Lepidoptera: Pyralidae) leaf feeding and ovipositional preference. J. Econ. Entomol. 88(4): 1044-1048.

Filled 6 reprint requests for: Wilson, R.L., C.A. Abel, B.R. Wiseman, F.M. Davis, W.P. Williams, B.D. Barry, and W.H. White. 1995. Evaluation for multiple pest resistance in European corn borer, Ostrinia nubilalis, resistant maize accessions from Peru. J. Kan. Entomol. Soc. 68(3): 326-331.

Distributed two copies of my Master’s Thesis.

Completed course work in Plant Ecology (BOT 484), Teaching Experience (ENT 590U) Immature Insects (577), and Research (ENT 699).

Publications:

Widrlechner, M.P., C.A. Abel and R.L. Wilson. 1996. Ornamental seed production in field cages with insect pollinators. Combined Proceedings of the International Plant Propagators' Society, vol. 46. In Press.

Wilson, R.L. and C.A. Abel. 1996. Storage conditions for maintaining Osmia cornifrons (Hymenoptera: Megachilidae) for use in germplasm pollination. J. Kan. Entomol. Soc. In Press.

F. Zea Curation (M. Millard, T. Ladjahasan, D. Fuller)

Activities

Curatorial Information

Significant events

Flatbed scanning to produce images of ears and kernels is now integrated into the maize regeneration process. A single photograph of 25 ears of each regeneration has been replaced by 5-9 images of 3-5 ears each by an HP4C scanner. Additionally, a kernel sample image is also captured after processing. Soon, with the acquisition of a table saw with special safety equipment, ear cross-section images will also be captured. The database is organized locally in the Windows-95 directory structure. Web browsers like Netscape and Explorer can access the images in the database. Early in 1997 a sample of these images will be placed on the GRIN database and will be available on the World-Wide-Web.

The last 2 of 44 PVP reference inbreds (W117, W153R) were regenerated during the 1996 season and are currently undergoing purity tests with isozyme markers. All 44 PVP reference inbreds will be available to requesters in 100-seed quantities in 1997. These are also being used often by researchers as inbred checks.

We received a shipment of 175 accessions from Robert Peterson at the University of Minnesota on 11/25/96: 155 of these were public Minnesota inbreds, and 125 of these are new to the NPGS. Twenty population samples were received of which 13 may be new to the NPGS. As of 12/1/96, NPGS had 123 of the 241 dent, sweet, and pop inbreds listed in Gerdes et. al. 1993. In addition, NPGS holds 39 inbreds from Minnesota not listed in that publication.

Due to successes in regeneration on St. Croix and small quantities of original seed, the backlog of accessions held in quarantine, unavailable for distribution has been reduced from almost 500 accessions to about 100 accessions. Efforts in 1997 will focus on these last 100 accessions and increasing the population size of past regenerations.

Seven tropical hybrids were received from Dekalb Plant Genetics. These will represent improved tropical germplasm and will partially address a proposal by the Maize CGC to acquire tropical hybrids and maintain them as populations to provide clients with the most improved germplasm of this type. U.S. improved germplasm will be incorporated into the collection over time via inclusion of PVP accessions as their protection expires and through CSR registrations.

The NCRPIS farm is now linked via fiber optic cable into the Iowa State University network backbone and further into the Internet. Data transfer speeds between the farm and the Beltsville computer where the NCRPIS germplasm data resides have increased at least ten times. Additionally the maize curator was assigned a new Pentium 166 MHz computer. This should substantially improve data maintenance and use efficiency.

Acquisition:

New accessions received

During 1996, 690 Zea accessions were acquired. Among those acquired, 147 originated from the corn breeding program at the University of Minnesota. Three-hundred eighty accessions originated from the quarantine increase program managed by Esther Peregrine on St. Croix. Ninety-one accessions were received through Crop Science registrations. Dr. Coe at the University of Missouri donated several important older inbreds which had been molecularly typed there. The remainder of the 690 new accessions are mostly accessions formerly held only at NSSL and obtained by the NCRPIS to fill seed orders and to make the active collection more genetically representative.

Maintenance and distribution:

#/% available for distribution--69% percent (10,185) of the 14,804 accessions held in December 1996 were available for distribution. The largest portion of unavailable accessions continues to be the 1600 accessions in the Galinat-Mangelsdorf collection. The next largest block of unavailable accessions are 91 Crop Science Registered accessions which have been received five or less years ago. These CSR accessions are available from the donor until the five-year period have expired.

#/% distributed--We distributed 4415 packets of Zea seed in 1996. This represents 19% (2780) of all Zea accessions held at the NCRPIS. Last year's figures were 4339 packets representing 19% (2636) of the collection. Packet distribution was very similar to 1995 figures; however, there was a 38% increase in recipients of maize germplasm in 1996 over 1995. Two-hundred fifty-two orders were sent to 180 clients compared to 187 orders to 130 cooperators in 1995. A minor achievement for 1996 was that the first order for maize germplasm was sent to China in several years. Previously, Chinese cooperators were unable to secure import permits for maize from their government. Carlos Diaz Amaris at the Colombian maize germplasm bank was sent 25 accessions of 500 seed for regeneration. We had previously received the seed from their bank as part of the Goodman regeneration project. Hopefully, the NCRPIS will received a larger amount from this regeneration than is currently on hand. Additionally, 4000 seeds of 4 accessions previously received from them and regenerated on Puerto Rico was sent to replenish their supplies.

#/% duplicated at NSSL--NSSL has 68% (10185) of the Zea accessions held at the NCRPIS: **9675 of the 10,594 (91%) of the PI'ed accessions are backed up at NSSL.** Only a small shipment of 84 Zea accessions as made to NSSL in 1996. In 1996, as in 1995, the NCRPIS emphasized backing up other crops with a much lower percentage of accessions duplicated at NSSL. A review of 1000 accessions of Zea scheduled for PI-number assignment was planned for 1996, but a personnel change in early 1996 delayed this project until early 1997. PI assignment before shipment to NSSL increases the efficiency of the entire backup process.

#/% accessions regenerated--In 1996, 659 accessions were planted for regeneration as compared to 425 accessions in 1995. This represents just under 4.5% of the total Zea collection. The increase over 1995 was caused by smaller plantings of more accessions at the quarantine nursery on St. Croix. There were fewer original seeds available for planting. One-hundred seventy-six of the 659 grow-outs were planted in Ames field plantings as opposed to 261 in 1995. Flat budgets and increased salaries caused a further reduction in temporary staff available to this project. One hundred accessions were grown in Puerto Rico and 383 accessions were regenerated at the St. Croix quarantine nursery.

The nursery on Puerto Rico was hit indirectly by one hurricane and directly by a second hurricane in 1996. The quality and quantity of regenerations were reduced.

The hurricanes hit toward the end of the pollination period and early planted lines survived best. This is the first time this nursery has suffered hurricane damage in 10 years. The later St. Croix nursery also received a glancing blow from one of these hurricanes. The quality was much reduced on this nursery. The Ames nursery again suffered from early cool-wet conditions which delayed seedling emergence the longest in 16 years of the current curator's experience. In general, the nursery could be rated average, because later conditions favored the pollination and growth of many of the early inbreds planted in 1996.

Pioneer Hi-Bred International attempted to regenerate in their Chilean quarantine nursery 12 Chinese accessions which were held in quarantine. APHIS would not permit these accessions to be grown on St. Croix, so they would have had to been grown in a quarantine greenhouse in Beltsville. We are grateful for Pioneer's assistance.

#/% tested for viability--We tested the viability of 3.3% (498) of the Zea collection in 1996. This compares with 8% (1165) of the Zea accessions tested for viability in 1995, 12% (1687) in 1994, and 20% in 1993. The reduction over time is of concern. Several temporary factors are contributing to this decline. There were fewer regenerations in 1993, 1994, and 1995 requiring fewer germination tests for quality control. A new germination data capturing program is being prepared at the NCRPIS. Perhaps in 1997, the level will return to the 20% figure needed to adequately monitor collection status. Certainly the NCRPIS should try to test 10% of the collection every year.

#/% of collection with permanent PI accession numbers is 72% (10,594) of the total Zea accessions. Few temporary-numbered accessions were PI'ed in 1996, because of personnel changes. A new Germplasm Program Assistant was hired in 1996. Zea will become a priority crop for assigning permanent numbers in early 1997.

Significant progress--The nursery on St. Croix produced excellent quality seed in its first nursery in 1996, but the second nursery suffered from hurricane damage. The backlog of quarantined accessions has been significantly reduced. The numbers of accessions increased in 1996 approached numbers necessary to maintain the collection in a 20-30 year regeneration cycle. Although the number of regenerations was achieved due to smaller populations, a result of small original seed numbers, the numbers of new accessions available to cooperators increased in 1996.

Characterization/taxonomy:

#/% characterized/classified--The accessions grown in 1996 were characterized in a cursory fashion. Little progress was made in computerizing old data. Efforts were focused on obtaining good images for future data acquisition. Seventeen-hundred ninety-three images representing 163 accessions were obtained during the development stages of the database with the ISU Seed Science Imaging Lab. Later in 1996, the process was transferred to the NCRPIS farm, and 635 additional images on 211 accessions was obtained. To date, 2.5% (374) images of the collection have been placed in the local image database.

Significant progress--As mentioned earlier, accessions have been imaged with a color flatbed scanner, and an image database has been created. Photography was discontinued in 1996 and was replaced by digital images that can be used in the future for precise characterization of ear and kernel traits.

Evaluation:

#/% evaluated--74% (10,969) of the accessions in the collection have been evaluated for resistance to first-generation European Corn Borer.

Late-generation European corn borer resistance data will be loaded into GRIN in

1997. Data from evaluations performed by the NCRPIS entomology group in 1995 were loaded in 1996. To date, 16% (2316) of the accessions in the collection have been evaluated for resistance to second-generation European Corn Borer.

During the last six 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 increases are free of these diseases.

Significant progress--The first-generation European corn borer observation represents the highest percentage of the corn collection evaluated for any characteristic.

Enhancement and/or utilization:

#/% enhanced--No enhancement program has been undertaken with Zea at the NCRPIS. The NCRPIS is providing seed storage space for the intermediate stages of the GEM project headed by Linda Pollak, who 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.

Significant progress--GEM has sparked continued interest in those landraces used in the enhancement program. It has also sparked some interest in evaluating other accession in the collection for future enhancement.

Support/administrative personnel:

Significant accomplishments--The Zea technician continues to become more proficient with computers. This can only help the maize project move forward. He began documentation of procedures using internal network web pages.

Doug Fuller, a Research Associate working with Iowa State University's corn yield test program, again assisted the Zea curatorial effort for three months in the winter of 1996-97. He was of great value in the imaging area. Funding was reduced by Iowa State for the yield test and Doug's position was terminated; therefore, we will not have his services in 1997-98.

