NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1995

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I. PROJECT TITLE: NC-7 "New Crops - The Introduction, Multiplication, Evaluation, Preservation, Cataloguing, Enhancement, and Utilization of Plant Germplasm."

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. Andrews
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	Vacant
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
	Program Office Coordinator	L. Wilson-Voss
	Office Automation Clerk	L. Wells
	Biological Science Technician	Vacant
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. Jeffryes
c.	Research Entomologist	R. Wilson
	Agricultural Research Technician	S. McClurg
	Entomologist	C. Abel
	Biological Science Lab 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.	System Support Specialist II	T. Le
d.	Asst. Scientist II (Plant Pathology)	C. Block
e.	Curator II (Brassica, Grasses)	R. Luhman
f.	Curator II (Vegetables)	K. Reitsma
g.	Curator II (Amaranth)	D. Brenner

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

Personnel changes:

Resignations: No permanent, full-time staff resigned during 1995.
Hirings: R. Jeffryes was hired as a Germplasm Program Assistant, T.Le as a Systems Support Specialist II, P. Ovrom as an Agricultural Research Technician, and L.Wells as an Office Automation Clerk.
Promotions: C. Abel was re-classified as GS-9 Entomologist, L.Burke as GS-6 Biological Science Technician, and R. Schweppe as GS-4 Biological Science Lab Technician. M. Brothers switched from an ISU Curator II position to GS-9 Geneticist.

Construction:

1. Installation of a -20° C walk-in freezer for conserving original seed was completed.
2. Renovation of the seed handling room was completed.
3. An additional 500' of chain-link fencing were erected as a trellis for growing ornamental vine germplasm.
4. The first stage of a multistage effort to renovate the drainage tile system on NCRPIS farmland was initiated.

(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 MANAGEMENT, RESEARCH, AND EDUCATION (P. K. Bretting, L. Wilson-Voss, L. Wells)

Acquisition:

1. More than 570 germplasm accessions were acquired by the NCRPIS during 1995 (details listed under the germplasm program assistant's and the curators' reports).
2. Significant acquisitions included 181 accessions of maize, 72 accessions of ornamentals from China and Mongolia, 50 accessions of Cucumis sativus from China, and 43 accessions of Cucurbita pepo transferred from SRPIS.

Maintenance:

1. Nearly 40,000 accessions (39,979) representing more than 300 genera and 1500 species are now maintained at the NCRPIS.
2. More than 2,300 accessions were "backed-up" in long-term storage at the National Seed Storage Laboratory (NSSL).

Regeneration:

1. More than 1500 accessions were cultivated for regeneration in Ames, Puerto Rico, and St. Croix during challenging but successful field seasons which at Ames incorporated 800 insect cages for controlled germplasm pollination.
   a. The NCRPIS's germplasm regeneration program received valuable assistance from seed companies. Asgrow 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, regenerated Spinacia germplasm in positive pressure chambers at the USDA/ARS research site in Salinas, CA.
2. Our Horticulturist, M. Widrlechner, served as an invited participant in an international meeting on seed regeneration at the International Crops Research Institute for the Semi-Arid Tropics in India, sponsored by the International Plant Genetic Resources Institute.

Distribution:

1. More than 15,000 seed packets were distributed to researchers in the U. S. (ca. 75% of the total) and abroad (the remaining 25%).
2. More than 100 vegetative cuttings were distributed. Eleven 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 2800 accessions were assayed for their germination/viability percentages.
2. Maize, sunflower, cucumber, melon, amaranth, Chenopodium, brassicas, millets, 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. Further research was conducted on the frequency that Stewart's wilt is transmitted through maize kernels.

Information management:

1. The new position of germplasm program assistant was established to augment the NCRPIS's information management capabilities.
2. A personal computer and other information management equipment were purchased with funds from the NCRPIS-ISU imaging project.
3. The NCRPIS computer staff continued to cooperate with other NPGS sites to refine the new version (GRIN3) of the Germplasm Resources Information Network.
4. A committee began to reorganize, file, and consolidate a large amount of paper archival materials on file at the NCRPIS.
5. Several large sunflower evaluation data sets were entered into GRIN.
6. Passport data for 1,200 amaranth accessions were greatly augmented.

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 is being incorporated into our daily maize germplasm management effort. To date, images of 100 accessions have been captured with a novel method incorporating a flat bed scanner.
3. Isozyme analyses of several maize populations regenerated according to several different pollination protocols were completed. These genetic marker data will be used to test the efficiency and efficacy of the NCRPIS's maize regeneration effort.
4. A descriptor list for Brassica was approved by the Crucifer CGC and established on GRIN.

Evaluation:

1. Accessions of maize, millets, brassicas, Cuphea, mints, and potential ornamentals were evaluated for general agronomic or horticultural merit.
2. More than 130 maize accessions were evaluated for host-plant resistance (in silks) to corn earworm feeding. More than 870 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. Fifty sunflower accessions were assayed for host-plant resistance to sunflower moth.
4. A multi-year evaluation of brassicas for host-plant resistance to green peach aphid continued.
5. Evaluation of almost the entire NPGS active collection of cucumber for host-plant resistance to Sphaerotheca fuliginea was completed.
6. Research continued with seed transmission and disease etiology of Erwinia stewartii, the causal agent for Stewart's wilt of maize.