Travel and Meetings attended:

I attended the 1996 Maize CGC meeting at the American Seed Trade Association meetings in December in Chicago. Highlights of that meeting affecting the curatorial effort at Ames were:

1. The chairman, Dr. John Dudley presented the finished Maize Crop Germplasm Report, which will act as a guide for future maize curatorial activities.

2. Jim McClaren gave an expansive presentation of the National Corn Genome Initiative, followed by extensive discussion of the proposal. Concern was expressed about the project's cost of the project in relation to current corn research and what this might mean to existing corn research programs. McClaren assured the group that the lobbying effort was for "new" money.

3. Dr. Bretting presented the NCRPIS's proposal for gathering information from users of the NCRPIS's germplasm. It was received with favor with a comment that we should also try to capture such data on recent past distributions.

4. A lively discussion of the number of accessions backed up at the NSSL was initiated by Dr. Eberhart. The mistaken idea that several thousand accessions regenerated in the Goodman regeneration project were not backed up at NSSL was corrected to around 800 accessions. I indicated that the

NCRPIS would redouble our efforts to duplicate those accessions at NSSL in 1997.

5. Dr. Wilfredo Salhauna indicated that the NCRPIS should undertake a cooperative effort to produce a world inventory of maize germplasm accessions in conjunction with CIMMYT and the NSSL.

6. Discussions continued where maize accessions should be managed in active collections. The NCRPIS referred to early decisions by the CGC and our plans are to continue to pursue those decisions as resources permit.

I attended the NCR-167 meetings held in St. Louis in February along with the joint Regional Corn Conference meeting. I discussed with the members of the NCR-167 committee the willingness of the NCRPIS to obtain and distribute important public inbred lines. They agreed to cooperate in exchanging information, lists of accessions, and seed in the future.

While in St. Louis, I visited the Missouri Botanical Gardens. I discovered that they held information and museum specimens of some very old accessions gathered by Dr. Edgar Anderson. These specimens seem to correspond to accessions deposited at the NCRPIS in the 1950s by Dr. Bill Brown from Pioneer. Further correspondence and travel will be necessary to fully document these materials and their relationship to living collections. They may add to our knowledge of the few native U.S. corns.

I attended a GRIN advisory meeting held in December to discuss development of Windows-based forms for updating GRIN data.

Conclusions:

State of the program

In summary, we are keeping up with accession maintenance tasks, but again in 1996 as in several previous years we must say: "barely." Regeneration numbers need to be increased, and we need to improve the data for those accessions in the GRIN database. Designation of accessions for seed orders is still hindered by a lack of rapidly accessible data and the lack of certain accessions representing key variability in maize.

Strengths and weaknesses: what facilitated or hindered progress

The maize collection requires all of my working hours, and additional full-time permanent positions would be desirable. At present, many jobs are not done efficiently due to rapid personnel turnover. Travel to other nurseries must be rotated among personnel. Spring planting and fall harvests are delayed because of personnel shortages. Tasks of a more technical nature are not accomplished.

Future plans:

Acquisition plans

No accessions have been acquired to fulfill previous CGC recommendations that all Caribbean accessions held by CIMMYT should also be available at the NCRPIS, although an import permit that would enable us to do so was obtained in 1995. We will try to procure some of this material in 1997, as the budget allows. Dr. Taba Suketoshi visited in October and I agreed to send accessions from the NCRPIS collection that CIMMYT wants to regenerate and include in their collection. This should help with exchange in the opposite direction.

Maize from Guatemala, Bolivia, Ecuador, Paraguay, Venezuela, and Brazil is not

well-represented in the NCRPIS collection. We did receive some accessions from NSSL which improved this situation in 1994, but passport information must be reviewed to determine the provenance of these accessions. In 1995, LAMP top 5% accessions were received via CIMMYT and NSSL from Guatemala, Bolivia, and Venezuela. The NCRPIS should obtain at least the racial type collections from these countries to round out the representation relative to other countries in the active collection.

An orderly procurement of important older public inbred lines will continue in 1997 with the exchange of lists of lines currently held in the NPGS with public breeders. Next, those breeders will indicate which inbred lines they feel should be preserved. Because we have received seed from Minnesota, the focus on documentation and further acquisition of Minnesota accessions will continue. Next, because there is not a full time maize breeder at either Kansas or Michigan, the curator will pursue try to secure more germplasm from these states.

Maintenance:

A top priority in 1997 will again be to maintain regeneration numbers nearer to levels achieved in the late 1980s and early 90s.

Dr. Bill Tracy spent considerable time prior to 1995 selecting the most important materials to be conserved of the Crookham collection held by NSSL. I will try again in 1997 to begin regenerating some of these accessions.

We will attempt to regenerate about 50 accessions of the Galinat-Mangelsdorf collection. We will refine the passport data for these accessions.

One hundred accessions will be sent to Puerto Rico for tropical increase. The focus in 1997 will be to regenerate tropical CSR-registered inbred accessions not successfully regenerated on St. Croix or not previously regenerated by the NCRPIS.

Characterization and evaluation work

I will continue entering field book data into GRIN. Cooperator evaluation data which have arrived will be loaded in 1997. Original GEM accession evaluation data will be loaded into GRIN in cooperation with Dr. L. Pollak.

Experimental work requiring the maize program's resources

The cooperative agreement with the Seed Science Center at Iowa State University continues with residual funding from previous years. We will continue to incorporate the technology developed into the curatorial effort.

Travel

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

The Puerto Rico winter nursery will again require 2-3 weeks of my time in the spring of 1997. One or two other staff members will also be needed.

There may be a Germplasm Resources Information Network (GRIN) meeting in 1997. I may need to attend in my capacity as GRIN liaison and advisory committee member from the NCRPIS.

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

G. Vegetables (K. Reitsma)

Activities--General Summary

Acquisition:

New accessions: We received 119 new accessions in 1996, and 12 accessions were transferred to other sites as a result of reidentifications.

Status: There are currently 7531 vegetable accessions (5609 PI numbers, 1916 Ames numbers) with 4516 accessions (60%) available for distribution. In 1996, 4433 packets were distributed (2324 accessions, 31% of the vegetable collections) with 3619 packets distributed for domestic requests and 814 packets distributed for foreign requests. An additional 130 accessions were sent to NSSL for back up to total 3352 accessions (45%) duplicated at NSSL.

I have reviewed and updated passport data and accession record data for 1258 Cucumis, 114 Cucurbita, 34 Daucus, 8 Ocimum, and 20 miscellaneous umbels. Data were added or corrected in the following fields/records on GRIN: donor, collector, developer, origin, cooperator, habitat, pedigree, secondary identifiers, top name, and general narrative. I will continue to review passport data for accessions in the vegetable collections, especially in preparation for PI number assignments to accessions in the Cucumis, Cucurbita, Daucus, and Cichorium collections.

Activities--Specific Crop Summaries

ASPARAGUS

Acquisition:

New accessions received: 0

Status: 146 PI-numbers, 14 Ames-numbers, 160 total.

Maintenance and distribution:

#/% available for Distribution: As of December 1996, 31 (20%) of 160 accessions are available for distribution.

#/% distributed: Thirty-two packets (30 accessions, 19% of collection) were distributed in 1996. (32 packets domestic, 0 packets foreign.)

#/% duplicated at NSSL: Fourteen accessions (9%) of asparagus accessions are currently duplicated at NSSL.

#/% regenerated: Seed of Asparagus has not been regenerated at Ames since 1956. The Horticulturist maintains some ornamental accessions as plants in the campus greenhouse.

#/% tested for germinability/viability: All of the available accessions were germinated in 1991 to monitor seed viability. The five-year germination test for this collection will be done in 1997.

Significant progress: There has been no progress in maintaining the Asparagus collection. Asparagus germplasm is difficult to maintain as seed and it would be best if we could find a clonal repository for this collection (many accessions are dioecious or pollen-sterile). Greenhouse space at the NCRPIS is limited and therefore the NCRPIS is a poor site for maintaining the this collection.

Characterization/taxonomy:

#/% characterized/classified: Ninety-nine percent of the collection has country

of origin specified on GRIN, and 27% of these accessions have an alternate id on GRIN. No other characterization of the Asparagus collection has occurred. There are a few notes recorded in old field books, but these data cannot be entered on GRIN until descriptors are specified. There is no Asparagus Crop Germplasm Committee.

Significant progress: None.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CICHORIUM

Acquisition:

New accessions received: 1

Status: 62 PI-numbers, 157 Ames-numbers, 219 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 82 (37%) of 219 accessions of chicory are available.

#/% distributed: In 1996, 76 packets (76 accessions, 35% of collection) were distributed. (8 packets domestic, 68 packets foreign.)

#/% duplicated at NSSL: Forty-eight chicory accessions (22% of collection) are duplicated at NSSL.

#/% regenerated: No accessions were regenerated in 1996.

#/% tested for germinability/viability: None.

Characterization/taxonomy:

#/% characterized/classified: Only 33% of the chicory collection has the country of origin specified on GRIN. Field observations of accessions will be conducted before assignment of PI numbers.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS MELO

Acquisition:

New accessions received: 17

Status: 2408 PI-numbers, 625 Ames-numbers, 3033 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 1808 (60%) of 3033 accessions are available for distribution. This includes 236 Ames numbers, which will be reviewed for PI number assignment.

#/% distributed: In 1996, 763 accessions (25% of collection) were distributed for a total of 1072 packets (958 packets as domestic requests and 114 packets as foreign requests).

#/% duplicated at NSSL: The total number of melon accessions duplicated at NSSL is 1259 (42% of the collection).

#/% regenerated: The 227 accessions chosen for the 1996 melon regenerations again focused on germplasm collected in India in 1993 and China in 1994. Harvests were made of 202 melon (198 cage, 13 greenhouse) regenerations. Actual results of the 1996 increases will not be known until the crop is stored. All field-increase seeds were treated with a 1% HCl solution to clean seeds of possible seedborne pathogens.

The Assistant Scientist II (Plant Pathology) visually inspects cucurbit seedlings before they are transplanted to the field for regeneration and periodically during the growing season. This inspection process allows the pathologist to provide the "additional declaration" statements sometimes required with phytosanitary certificates for distribution of cucurbit seeds.

#/% tested for germinability/viability: Germination tests were preformed on 134 accessions regenerated in 1995. One hundred fifty-three of 154 accessions received in 1991 from Cheyenne, Wyoming were inactivated because the seed was no longer viable. This collection was composed primarily of old cultivars from the United States and Europe with seed lots dating back to the 1930s and 1940s.

Characterization/taxonomy:

#/% characterized/classified: Limited characterization data were taken at harvest because energies were focused on harvesting the fruits before frost.

Significant progress: Accession records updated for 1258 Cucumis.

Evaluation:

#/% evaluated and significant progress: No new evaluation data sets were received in 1996.

Enhancement:

#/% enhanced and significant progress: None, as there is no enhancement program in the vegetable crops at NCRPIS.

CUCUMIS SATIVUS

Acquisition:

New accessions received: 3

Status: 961 PI-numbers, 383 Ames-numbers, 1344 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 1076 (80%) of 1344 accessions are available for distribution, 334 are Ames numbers which will be reviewed for PI number assignment in 1997.

#/% distributed: In 1996, 2275 packets (920 accessions, 68% of collection) were

distributed, 2048 packets as domestic requests, 227 packets as foreign requests.

#/% duplicated at NSSL: There are 742 (55%) accessions duplicated at NSSL.

#/% regenerated: The 1996 regenerations include 126 cucumber accessions with harvests from 117 caged increases and 1 greenhouse increase.

The Assistant Scientist II (Plant Pathology) visually inspects cucurbit seedlings before they are transplanted to the field for regeneration and periodically during the growing season. This inspection process allows the pathologist to provide the "additional declaration" statements sometimes required with phytosanitary certificates for distribution of cucurbit seeds.

#/% tested for germinability/viability: Germinations were done on 154 accessions in 1996. Twenty accessions received in 1991 from Cheyenne, Wyoming were inactivated because the seed was no longer viable. This collection was composed primarily of old cultivars from the United States and Europe with seed lots dating back to the 1930s and 1940s.

Significant progress: Many of the unavailable accessions are "hard-to-handle", and require day-length manipulation, growth regulator treatment, or a longer growing season, to initiate flower and fruit production. This work must occur in the greenhouse (hand pollination is required) as time permits.

Characterization/taxonomy:

#/% characterized/classified: Basic notes for accession identification are recorded whenever an accession is regenerated. Due to insufficient crew and a need to harvest the fruit before frost, photography of fruit was stopped and only limited characterization notes were taken.

Significant progress: Updated accession records for 1258 Cucumis.

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS species (wild Cucumis)

Acquisition:

New accessions received: None.

Status: 277 PI-numbers, 14 Ames-numbers, 291 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 118 (41%) of 291 accessions are available for distribution.

#/% distributed: In 1996, 350 packets (116 accessions, 40% of collection) were distributed (160 packets domestic, 190 packets foreign).

#/% duplicated at NSSL: Twenty-two accessions are currently duplicated at NSSL.

#/% regenerated: No regenerations were attempted in 1996.

#/% tested for germinability/viability: None.

Significant progress: Accessions in this collection need special handling. Many species require long growing seasons or have become persistent weeds in observation fields. Greenhouse increases will be the primary means of regeneration at Ames.

Characterization/taxonomy:

#/% characterized/classified: All accessions have a country of origin specified on GRIN, and 41% of them have an alternate "id" on GRIN. Whenever an accession is regenerated a complete description of plant and fruit characteristics is recorded in field books and the fruits are photographed.

Significant progress: None.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCURBITA

Acquisition:

New accessions received: Ten accessions of Cucurbita pepo var. texana collected in Mississippi.

Status: 827 PI-numbers, 177 Ames-numbers, 1004 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 665 (65%) of 1004 accessions are available for distribution.

#/% distributed: A total of 15 packets (11 accessions, 1% of the collection) were distributed (6 packets domestic, 9 packets foreign).

#/% duplicated at NSSL: There are 472 accessions (47% of the collection) duplicated at NSSL.

#/% regenerated: Regenerations were attempted on 81 (8%) accessions, with 56 accessions transplanted to the field (50 for hand pollination, 16 for bee

pollination in cages). Fifteen accessions failed to germinate, and 10 accessions had immature fruits at harvest.

#/% tested for germinability/viability: Eight accessions received in 1991 from Cheyenne, Wyoming were inactivated because the seed was no longer viable. This collection was composed primarily of old cultivars from the United States and Europe with seed lots dating back to the 1930s and 1940s.

Characterization/taxonomy:

#/% characterized/classified: Due to insufficient time, only limited characterization notes were taken on fruits harvested from the 1996 regenerations. All accessions have the country of origin specified on GRIN, and 72% of the accessions have an alternate id.

The Assistant Scientist II (Plant Pathology) visually inspects cucurbit seedlings before they are transplanted to the field for regeneration each year. Because of the increasing concern about seedborne diseases in the cucurbits, we have begun to screen all Cucurbita seedlings for virus infection with an ELISA protocol before transplanting accessions to the field.

Significant progress: Updated accession records for 114 Cucurbita.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

DAUCUS

Acquisition:

New accessions received: 14

Status: 570 PI-numbers, 139 Ames-numbers, 709 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 510 (72%) of 709 accessions are available for distribution.

#/% distributed: In 1996, 377 packets (254 accessions, 36% of the collection) were distributed (291 packets domestic, 86 packets foreign).

#/% duplicated at NSSL: A total of 593 (84%) accessions is backed up at NSSL.

#/% regenerated: Regenerations were attempted on 24 accessions of carrots. Only one accession was transplanted to a field cage for pollination by bees. The other accessions failed in the vernalization chamber. We received increase seed for 9 of 10 accessions sent for regeneration to Roger Freeman, Sun Seeds, Brooks, Oregon. We did not receive notification in time to send another 10 accessions to Dr. Freeman for a 1997 regeneration planting. Twenty-five accessions were sent to Larry Baker, Asgrow Seed, Sun Prairie, Wisconsin for increase in 1996 and in 1997.

#/% tested for germinability/viability: Five-year germination tests were done on 377 seed lots in 1996. Eighty-six accessions received in 1991 from Cheyenne, Wyoming were inactivated because the seed was no longer viable. This collection was composed primarily of old cultivars from the United States and Europe with seed lots dating back to the 1930's and 1940's.

Characterization/taxonomy:

#/% characterized/classified: Ninety percent of the Daucus collection has country of origin specified on GRIN, and 43% of these accessions have an alternate id on GRIN. With the aid of the Horticulturist, each newly regenerated accession is reviewed for correct taxonomic identification.

Significant progress: Updated accession records for 34 Daucus.

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

OCIMUM

Acquisition:

New accessions received: 4

Status: 70 PI-numbers, 9 Ames-numbers, 79 total.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 41 (52%) of 79 accessions are available for distribution.

#/% distributed: In 1996, 108 packets (67 accessions, 84% of the collection) were distributed. (108 packets domestic, 0 packets foreign).

#/% duplicated at NSSL: Forty-six accessions (58%) are duplicated at NSSL.

#/% regenerated: None.

#/% tested for germinability/viability: None.

Characterization/taxonomy:

#/% characterized/classified: Ninety-five percent of the collection has country of origin specified on GRIN, and 49% of these accessions have an alternate id on GRIN.

No descriptors have been determined for this crop. (Some field book notes have been put in Key Entry files, but we must determine what information should be entered into GRIN and its format.)

Significant progress: Updated accession records for 8 Ocimum.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement: None.

#/% enhanced and significant progress: One accession, PI 358465, from Yugoslavia, is the progenitor of the newly released lemon basil 'Sweet Dani' bred by J. E. Simon and Mario Morales of the Center for New Crops and Plant Products, Purdue University.

UMBELS

Acquisition:

New accessions received: We received 70 new umbel accessions: 5 Ammi, 11 Angelica, 6 Carum, 7 Chaerophyllum, 2 Cuminum, 10 Eryngium, 5 Ferula, 2 Foeniculum, 3 Levisticum, 6 Pastinaca, 6 Pimpinella, 2 Sium, 1 Trachyspermum, 4 unidentified Apiaceae.

Status: The NC7-umbels sitecrop has 337 PI-numbers, 348 Ames-numbers, for a total

of 688 accessions including: 11 Ammi, 81 Anethum, 29 Angelica, 1 Astrantia, 3 Astrodaucus, 20 Bifora, 1 Bunium, 22 Carum, 1 Caucalis, 16 Chaerophyllum, 128 Coriandrum, 1 Crithmum, 23 Cuminum, 1 Ducrosia, 24 Eryngium, 12 Ferula, 44 Foeniculum, 4 Levisticum, 1 Muretia, 48 Pastinaca, 148 Petroselinum, 40 Pimpinella, 1 Scaligeria, 1 Schumannia, 4 Sium, 11 Torilis, 1 Trachymene, 1 Trachyspermum, and 9 unidentified Apiaceae.

Maintenance and distribution:

#/% available for distribution: As of December 1996, 196 (28%) of 688 accessions are available for distribution.

#/% distributed: Of 128 packets distributed (87 accessions, 13% of the collection), 8 packets were shipped for domestic requests, and 120 packets for foreign requests.

#/% duplicated at NSSL: Only 156 accessions (23%) are duplicated at NSSL.

#/% regenerated: No successful regenerations in 1996.

#/% tested for germinability/viability: Although no specific germination testing was performed on the umbels, a large percentage of the accessions in this site crop will be inactivated because of previous germination results and the failure of the accessions to germinate for regenerations.

Significant progress: None.

Characterization/taxonomy:

#/% characterized/classified: Eighty-four percent of the accessions in the NC7-umbels sitecrop have country of origin specified in GRIN, and 45% of these accessions have an alternate id in GRIN. There are a number of misidentifications in this sitecrop. Herbarium specimens will be prepared and sent to Beltsville, MD for reidentification of accessions if the Horticulturist and I are unable to reidentify the accessions ourselves.

Significant progress: Updated accession records for 20 umbels.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

Conclusions:

Meetings attended:

February 4, I attended the Cucurbit Crop Germplasm Committee meeting and the Watermelon Researchers Committee meeting in Greensboro, North Carolina.

May 1, I attended the Teamwork Culture Re-check as follow-up to training provided to the staff of the NCRPIS in 1995 through the Leadership Development Center (Peoria, IL), to improve personal and NCRPIS staff teamwork skills. The facilitator was Bob Farquhar.

October 6-9, I attended the following meetings held in conjunction with the American Society for Horticultural Science (ASHS), in Lexington, Kentucky:

- Root and Bulb Vegetable Crop Germplasm Committee

- Leafy Vegetable Crop Germplasm Committee
- Cucurbit Genetics Cooperative
- Squash Breeders Working Group
- Vegetable Breeders Working Group
- Genetics and Germplasm Working Group (I will serve as secretary of this working group for 1997, Vice Chair for 1998, and Chair for 1999)

H. Crucifers and Grasses (R. Luhman)

Acquisition:

In 1996 the NCRPIS logged into the GRIN database 99 new Brassicaceae accessions, two new millet accessions, and 15 new Linum accessions (Table 1).

Table 1: Numbers of accessions received in calendar year 1996.

GENUS	TOTAL ACCESSIONS	ACCESSIONS ACQUIRED	PERCENT ACQUIRED
Alliaria	45	3	6.7
Alyssum	36	1	2.8
Berteroa	12	1	8.3
Brassica	3139	48	1.5
Camelina	24	5	20.8
Crambe	225	4	1.8
Eruca	169	8	4.7
Erucastrum	21	2	9.5
Erysimum	64	1	1.6
Iberis	4	1	25.0
Isatis	14	1	7.1
Lepidium	122	8	6.6
Linum	127	15	11.8
Matthiola	13	2	15.4
Setaria	984	2	0.2
Sinapis	156	11	7.1
Thlaspi	16	3	18.8
All Others	1349	0	0.0
TOTAL	6520	116	1.8

Maintenance and distribution:

About 64% of the accessions that I maintain have Plant Introduction numbers and about 56% are available for distribution (Table 2). One-thousand three-hundred thirty-one Brassica accessions received in 1988 from the National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois lack Plant Introduction numbers. Oil analysis information has arrived from the NCAUR for this Brassica shipment. We will analyze this information and then make decisions about formal entry of these accessions into the NPGS.