Enhancement:

1. An interspecific mint hybrid continues to be developed as a potentially superior nectar source for honey bees. Genetic enhancement of another mint species for adaptation to central Iowa is also underway.
2. A long-term project was initiated to develop a composite population of wild sunflowers (H. annuus) with host-plant resistance to both Alternaria and Septoria leaf blights.
3. 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, Fire Extinguisher Training, HIV Training, and Dust Mask Training. All field workers received training in the proper use of dust masks. Several NCRPIS staff serve as members of the ARS Campus Safety Committee.
2. The NCRPIS initiated extensive efforts to document training received by various staff.
3. NCRPIS staff attended various seminars regarding civil rights, preventing sexual harassment, gender diversity, ethics.
4. The Communications/Teamwork Committee was instrumental in formulating an extensive ongoing training program by The Leadership Training Center regarding improving teamwork culture.
5. Several NCRPIS staff arranged an "Asian-Pacific" dinner which featured indigenous cuisine and a guest speaker from the Philippines.
6. The Research Leader served as a panel member for reviewing USDA/CSREES Capacity Building Grants for 1890 Schools.

Outreach:

1. 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 330 visitors toured the NCRPIS during 1995.
3. Mr. M. Rettke, Australian Tropical Field Crops Germplasm Centre, spent several months at the NCRPIS learning germplasm management techniques.
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 to trial site cooperators.
7. The NCRPIS hosted the 1995 annual meetings of the NPGS-Plant Germplasm Operations Committee, the NC-7 Regional Technical Advisory Committee, and the Sunflower Crop Germplasm Committee.
8. NCRPIS staff travelled extensively internationally (China [two staff members], Costa Rica, India, and Mexico) to present lectures, attend workshops, or establish contacts with foreign germplasm researchers.

V. INDIVIDUAL PROGRESS REPORTS

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

Progress:

Field

Corn - Corn earworm evaluation: One hundred thirty-five maize accessions were planted in the field 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 Maurice Snook (ARS-Georgia)for chemical analysis.

European corn borer evaluation: Eight hundred seventy-two maize accessions were evaluated for leaf feeding resistance to first generation European corn borer. Twenty-seven rated resistant. One hundred ninety-eight maize accessions were evaluated in the field for second generation European corn borer resistance. Six rated resistant. This testing also included 200 LAMP maize lines evaluated for first generation resistance and 20 LAMP lines evaluated for second generation borer resistance. Evaluation of the LAMP accessions was in cooperation with Linda Pollak (ARS-Ames).

Sunflower - Work continued on refining the sunflower moth evaluation technique for both cultivated and wild-type sunflowers. Forty cultivated sunflowers were planted in the field and infested with sunflower moth. Thirteen rated resistant. 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 not finished to date.

A pollination study for H. petiolaris in field cages was conducted during 1995. An initial data analysis showed that honey bees were the best pollinators. Osmia bees normally pollinate in cool spring weather but not in hot weather, so they were not effective pollinators of sunflower.

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 1996 Brassica seed increases because they are more economical than are 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.

Fifty cucurbit accessions were planted as an observation plot for natural insect pests. In general, C. pepo was less attractive to insects than were C. sativa and C. melo. The most common pests were spotted cucumber beetle, squash bug, and striped cucumber beetle.

Coriandrum - A cage pollination study was conducted to find the best insects for pollinating this crop. Germination tests are in progress and data have not been analyzed to date.

Laboratory

Rearing - A colony of sunflower moths is being maintained so that we will have sufficient numbers of insects for use in our field evaluation program.

A longterm colony of corn earworms is being maintained so that we will have sufficient numbers of insects for comparison with insects obtained from the rearing colony in Tifton, GA.
A colony of green peach aphids is being maintained in the greenhouse and growth chamber so that we will have sufficient numbers of insects for our greenhouse evaluation of host-plant resistance Brassica to aphid feeding.

Greenhouse - During 1995, 349 Brassica accessions were evaluated in the greenhouse for resistance to green peach aphid. One accession rated resistant. A wasp parasitic on aphids, Diaeretiella rapae, forced us to quit evaluations until the winter of 1996.

Miscellaneous

I serve on graduate committees for one M.S. and one Ph.D. candidate in entomology.

Manuscript review:

During 1995, I peer reviewed several manuscripts including some for the editors of the Journal of Economic Entomology and the Journal of the Kansas Entomological Society.

Cooperative research:

I cooperated with Linda Pollak (ARS, Ames, IA) on the evaluation of maize for both first and second generation resistance to European corn borer.

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

I cooperated with Rick Luhman and Craig Abel (ISU and ARS, NCRPIS, Ames, IA) on a Brassica pollination study.

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

I am cooperating with Kathy Reitsma and Craig Abel (ISU and ARS, NCRPIS, Ames, IA) on a cucurbit pollination study.