Table 2: Total and Available NCRPIS Accessions:

GENUS	TOTAL ACCESSIONS	ACCESSIONS WITH PI NUMBERS	PERCENT ACCESSIONS WITH PI NUMBERS	AVAILABLE ACCESSIONS	PERCENT AVAILABLE ACCESSIONS
Brassica	3139	1522	48.5	1393	44.3
Echinochloa	219	160	73.1	136	62.1
Linum	127	74	58.3	10	7.9
Panicum	980	911	93.0	825	84.2
Setaria	984	950	96.5	789	80.2
Other Crucifers	963	481	49.9	495	51.4
Other Grasses	108	42	38.9	12	11.1
TOTAL	6520	4140	63.5	3659	56.1

In 1996, we distributed seed from 11 of the 34 genera that I curate. Thirty-three U.S. and 25 foreign orders were shipped representing 336 and 1286 packets of seed, respectively (Table 3).

Currently, about 86% of these accessions are backed up at the National Seed Storage Laboratory (Table 4). This is an increase of 13% over 1995.

Table 3: 1996 Distributions.

GENUS	TOTAL ACCESSIONS	DOMESTIC ITEMS DISTRIBUTED	FOREIGN ITEMS DISTRIBUTED	DOMESTIC ACCESSIONS DISTRIBUTED	FOREIGN ACCESSIONS DISTRIBUTED	TOTAL ITEMS DISTRIBUTED	TOTAL ACCESSIONS DISTRIBUTED	PERCENT ACCESSIONS DISTRIBUTED
Brassica	3139	186	759	172	685	945	802	25.5
Camelina	24	0	8	0	8	8	8	33.3
Crambe	225	110	87	100	52	197	102	45.3
Echinochloa	219	16	0	16	0	16	16	7.3
Eruca	169	0	175	0	145	175	145	85.8
Lepidium	122	1	11	1	8	12	9	7.4
Panicum	980	2	10	2	10	12	12	1.2
Setaria	984	19	168	16	156	397	314	31.9
Sinapis	156	1	67	1	43	68	43	27.6
Thlaspi	16	0	1	0	1	1	1	6.3
Tridens	69	1	0	1	0	1	1	1.4
All Others	417	0	0	0	0	0	0	0
TOTAL	6520	336	1286	309	1108	1832	1453	23.7

Table 4: Numbers of accessions backed up at the National Seed Storage Laboratory.

GENUS	TOTAL ACCESSIONS	ACCESSIONS BACKED UP	PERCENT BACKED UP	# BACKED UP IN 1996
Alliaria	45	3	6.7	3
Alyssum	36	9	25	8
Apera	5	5	100	5
Aurinia	2	1	50	1
Berteroa	12	11	91.7	11
Biscutella	16	1	6.3	1
Brassica	3139	3009	95.9	0
Brassicoraphanus	1	1	100	1
Camelina	24	13	54.2	13
Christolea	1	1	100	1
Crambe	225	149	66.2	81
Echinochloa	219	163	74.4	151
Eruca	169	151	89.3	40
Erucastrum	21	6	28.6	5
Erysimum	64	21	32.8	21
Iberis	4	3	75	1
Lepidium	122	93	76.2	57
Matthiola	13	1	7.7	1
Panicum	980	850	86.7	90
Schedonnardus	1	1	100	1
Setaria	984	906	92.1	243
Sinapis	156	134	85.9	112
Thlaspi	16	8	50	7
Tricholaena	6	6	100	6
Tridens	69	23	33.3	23
All Others	190	9	99.6	0
TOTAL	6520	5578	85.5	2879

For the first time in 1996, we utilized Osmia cornifrons as the exclusive pollinator of our Brassicaceae regenerations. During this season we attempted to regenerate 162 accessions (Table 5). Six of these accessions were actually started in the greenhouse in 1994. Harvests were made of 99 accessions. The majority of the difference between attempts and harvests can be attributed to only two of the 40 Alliaria germinating. Additionally, some of the wild material will remain in the field to see if (1) it will overwinter and (2) to attempt to achieve a harvest or a better harvest in 1997. Green peach aphids were a serious problem in 1996, and some of the early maturing accessions did not have a very good harvest. Also in 1996, fifty lots were grown to verify species identity from previous Plant Introductions separations. For most of these separations, new PI numbers will be requested.

We attempted to regenerate 82 grass (Echinochloa, Panicum, and Setaria) accessions in 1996 (Table 5). Most of the material attempted was from the deWet collection (University of Illinois Crop Evolution Lab). Thirty-two of those accessions did not germinate and will be inactivated.

Table 6 indicates that 149 germinations (131 accessions) were completed during calendar year 1996.

Table 5: 1996 Regeneration.

GENUS	TOTAL ACCESSIONS	ATTEMPTED REGENERATIONS (LOTS)	ATTEMPTED REGENERATIONS (ACCESSIONS)	HARVESTED REGENERATIONS (LOTS)	HARVESTED REGENERATIONS (ACCESSIONS)	GROWN FOR OBSERVATION (LOTS)
Alliaria	45	40	40	**2**	**2**	0
Alyssum	36	1	1	1	1	0
Biscutella	16	5	5	1	1	0
Brassica	3139	56	52	43	41	50
Camelina	24	10	10	9	9	0
Chorispora	1	1	1	1	1	0
Christolea	1	2	1	0	0	0
Crambe	225	5	4	2	2	0
Echinochloa	219	22	20	5	5	0
Enarthrocarpus	3	1	1	1	1	0
Eruca	169	16	10	16	10	0
Erucastrum	21	11	11	12	12	0
Goldbachia	3	1	1	1	1	0
Lepidium	122	3	3	3	3	0
Matthiola	13	3	3	1	1	0
Panicum	980	59	42	34	30	0
Setaria	984	23	20	13	12	0
Sinapis	156	20	19	15	15	0
All Others	363	0	0	0	0	0
TOTAL	6520	279	244	160	146	50

TABLE 6: Germinations performed in calendar year 1996.

GENUS	TOTAL ACCESSIONS	PACKETS GERMINATED	ACCESSIONS GERMINATED	PERCENT ACCESSIONS GERMINATED
Aurinia	2	1	1	50
Brassica	3139	116	101	3.2
Crambe	225	16	13	5.8
Erucastrum	21	2	2	9.5
Lepidium	122	5	5	4.1
Linum	127	5	5	3.9
Sinapis	156	3	3	1.9
Thlaspi	16	1	1	6.3
All Others	2712	0	0	0
TOTAL	6520	149	131	2

Characterization/taxonomy:

During the 1996 Brassicaceae increase, flowering date, corolla color, silique arrangement, plant height, harvest date(s), and number of plants harvested were recorded. For the grass increase, heading date, stem number, texture, habit, leaf number and width, panicle length, width, and type, harvest date(s) and number of plants harvested were recorded.

Nine-hundred eighteen Brassica observations (data for 128 accessions) were entered into GRIN.

Fifty Brassica inventory lots were grown for identification purposes only. These lots were separations from current PI numbers and were identified to species in the field. New PI numbers will be requested for these lots.

Meetings attended:

1. Communication training-conducted by Bob Farquhar (Leadership Development Center, Peoria, IL).

2. Forage and Turf Grass Crop Germplasm Committee Meetings
   A. Griffin, Georgia (September)
   B. Indianapolis, Indiana (November)-in conjunction with the ASA meetings.

3. Crucifer Crop Germplasm Committee Meeting (November)-in conjunction with the ASA meetings.

4. NetWare training sessions
   A. September
   B. November

Publications:

None.

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 the Systems Support Specialist.

B. Assisted with fiber optics hookups.

C. Assisted with installation of backup system software and hardware.

D. Assisted with campus printer installation.

E. Installed software for NCRPIS workstations.

F. Server maintenance.

2. I served on the following committees:

A. Computer Committee

B. Communications Committee

C. Curators' Committee

D. Extension Committee

Future Activities:

The 1995 and 1996 Brassica and grass regenerations will be stored.

New Plant Introduction numbers will be requested for the separations that were identified to species in the field in 1996.

An attempt will be made to determine which lines should be retained from the NCAUR Brassica collection.

The 1997 field regeneration will include ca. 150 Brassicaceae accessions and ca. 50 grass accessions.

I will be requesting several Brassica accessions from the Australian Temperate Field Crops Collection in Horsham, VIC, Australia.

I will be checking the Brassica and millet accessions 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.

I will perform computer related tasks as needed.

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

AMARANTHUS: 3,299 accessions.

Acquisition and inactivation:

One-hundred twenty-five accessions were acquired, including wild species from Brazil and accessions collected by S.K. Jain in India before 1980, used in research at U.C. Davis in the 1980s.

Sixteen accessions were inactivated or merged due to duplication within the collection.

Maintenance and distribution:

1996	#	% of collection
Accessions available for distribution	2049	62
Seed orders	44	NA
Packets distributed	550	NA
Accessions distributed	239	7
Accessions backed-up at NSSL	3000	91
Accessions planted to regenerate in 1996	295	9
Accessions germination tested in 1996	220	7

We sent 1,669 accessions to NSSL for back-up.

Four accession received new PI numbers.

Temperatures in greenhouse rooms containing amaranth populations for seed increase dropped to below 0°C overnight from February 3 to 4, 1996 when the heating system (steam line) failed. Many amaranth plants were lost, but the populations can be regrown from remnant seeds.

Characterization/taxonomy/evaluation:

In 1996; 8,662 observations were loaded into GRIN. These data include 100-seed weights, and other smaller data sets.

Two-hundred seventy-two accessions were re-identified. Most identifications were based on grow-outs during regenerations; 899 (27%) amaranth accessions are still identified only to genus.

Leon Weber of the Rodale Institute donated extensive files of articles. These papers significantly improve our access to scientific information.

An Amaranthus hypochondriacus accession Ames 2084 (seed lot: 83ncai01) had many male flowers, but no female flowers on almost 100 percent of the plants in a field planting. I am repeating the planting in a greenhouse to confirm the observation. The control of this trait remains to be determined. An accession (PI 568150) was found to have seeds with pink embryos and opaque endosperm. This combination of these common traits was previously unknown.

Enhancement and/or utilization:

Under short-day (10-hour) conditions, an accession of Amaranthus pumilus (PI 553080) flowered with 100% female flowers. Exclusive female flowering interferes with seed set, but if it can be repeated by using 10-hour day lengths; it could be useful for making hybrids. Other Amaranthus species have mixed gender flowering under the same conditions.

Amaranthus hypochondriacus plants with determinate flowering and white seeds were recovered in a F_2 hybrid population at the NCRPIS. The enhanced population could become useful in crop improvement.

Plans:

I plan to enter characterization data on seed shapes and colors into GRIN. These data are nearly ready for loading. Each distribution lot was characterized for color and shape in 1996 by Paul Maiefski and Ronald Schweppe.

I plan to help organize an Amaranth Institute meeting at the Plant Introduction Station here in Ames on August 8, 1997.

I plan to edit the ninth issue of Legacy, the Amaranth Institute newsletter, which will be published in the summer of 1997.

CELOSIA: 30 accessions.

Acquisition: One accession was transferred from NSSL.
Nine accessions were reactivated from inactive storage, correcting a previous error.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	12	40
Seed orders	2	NA
Packets distributed	6	NA
Accessions distributed	6	20
Accessions backed-up at NSSL	12	40
Accessions planted for regeneration	1	3
Accessions germination tested in 1996	0	0

Seven accessions were sent for back up at NSSL.

Characterization/taxonomy/evaluation:

Plans:

Twenty of the large seed lots should be germination tested in 1997.

An accession was planted in 1996 for cage pollination in the greenhouse with Osmia bees during the winter of 1997. If this works well, it is a potential solution to our regeneration bottleneck. Many of our accessions need bee pollination, but flower too late for field cages.

Two accessions of Gomphrena were requested from the NSSL. These are actively distributed as virus indexing accessions and need regeneration. They will be the first Gomphrena accessions here, even though we have long been the priority site for the genus. For management purposes, the accessions will be grouped with Celosia , a related genus, which has similar growth requirements.

CHENOPODIUM: 223 accessions.

Acquisition: 14 accessions, including four minor vegetable species and ten transferred from NSSL, were acquired in 1996.

Two accessions were merged due to duplication.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	155	70
Seed orders	14	NA
Packets distributed	311	NA
Accessions distributed	131	59
Accessions backed-up at NSSL	160	71
Accessions planted for regeneration in 1996	41	18
Accessions germination tested in 1996	120	53

One-hundred eleven accessions were sent for backup at NSSL. Three accessions received new PI numbers.

Plans:

The Chenopodium collection will have highest priority for assigning PI numbers to accessions with temporary Ames and NSSL numbers.

DALEA, GALEGA, MARINA, and SECURIGERA: 200 accessions.

***Acquisition*:** Thirty new accessions of Dalea, Galega, and Securigera were collected in the Russian Federation by an NPGS-sponsored expedition. Two accessions were transferred from NSSL.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	90	45
Seed orders	3	NA
Packets distributed	9	NA
Accessions distributed	9	4.5
Accessions backed-up at NSSL	100	50
Accessions regenerated in 1996	0	0
Accessions planted for harvests in 1996	0	0
Accessions germination tested in 1996	24	12

Thirty-one accessions were sent for back-up at NSSL. New PI numbers were assigned to two accessions.

The Desert Legume Program in Tucson, Arizona has put its germplasm holdings on GRIN. The holdings there include 70 accessions in these genera, most are Dalea.

After consultation with Dr. John Wiersema in Beltsville, we have adopted the international standard of splitting Coronilla into smaller genera; therefore crownvetch, Coronilla varia, is now Securigera varia in GRIN. "Coronilla" is listed as a one of its common names.

MELILOTUS: 896 accessions.

Acquisition: Twenty-one accessions, including eleven transferred from NSSL, and ten new collections from the Russian Federation, were acquired in 1996.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	651	73
Seed orders	4	NA
Packets distributed	719	NA
Accessions distributed	651	73
Accessions backed-up at NSSL	850	95
Accessions regenerated in 1996	0	0
Accessions planted for 1997	0	0
Accessions germination tested in 1996	80	9

One-hundred forty-seven accessions were sent for back-up at NSSL. Four accessions were inactivated due to inviability.

The large number of accessions distributed this year is due to a seed order for all available accessions from Dr. Mei Sun at Hong Kong University. The germplasm will be used for taxonomic evaluation by one of her graduate students.

Dr. Charles E. Brummer at Iowa State University has begun Melilotus forage research and has requested seeds.

The Desert Legume Program in Tucson, Arizona has put its germplasm holdings on GRIN. They include 7 accessions of Melilotus.

Characterization/taxonomy/evaluation:

We loaded 1,133 observations from a 1990 project led by Rumbaugh and Pendery in Utah into the observation part of GRIN.

Thirty new PI numbers were assigned.

Plans:

I plan to start seedlings in October 1997 for seed harvests in the summer of 1998. 1998 will be a regeneration year for Melilotus and will be followed by two or more years without regenerations as recommended by the Clover and Special Purpose Legume CGC.

PERILLA: 19 accessions.

Acquisition: None.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	19	100
Seed orders	4	NA
Packets distributed	26	NA
Accessions distributed	10	53
Accessions backed-up at NSSL	19	100
Accessions regenerated in 1996	0	0
Accessions germination tested in 1996	3	16

Four accessions were sent for back up at NSSL.

Two new PI numbers were assigned.

Plans:

We hope to acquire an ornamental accession with green foliage.

SPINACIA: 364 accessions.

Acquisition: Sixty-six accessions were transferred from NSSL.

Maintenance and distribution:

1996	#	% of total number of accessions
Accessions available for distribution	217	60
Seed orders	6	NA
Packets distributed	1,063	NA
Accessions distributed	218	60
Accessions backed-up at NSSL	340	93
Accessions planted for regeneration in 1997	103	28
Accessions germination tested in 1996	60	16

One-hundred accessions were sent to Joe Kojima of the Sakata Seed Company in Salinas, California for regeneration using facilities and labor donated without charge by the Sakata Seed Company and by Ed Ryder of the USDA.

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

All available accessions were distributed from this collection four times. This unprecedented demand was from the breeding projects of private seed companies. A new race of downy mildew (blue mold) (Peronospora farinosa) race 5 has appeared and become very harmful in Europe. Plant breeders are seeking any source of disease resistance.

Characterization/taxonomy/evaluation:

A draft of new descriptors was presented to the Leafy Vegetables CGC at the meeting in October 1996. No action has been taken on editing or approving them.

Plans:

Cooperation with the seed regeneration group in Salinas, California will be continued.

I plan to concentrate my regeneration and acquisition efforts on the wild species of Spinacia. I believe that the wild germplasm is under-represented in the collection, and will become useful. Only three accessions in GRIN are listed under the taxonomic names of wild species, and none is available for distribution.

Miscellaneous progress involving several crops:

I requested samples of the accessions of my crops that were held only at NSSL. These accessions were integrated in the NCRPIS collections to safeguard them via duplication and to manage them better.

I prepared and presented three written progress reports for Crop Germplasm Committees.

I cooperated with Clover and Special Purpose Legume CGC members in preparing a

germplasm status report. My contribution included writing most of the collection priorities section, and preparing a table of collection size, location, and curator for the 98 genera clearly included in the CGC's mandate.

Information orders

In addition to distributing seeds I distribute information. The information is often included in undocumented conversations. However, separate information requests (even for multiple facts) were counted once, in the most appropriate of the following four categories. This excludes information directly linked to preparing a seed order, or to reprint requests. In addition to these requests, printed information was distributed frequently regarding commercial seed sources and growing amaranth germplasm.

8 Administering seed orders (When will my seeds arrive?)

10 Reference for the general public (Information for school reports)

43 Referral to people or to standard published references (How do I market amaranth grain?)

40 Advice about accessions, procedures, technical literature

Professional meetings attended:

American Society for Horticultural Science, Lexington, Kentucky, October 6-10, 1996.

Agronomy Society of America, Indianapolis, Indiana, November 3-8, 1996.

Publications and presentations:

Brenner, D.M. 1996. An amaranth tour of China. Legacy 9:11-12.

Brenner, D.M. 1995. Amaranth. 1995. Permanent internet posting at: http://www.ars-grin.gov/ars/MidWest/Ames/crops/amaranth.html.

I edited the 1996 issue of Legacy, the official newsletter of the Amaranth Institute.

Acknowledgements:

Ronald Schweppe worked with me all year, on loan from the entomology project. His good work allowed me additional hours in the office for loading data into GRIN and other projects. Ron Schweppe and our student crew member, Paul Maiefski, are both experienced and skillful. Thanks to their work, this year has gone very smoothly. Heath Paulson was on the crew in the spring and was partly responsible for the excellent accuracy of our seed-weight data.

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

Acquisition:

New accessions:

In 1996, 21 Helianthus accessions were received and logged into GRIN. Nine of these accessions were cultivated Helianthus annuus and the remaining accessions were of various wild Helianthus species. Additionally, four new Vernonia accessions were acquired (one accession for each of the following: V. fasciculata, V. noveboracensis, V. gigantea, and V. patula).

Maintenance and distribution:

The status of the Helianthus collection is summarized in Table 1.

Seventy-three of the 273 miscellaneous asters (27%) are available for distribution. Fifty-eight accessions (21% of the collection) have PI numbers.

Original seed lots for both the Helianthus collection and the miscellaneous aster collection were inventoried and relocated into the -18°C seed storage facility.

#/% distributed--Sixty-four separate Helianthus requests (15 foreign and 49 domestic) were received and 3137 packets representing 1507 accessions (41% of the collection) were distributed. Compared to 1995, Helianthus germplasm requests decreased 15% but packet distribution increased 4%.

Nine Vernonia packets were distributed to three requestors (two foreign and one domestic).

#/% duplicated at NSSL--1028 Helianthus accessions were sent to NSSL; 56% (2035 accessions) of the total collection is now duplicated.

Thirty-two accessions of miscellaneous asters were sent to NSSL; 20% (54 accessions) of the total collection is now duplicated.

#/% regenerated--1996 greenhouse regenerations were conducted on 27 cultivated H. annuus accessions with limited original seed quantity or poor seed quality. Twelve cultivated accessions were planted for a late-summer greenhouse increase. Hand-pollinated field increases were attempted on 114 cultivated accessions, including one accession regenerated by Pioneer Hi-Bred International, Woodland, California. Five additional cultivated H. annuus accessions were insect-pollinated in cages. One hundred forty-four (144) wild, annual accessions were germinated for regeneration and 131 of these accessions were transplanted for controlled pollinations. Nine perennial Helianthus accessions were germinated and transplanted to the field and tubers were harvested from four H. tuberosus accessions.

1996 field regenerations were attempted on 12 Vernonia accessions. Eight accessions did not germinate and the four remaining accessions were transplanted into cages for controlled pollinations. Seed was harvested from two accessions and one accessions was relocated into a greenhouse on October 15, 1996.

Implementation of the perennial Helianthus management program continued; as planned, 23 perennial plots were removed. Twenty-four new sunflower cages (10x10x20) were fabricated.

#/% tested for germinability/viability--Viability tests were conducted on 185 Helianthus inventory lots.

Significant progress--The inventory lot codes for all Helianthus accessions with perennial plantings were reviewed and corrected on GRIN. The 'NC7-sun.tubers' inventory maintenance group was merged with the 'NC7-sun.wilds' maintenance group.

Characterization/taxonomy/evaluation:

Plant and achene characterization data were recorded for all increases. Descriptor definitions and GRIN data were reviewed and corrected when necessary.

Forty-five (45) Helianthus accessions were inactivated, duplication of 24 accessions was eliminated by combining similar accessions under one Ames or PI number, and nine accessions were re-identified (seven to other Helianthus species and two to different genera). The origins for Helianthus accessions were reviewed

and corrections made on GRIN.

Significant progress--Data from 1990-1996 were loaded into GRIN. In total, 23,888 observations were added for 1772 accessions.

Research:

A second-year pollinator study conducted jointly with the Entomology project investigated the effectiveness of honey bees, Osmia cornifrons, and bumble bees as pollinators of H. petiolaris.

Professional development (I. Larsen):

Training activities:

Completed the following Iowa State University courses:
Principles of Plant Pathology (Plant Pathology 407)
Seed Science and Technology (Agronomy 338)

Completed pesticide applicators recertification courses in the following categories:
1A - weed control
1B - insect control
1D - fruit and vegetable pest control
3G - greenhouse pest management

Meetings/Seminars attended:

The 18th Sunflower Research Workshop, January 11-12, 1996 (Fargo, ND).

Participated in the final group meeting with Mr. Bob Farquhar, The Leadership Development Center, to improve the NCRPIS's teamwork culture.

Significant accomplishments:

In cooperation with Jerry Scheuermann, an existing field trenching system was adapted to accommodate the needs of the sunflower germplasm management program. The resulting trenching system replaces the use of 'dibble sticks' in transplanting sunflower, increasing transplanting efficiency.

Professional development (M. Brothers):

Meetings/Seminars attended***:***

The 18th Sunflower Research Workshop, January 11-12, 1996 (Fargo, ND).

Federal Injury Compensation Training, September 10, 1996 (Ames, IA).

New Crops Germplasm Committee, November 3, 1996 (Indianapolis, IN).

ASA-CSSA-SSSA annual meetings, November 3-8, 1996 (Indianapolis, IN).

Category 3 Scientist Focus Group, December 5, 1996 (Ames, IA).

Participated in the final group meeting with Mr. Bob Farquhar, The Leadership Development Center, to improve the NCRPIS's teamwork culture.

Served on the following: Extension committee, Viability committee, ARS campus safety committee, and Biological Science Laboratory Technician selection committee.

Presentations or seminars***:***

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

Brothers, M.E. North Central Regional Plant Introduction Station's sunflower collection. Presentation at the Sunflower Research Workshop, January 11, 1996.

R.C. Cronn, M.E. Brothers, K.M. Klier, P.K. Bretting, and J.F. Wendel. Isozyme Genetic Markers and Helianthus Germplasm Management. Poster presented at the ASA-CSSA-SSSA Meetings, November 8, 1996.

Future plans:

Regenerate 32 accessions in the greenhouse, and conduct hand-pollinated increases of 120 cultivated Helianthus accessions and caged increases of 125 wild annual Helianthus accessions. Future Vernonia increases will focus on accessions with low quantities of original seed.

Acquisition activities will emphasize obtaining ornamental sunflowers. Material at the National Center for Agricultural Utilization Research will be evaluated for possible inclusion into the National Plant Germplasm System.

Implementation of the perennial field management plan will continue, with emphasis on representing a greater diversity of perennial species.

Review Ames-numbered Helianthus accessions for possible assignment of PI numbers.

Table 1. Status of the Helianthus collection (December 31, 1996).

		Available accessions		Accessions with PI numbers	
	Accessions	#	%	#	%
Cultivated accessions	1496	1068	71	872	58
Wild accessions	2142	636	30	1579	74
Total collection	3638	1704	47	2451	67

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

Cuphea

Acquisition:

One accession of Cuphea from Virginia was added to the collection.

Maintenance and distribution:

Number and percentage of total number of 809 Cuphea accessions.

1996	# of accessions	% of accessions in collection
Available	336	42
Distributed	108	13
Duplicated at NSSL	470	58
Regenerated	72*	9
Germinated	321	40

* Accessions grown for seed increase in 1996; seed is being processed at the time of this report.

Characterization/taxonomy:

Significant progress: Characterization data for 1996-increased accessions have been collected.

The 1996 field-increased accessions have been photographed, and accessions being maintained in the greenhouse will be photographed and characterized at maturity.

Evaluation/Enhancement:

Field evaluation of accessions for possible ornamental use continues to be performed on regenerated accessions by Dr. M. Widrlechner.

Collaborated with Craig Abel in an evaluation of pollinators. In an attempt to find better pollinators for Cuphea, a randomized complete-block experiment was conducted to test three different pollinators of two Cuphea species.

A list of Cuphea descriptors, {Cuphea (Lythraceae) Descriptors, L.C.S. Ramos, W. W. Roath, T.B. Cavalcanti, and J.H. Kirkbride, 1992} was presented to the New Crops CGC for its approval in November. It was to be distributed to all members for discussion and action at its 1997 meeting.

Euphorbia

Acquisition:

Sixty-nine accessions of Euphorbia were added to the collection. Of these, 62 are E. lagascae (Spain), four are E. lathyris (Germany), and one each are E. bungei (Iran), E. dulcis (Germany), and E. heterophylla (Missouri).

Maintenance and distribution:

Number and percentage of total number of 86 Euphorbia accessions.

1996	# of accessions	% of accessions in collection
Available	6	7
Distributed	1	1
Duplicated at NSSL	4	5
Regenerated	4*	5
Germinated	6	7

* Accessions grown for seed increase in 1996; seed is being processed at the time of this report.

Significant progress: In 1996, six accessions were germinated for increase, leading to 4 regenerations.

Characterization/taxonomy:

None.

Evaluation/Enhancement:

The small field planting in 1996 facilitated the observation of growth habit, seed set and maturity, and potential pest and disease problems.

Meetings attended:

The 7th International Pollination Symposium, Lethbridge, Alberta, Canada.

New Crops CGC meeting, Indianapolis, Indiana.

American Society of Agronomy and Crop Science Society of America, Indianapolis, Indiana.

EEO activities:

Martin Luther King video presentation, January 16, 1996.

Black History Month presentation, February 22, 1996.

Actively participated in the Diversity Meal, April, 1996.

Training:

Tractor Safety Training, March 28, 1996.

Improving Teamwork Culture, May 1, 1996.

Completed MIPM 302, Introduction to Basic Microbiology, Iowa State University, May, 1996.

Pesticide Applicator Continuing Education, Categories 1A, 1B, and 10, December, 12, 1996.

Completed Agronomy 318, Crop Plant Physiology, and Entomology 570, Host Plant Resistance, Iowa State University, December, 1996.

Extension/Outreach:

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

Plans:

For the 1997 growing season, a study of pollinators for Cuphea is being continued.

I am currently enrolled in a taxonomy course, Botany 306, at Iowa State University to increase my knowledge and ability to describe and identify plants.

L. 1996 Seed Storage and Order Processing (D. Kovach, L. Burke, L. Minor)

Abstract:

1996 proved to be one of the busiest years in the past five years for Seed Storage and Order Processing. Increased seed orders and packets requested, markedly increased activity in backing up seed inventory to the National Seed Storage Laboratory and in storing original seed into the station's long-term storage facility, and a fairly typical year in the amount of seed stored made for a busy year. The acquisition of new computer software and the regular demands of computer programming, as well as continued research on seed dormancy in two sitecrops, rounded out the year for Seed Storage.

Seed Storage:

Order Processing and Seed Shipping:

The NCRPIS shipped 722 orders this year, resulting in more than 17,000 packets distributed for client requests or evaluation purposes, while another 4,589 packets (representing approximately 10% of the accessions held at this station) were sent to the National Seed Storage Laboratory (NSSL) in Ft. Collins, CO for security backup. This backup may not be reflected in the Germplasm Resource Information Network (GRIN) database, as NSSL typically enters data into GRIN two to six months after being received. Another 3,400 packets were filled for regeneration or viability monitoring by the curators. Of the 17,180 packets sent for client requests or evaluations, 35% were shipped to foreign countries. A summary graph of the history of seed shipping activity for the past five years is shown in Figure 1. There has been a steady increase in the number of packets and plants sent out over the past three years. 1996 resembled 1993, a very active year for Cucumis. The five-year average for seed packet and plant distribution

was 15,826. 1996 exceeded the average by over 1,500 packets and plants. All figures cited did not include Beta, as it was transferred to WRPIS in 1994.

In addition, the station received more then 1,300 new accessions, the vast majority of which were stored by Lisa Burke with assistance from her crew. (The precise number of new maize accessions received for 1996 was not available at report time.) This is approximately equal to the five-year average of 1200.

Information-only requests required approximately 52 hours of Linda Minor's time. These orders were filled accurately and in a timely manner, illustrating NCRPIS's commitment to excellent client service. Linda also served on the committee that redesigned the Accession Performance Reports. An enclosure letter and response card are sent out to our clients with each seed order. After one year from the time of seed shipment, the client then receives an Initial Performance Report for them to fill out. The client then sets a date for when the Accession Summary Performance Report should be sent. This report gives feedback to NCRPIS on agronomic and horticultural merit, unusual traits or genotypes, and other information. The overall process gives NCRPIS feedback regarding client satisfaction as to quality of seed, quality of service received from NCRPIS, as well as much needed information on the seed germplasm.

Storage of Locally Increased Seed:

More then 2,800 seed inventory lots grown at the station in 1995 were stored in 1996. As can be seen from Table 1, the sitecrops stored are evenly distributed. This means that seed storage appears to be keeping up with the curators' regneration efforts, avoiding potential backlogs. The amount of inventory lots stored in 1996 was 1,256 less than what was stored in 1995. This amount can be attributed solely to the differences in amounts stored for Amaranthus. In 1995 over 1,450 Amaranthus seed lots were stored, whereas in 1996 only 251 lots were stored. Cucumis melo also had an unusually high amount stored in 1995. These high amounts of inventory lots stored were due to the storing of several years of seed increase for these two sitecrops. The amount of inventory stored was not tracked

in the GRIN database before 1995.

In a continuing tradition of quality control, Seed Storage personnel reviewed the counts of approximately 13,500 inventory lots to ensure accuracy for the amounts on hand in the GRIN database. In addition, Paul Ovrom and Jeanne Edwards and the Ornamental Horticulture crew inventoried the seed quantities of about 1,000 inventory lots of ornamentals for the first time. With this additional effort by the Ornamental Horticulture crew, all of the collections at NCRPIS are now tracked on a seed quantity basis, as opposed to a number of packets basis.

Dave Brenner and Ron Schweppe and the Amaranth crew "pre-packaged" 50 of the most frequently distributed accessions of Amaranthus. Two-hundred seeds were counted with an electronic seed counter and put in small, plastic, zip-locked bags. This pre-packaging will improve the accuracy, speed, and ease of future seed orders for this collection.

Storage of Original Seed:

This year approximately 10,500 inventory lots of original seed were specially packaged and put into the -20 °C Storage Room. To date, nearly 20,000 inventory lots have been placed in this long-term storage facility. These packets are clearly identified and each packet's location is recorded in the GRIN database for quick retrieval.

Seed Research:

Research work on Cuphea, for all practical purposes, came to a close in 1996. Promotive effects from treatments were found in seven of the eleven species tested. Cuphea showed incremental and additive increases in germination for each of the following treatments: alternating temperatures (at lower than traditional 20/30°C regimens), light, pre-humidification treatments at alternating temperatures, and KNO_3. GA_3 treatments were not tested as the researcher believed that the former and present curators had tested this already. The present curator indicates this may or may not be true. Therefore, a test of the effectiveness of GA_3 is scheduled for 1997.

Research on seed dormancy of wild Helianthus was begun in 1996. Baseline germinations, based on standard germination tests of 20/30°C with light were performed on ten species chosen by the sunflower curator. One of the ten had apparently lost its dormancy while the other nine species showed little or no germination. The non-dormant species will be kept in tests conducted in 1997 to assess the "harshness" of treatments on a non-dormant Helianthus species. In this way, it is hoped that an effective test for breaking seed dormancy can be found that will not harm non-dormant seeds.

No work was conducted on the "recovery" of Zea mays seed from the Galinat collection, as no lots were approved by the corn curator for testing. Further work is anticipated in 1997, as one technique tried in 1995 showed excellent promise.

Seed Storage Room Improvements:

In 1996, one more item was added to the renovation of the Seed Storage Room. With the generous allocation of funds by Dr. Henry Shands, high-quality ceramic tile for the floor was purchased, allowing us to complete the Seed Storage Room renovation project.

One other project was initiated in the Seed Storage Room in 1996. One of the three Hoffman germinators used for seed dormancy studies failed to keep its programmed temperatures. A retrofit kit was purchased from the manufacturer and a

completely new electronic temperature-control system was installed. It has worked so well that plans for retrofitting the remaining two germinators have been initiated.

Computer Programming and Application Development:

Reports:

Many SQL-queried reports of the GRIN database were written for NCRPIS personnel in 1996. These reports covered a wide variety of needs and purposes.

Seed Lists:

A complete seedlist program was written for the sunflower curator in 1996. This program produces a report that tabulates observations of the cultivated or wild sunflower sitecrops; the sitecrop is chosen by the curator at program runtime. The computer programmer worked with the curator to produce multiple observations per line of accession being reported as the curator requested. No "polished and formatted" laser-printed output has been developed yet. This is scheduled for 1997 when the computer programmer hopes to find time to learn the Oracle 2000 Reports program.

Seedlist work for Daucus was initiated in 1996. A scheme for transferring old observation data to newly developed and Crop Germplasm Committee (CGC) approved observation coding was presented to the Daucus curator and the Horticulturist for approval. It is hoped that this scheme will be modified and/or approved and the Daucus seedlist will be completed in 1997.

Application Development:

Oracle Corporation's powerful developmental software (Oracle Designer 2000 and Developer 2000) was ordered in October and received and installed in mid-November of 1996. Work has begun on the development of many forms. The first to be "tackled" is a germination data entry form. The computer application developer is learning a great deal as he attempts to "build" the form. Progress is slow, but the form is anticipated being completed by the early second quarter of 1997.

Hardware modifications:

Two modifications were made to computer hardware located in Seed Storage and Order Processing. The first was the installation of a larger hard drive, controller card, and a Phase-Write / CD-ROM drive in the computer of the computer applications developer. The second modification was the installation of a rewind option retrofit for the order processing Zebra bar code label printer. Both modifications were successful and saved the station contracted-labor costs.

EEO/HRM:

Lisa Burke served as the Chairperson for the Ames Area Civil Rights Advisory Committee from October, 1995 through September, 1996. She will continue to be a member on the committee through September, 1997.

Special Training and Seminars:

D. Kovach:

In January of 1996, Dave attended the W-168 Seed Physiology Group Meetings in Corvalis, OR. This meeting has always proved to be of great value in keeping Dave abreast of the latest developments in Seed Science. Dave learned that many researchers struggle with overcoming dormancy in the seed they are studying. New ideas obtained from this meeting were tried on Cuphea here at NCRPIS. Unfortunately, the suggested ideas had no beneficial effects. Dave also attended the Seed Technology Conference sponsored by the Iowa State University Seed Science Center in February, 1996.

Dave received training in Oracle's Developer 2000 software from the Data Base Management Unit (DBMU) personnel in Beltsville, MD in September, 1996. This training proved very valuable as an overview of what the software can do. The time spent there helped develop relationships with the personnel that have proved invaluable. DBMU personnel's willingness to help Dave continue to learn this program has been much appreciated.

Dave also attended, as a guest, the GRIN Advisory Committee Meetings, also held in Beltsville, MD in December, 1996. Observing the committee process can only be described as a learning experience.

L. Burke:

Lisa was re-certified as one of the station's CPR/First Responders in February, 1996. She also attended the Seed Technology Conference sponsored by the Iowa State University Seed Science Center in February, 1996. At that conference she also staffed an information display about NCRPIS.

In August of 1996, Lisa attended the Agronomy Field Day sponsored by the Agronomy Department, Iowa State University. She also staffed NCRPIS's information display.

Lisa took a four-credit class at Iowa State University during the Fall, 1996 semester. The course was Statistics 401: "Statistical Methods for Research Workers."

L. Minor:

In June, 1996, Linda attended another Fred Pryor Seminar entitled: "Windows: A One-Day Seminar." This seminar was too elementary to be of any real value for Linda.

In July, 1996, Linda attended a Fred Pryor Seminar entitled "How to Manage Multiple Projects, Meet Deadlines, and Achieve Objectives." This seminar helped Linda "fine-tune" skills she already possessed, as well as introduce her to a couple new concepts.

Dave Kovach, Lisa Burke, and Linda Minor all participated in the "Recheck of Teamwork Culture", a workshop guided by Bob Farquhar, Leadership Development Center, Peoria, IL. Reactions from Dave, Lisa, and Linda were mixed with regards to the workshop's usefulness.

Table 1. Order Items Sent / Accessions Received Report

From 01-JAN-96 to 31-DEC-96

Site Crop	Backup	Distrib	Germs	Obs/Eval	Regrow	Total Order Items Shipped	Total Distribution and Obs/Eval Order Items Sent	Number of Domestic Order Items	Number of Foreign Order Items	# of New Accessions Acquired	# of Inventory Lots Stored	# of Inv Lots Sd Count Reviewed	# of Inv Lots Stored In Freezer
NC7-amaranth	1669	511	592	20	200	2992	531	156	375	130	251	2669	1903
NC7-asparagus	14	32				46	32	32				12	
NC7-asters	33	9		5	12	59	14	7	7	4	4	275	266
NC7-brassica		886	84	59		1029	945	186	759	48	48		66
NC7-brassica.csr			2			2	0			1	1		1
NC7-celosia	7	6				13	6	1	5	1	1	1	
NC7-chicory	48	76				124	76	8	68	1	12	55	
NC7-corn.kin	1	7				8	7	7		3	3		
NC7-crucifers	364	461	98			923	461	112	349	51	271	1182	908
NC7-cucumis.cucs		2275			126	2401	2275	2048	227	3	246	411	
NC7-cucumis.melo		1072			227	1299	1072	958	114	19	133	125	
NC7-cucumis.wilds		350				350	350	160	190		18	19	
NC7-cucurbita		15			81	96	15	6	9	13	34	18	
NC7-cuphea		102	163	28	234	527	130	31	99	1	92	18	725
NC7-daucus	311	377			49	737	377	291	86	14	100	1036	927
NC7-echinochloa	151	16				167	16	16				198	198
NC7-euphorbia		1			5	6	1	1		69	69		
NC7-flax		24				24	24	2	22	15	15		
NC7-grasses	35	1				36	1	1				94	93
NC7-legumes	31	13	21			65	13	9	4	35	59	8	
NC7-maize	37	2165	281	705		3188	2870	2805	65	292	462	187	
NC7-maize.csr	5	3	2	1		11	4	4		42	53	1	
NC7-maize.g				1		1	1	1					
NC7-maize.pvp	33	230	7	32		302	262	206	56	2	85	51	
NC7-maize.t		348		591	21	960	939	930	9				
NC7-maize.ta	38	99	64	61	4	266	160	156	4		50	73	
NC7-maize.wilds		111		77		188	188	187	1			2	
NC7-melilotus	145	720	88			953	720	53	667	40	119	71	
NC7-mints	46	12	42			100	12		12	2	2		
NC7-ocimum	7	108				115	108	108		4	4	5	
NC7-ornamentals		163	68	4	79	314	167	139	28	123	162	1993	
NC7-ornamentals.p		4		159		163	163	159	4	16		8	
NC7-panicum	90	12	25			127	12	2	10			1080	1076
NC7-perilla	4	26	3			33	26	7	19			3	
NC7-quinoa	110	304	41		34	489	304	21	283	26	114	94	
NC7-setaria	243	397	48			688	397	19	378	2	2	1105	1076
NC7-spinach	23	1009	54		101	1187	1009	432	577	60	128	68	
NC7-sun.csr	1		8			9	0				7	63	68
NC7-sun.cults	411	2614	207	77	167	3476	2691	1540	1151	9	102	1664	1423
NC7-sun.wilds	613	786	75	47	153	1674	833	426	407	12	98	2094	1844
NC7-umbels	118	126		2		246	128	8	120	72	128	63	2
TOTALS	4588	15471	1973	1869	1493	25394	17340	11235	6105	1110	2873	14746	10576

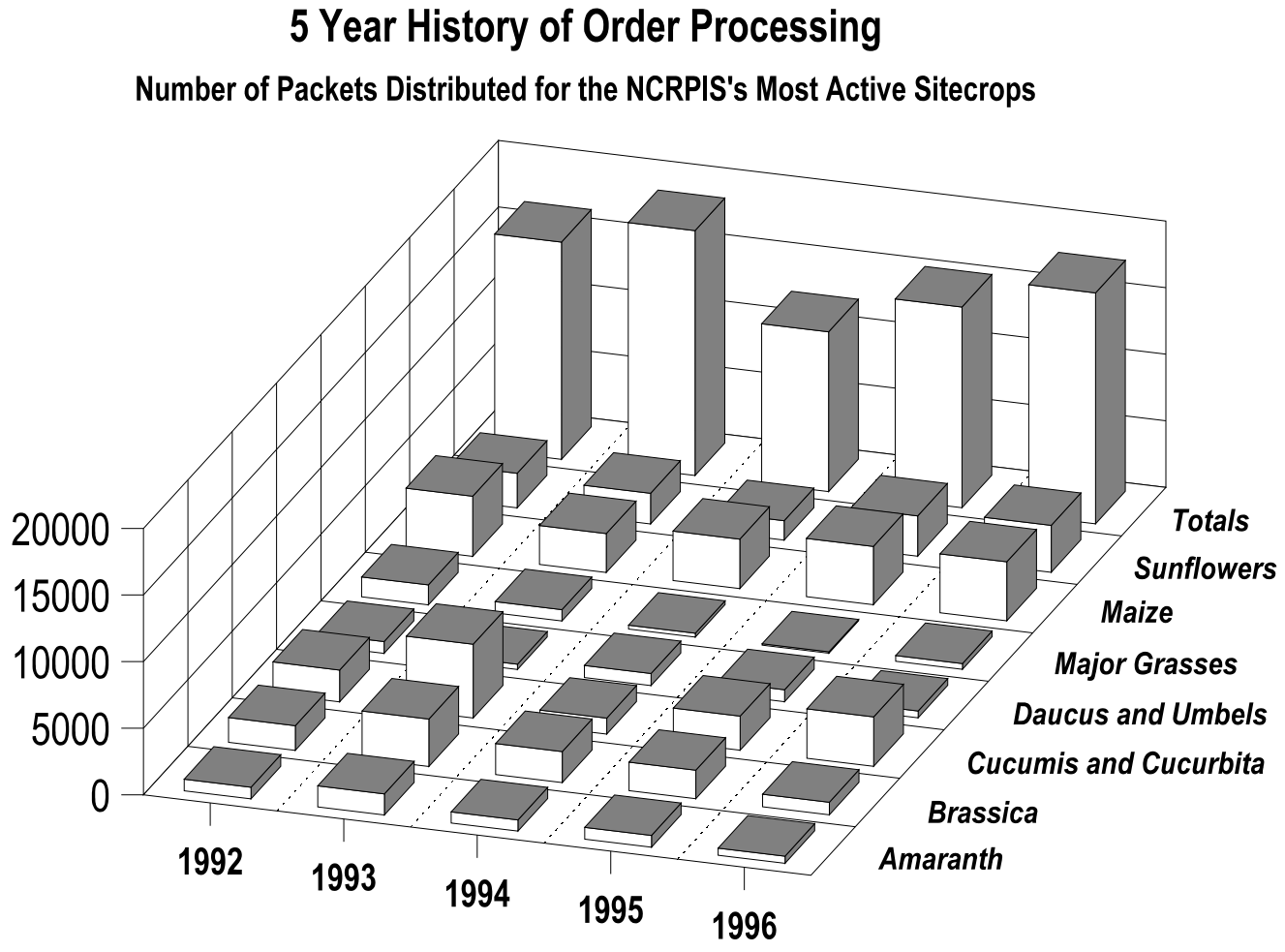

Figure 1. Summary Graph of Order Processing / Shipping History

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

(Note: Despite a vacancy in this position from June through October, all figures represent the full calendrical year of 1996.)

Germplasm Collections

Acquisition:

The NCRPIS acquired a total of 1304 new accessions. These new accessions came from both within and outside of the National Plant Germplasm System (NPGS).

Four-hundred ninety-one new accessions were received from within the NPGS. The majority of this seed came from the National Seed Storage Laboratory (NSSL) and the winter nursery in Saint Croix. Included in this group were 357 of Zea mays, 60 of Spinacia, and 30 of Melilotus.

Eight-hundred thirteen new accessions were received from outside the NPGS. Included in this group were 187 of Zea mays, 124 ornamental crops, 123 of Amaranthus, 74 of umbels, 69 of Euphorbia, 52 miscellaneous crucifers, and 47 of Brassica. 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 includes a source history, cooperator records, collection site description, pedigree, secondary identifiers, and any other pertinent information provided by the donor.

Maintenance:

Assistance with collection maintenance was provided to curators by processing requests for taxonomic re-identifications and nominations of accessions to the inactive file. Approximately 348 accessions received taxonomic re-identifications. Among these were 272 accessions of Amaranthus and 39 accessions of various ornamental crops. In addition, 496 accessions were nominated for inactivation. The inactivated crops included 153 of Cucumis melo, 86 of Daucus, 71 of Cuphea, and 69 of Helianthus.

PI numbers were assigned to 173 accessions. Including 71 of Zea mays, 37 of Cuphea, and 30 Melilotus.

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, secondary only to logging in new seed material. This proofing can involve locating paper files of accession information, corresponding with collectors and donors, searches of the internet, and researching maps and GIS databases.

Shortly after I assumed the duties of this position, Mark Widrlechner and I conducted meetings with curators on an individual basis. The purpose of these meetings was to obtain a list of passport information projects and assign priorities to these projects. Work began on these projects in December.

My first assignment was to finish entering passport information for 62 accessions of Euphorbia into GRIN. The information involved locality descriptions written during a collection trip in Spain. The descriptions were in Spanish and involved some translation and extensive study of maps of Spain.

A second project involved proofing passport information for 157 accessions of Cichorium. This was a general checking of accuracy and completeness. Many of the

institute names and addresses from which the seed originated were incomplete. Several searches of the internet and library provided additional information to fill in the gaps.

A third project was to prepare 33 accessions of ornamental crops for PI numbers. Working closely with the curator, this information was proofed and corrected. PI numbers have recently been assigned to this group.

My current project is the preparation of approximately 800 accessions of Zea mays for PI numbers. This work involves cross-checking a variety of computer databases for possible duplicates as well as accurate information.

Training received:

Although I started this position in October, I have been an employee of the Plant Introduction Station since September, 1994. As a former student employee of the Brassica and seed storage crews, I already had a comfortable familiarity with NCRPIS operations. During my time in seed storage, Lisa Burke trained me in the daily tasks of logging in new seed, inactivating accessions, re-identifying accessions, and adding and updating GRIN records accordingly. Recently, Mark Millard has provided additional training for loading tables of information into GRIN with Oracle and SQL. Also, David Kovach gave me some pointers about the printing of bar code labels and has provided a SQL program to perform complicated queries of the GRIN database.

Conclusions:

Because I was a student employee of NCRPIS before filling this position, I have required relatively little additional training. Since then I have become much more efficient at logging in new seed material through the use of Oracle tables. I have already completed a few passport information projects involving Euphorbia, Cichorium, and various ornamental crops. In addition, I have learned to use newer software and operating systems such as Windows 95.

In 1997, much of my time will be spent working on passport information projects including groups of Zea mays, Cucumis, Helianthus, and miscellaneous crucifers that are awaiting PI numbers. I plan to continue my training and learn more about the use of Oracle and SQL. Hopefully, I will be able to enter data into GRIN more efficiently and make more complicated queries. I would like to implement the use of GIS software to allow for more accurate and complete collection site descriptions. I have also given some thought to re-organizing the accession information file system to include a computerized indexing system to simplify locating materials in these files.

N. Genetic markers: (C. Dill, W. González, R. Ilarslan, M. Brothers, P. Bretting)

Personnel: C. Dill was hired in July 1996 as USDA/ARS Biological Science Technician, to work primarily in the NCRPIS genetic marker lab, but also in the plant pathology lab. Dr. R. Ilarslan, of the Department of Biology, Ankara University, worked at the NCRPIS as a visiting scientist for much of 1996. M. Brothers spent several weeks during early 1996 in the genetic marker lab conducting isozyme analyses to finish a sunflower genetic diversity study.

Equipment: Vertical laminar flow hoods were purchased with special allocations from the USDA/ARS Midwest Area Office. Pipetters and other molecular biology equipment were purchased with end-of-the year funds.

Facilities: W. González and C. Dill greatly upgraded the genetic marker labs by reorganizing the location of equipment and activities and by installing the

purchases noted above. Their effort tangibly increased lab productivity.

Progress: W. González, assisted during late 1996 by C. Dill, started analyzing variability at simple sequence repeat loci in maize, and thereby transferred the capability of analyzing DNA polymorphisms to NCRPIS labs. W. González completed isozyme and morphological assays of ca. 50 populations of Northern Flint maize, and began data analysis. C. Dill completed isozyme assays of several maize populations and inbred lines for quality control purposes. The data from these assays helped the maize curator make managerial decisions regarding this germplasm. R. Ilarslan completed isozyme and morphological assays of ca. 50 populations of Turkish maize, and began data analyses. M. Brothers and P. Bretting helped to complete an extensive survey of isozyme variability in sunflower (Helianthus annuus L.) that was conducted jointly with ISU Department of Botany researchers R. Cronn, J. Wendel, and K. Klier.

O. Computers and Telecommunications: (T. Le, R. Luhman, M. Millard, C. Block, D. Kovach, C. Brewer, R. Stebbins, R. Wilson, P. Bretting)

Personnel: For much of 1996, the computer-telecommunications responsibilities were shared by a group of NCRPIS staff, including T. Le, R. Luhman, M. Millard, C. Block, and D. Kovach. With T. Le's departure in Dec. 1996, the latter four staff members have continued to fulfill these responsibilities. They have listed details of their activities under their respective sections of this annual report. They are assisted in setting policy and making decisions by other members of the NCRPIS's Computer Committee: C. Brewer, R. Stebbins, R. Wilson, and P. Bretting.

R. Luhman and T. Le attended two sessions of network software training for managing the NCRPIS's Novell local area network.

Equipment: Thanks to supplementary allocations by the Midwest Area Office, and the USDA/ARS National Program Staff, the NCRPIS acquired much computer and telecommunication equipment in 1996. A new twin copper wire-fiber optic cable link with the ISU campus greatly enhanced speed and reliability of data transmission, and lowered the cost of long-distance telephone communications. Six new Pentium computers, a new Zebra printer for producing bar-coded labels, a server tape backup drive, several 17" monitors, several external tape backup drives, and other hardware purchases significantly enhanced the information management capabilities at the NCRPIS.

Software: An Oracle software development package was purchased so that D. Kovach could develop custom forms that would substantially increase the efficiency of data entry and management. These forms will be especially useful with GRIN tables.

Eudora, the standard e-mail package for Iowa State University telecommunications, and anti-virus software produced by McAfee were installed on all of the NCRPIS's computers. Most of the NCRPIS's computers now have web browsers, generally Netscape Navigator, which facilitate access to the Internet, and development of the NCRPIS's web page, which has been developed primarily by R. Wilson, with some assistance from R. Luhman. For the most part, the NCRPIS moved from the operating system Windows 3.1 to Windows 95 during 1996. In general, the transition to Windows 95 has made computer management easier.

Progress: Several NCRPIS-wide telecommunication/computer initiatives were accomplished. The entire NCRPIS staff now communicates daily via e-mail. All of our computers are protected by anti-virus software and are backed-up regularly either by computer staff or by individual users. Computer and telecommunications hardware and software were upgraded significantly. An NCRPIS web site, which has logged more than 1,000 "visitors" to date, was established.