I am cooperating with Mary Brothers and Craig Abel (ARS, NCRPIS, Ames, IA) on a sunflower pollination study.

EEO activities:

At present, one woman student is working part time for the entomology project.

Attended "Recognizing and Preventing Sexual Harassment in the ARS" at ISU on Jan. 19, 1995.

Attended "HIV Training" at ISU on April 6, 1995.

Attended "Asian-Pacific Lunch" at NCRPIS Farm on May 31, 1995.

Attended "Gender Communication" seminar at NADC on July 25, 1995.

Attended LTC Training, Ames, Aug. 28, Oct. 11-12, Nov. 1, Nov. 15, 1995.

Attended “Reaching for Common Ground” workshop at NADC on Sept. 21, 1995.

Attended “Ethics Training” at NADC, Oct. 6, 1995.

Attended “Shake Your Head Yes to Life” seminar at NADC on Oct. 24, 1995.

Viewed video “In the White Man’s Image” at NCRPIS Farm on Nov. 29, 1995.

Entomology and Agronomy Department activities:

I regularly attend faculty meetings held in both departments.

At present, I serve on Agronomy Department Building Committee, Greenhouse Committee, and Awards Committee.

At present, I serve on the following NCRPIS commiittees: Communication Committee, Computer Committee, Extension Committee, and sporadically on selection committees

for screening and evaluating applicants for vacant positions.

Meetings attended:

Southern Corn Improvement Conference, Memphis, TN, Feb. 13-15, 1995.

Amaranth Institute annual meeting, Sioux City, IA, Nov. 11, 1995.

Sunflower CGC meeting, Ames, IA, July 12, 1995.

PGOC meeting, Ames, IA, Aug. 22-24, 1995.

Attended board meeting of Amaranth Institute, Ames, IA, Mar. 18, 1995.

Attended meeting of Student Program Committee for Iowa Academy of Science, Ames, IA, Dec. 2, 1995. (I am committee member 1995-1997)

Entomological Society of America annual meeting, Las Vegas, NV, Dec. 16-21, 1995.

Attended annual meeting of the Iowa Academy of Science, Wartburg College, April 21-22. 1995.

Attended NC-7 Technical Committee meeting in Ames, IA, June 26-27, 1995.

Short courses/training:

Attended "Chemical Hygiene Training" at ISU on Mar. 2, 1995.

Attended "Dust Mask Training" at NCRPIS Farm on Mar. 29, 1995.

Attended "Worker Protection Standards" training at ISU on May 15, 1995.

Viewed "Lab Safety" video at NCRPIS Farm on Jan. 10 & 17, 1995.

Attended "Fire Extinguisher Training" at ISU on May 18, 1995.

Attended "Tractor Safety" video and discussion at ISU on Mar. 22, 1995.

Attended "Worker Right-to-Know Training" at ISU on June 20, 1995.

Papers presented at meetings:

"Taking Care of Maize Germplasm Having Resistance to Insect Pests" at Southern Corn Improvement Conference, Memphis, TN, Feb. 14-15, 1995. (Invited talk)

"Entomology and Bees" at NC-7 Technical Committee meeting, Ames, IA, June 26-27, 1995.

Other:

I serve as the primary resource person for entomological problems on amaranth in the U.S. Growers and researchers contact me and request information regarding insect problems they encounter on amaranth.

Currently serving on the board of directors of the Amaranth Institute for a three year term.

Guest lecturer for Entomology 110 class at ISU, Nov. 9, 1995.

Awarded "Lloyd Dresser Award" from Ames High School for my past work as a volunteer girl's track coach, Dec.8, 1995.

Plans:

Field

Evaluate 200 maize accessions for corn earworm silk feeding resistance.

Evaluate 750 maize accessions for resistance to leaf feeding by 1st generation European corn borer.

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

Evaluate 15 amaranth accessions for resistance to tarnished plant bug and develop a better technique for evaluation.

Cooperate with Rick Luhman and Craig Abel to compare honey bees and Osmia cornifrons for pollination efficiency of Brassica in cages.

Participate in cooperative research project to field test corn 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 cultivated type and 10 wild type sunflower accessions for resistance to sunflower moth.

Cooperate with Kathy Reitsma and Craig Abel on using Osmia bees to pollinate Cucumis and coriander in cages.

Cooperate with Larry Charlet (ARS, North Dakota) and Craig Abel to determine if Osmia bees will pollinate sunflower in cages in North Dakota.

Cooperate with Mary Brothers and Craig Abel to evaluate pollination efficiency of selected bees.

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

Laboratory

Prepare corn earworm evaluation diets from field-collected silks.

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

Continue rearing sunflower moth.

Continue rearing corn earworm.

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

Since 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.

Greenhouse

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

aphid.

Miscellaneous:

Continue active participation in ISU 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. 1995. Taking care of maize germplasm having resistance to insect pests. Proc. 47th South. Corn Improv. Conf. : 20.

Wilson, R.L., B.R. Wiseman, and M.E. Snook. 1995. Evaluation of pure red pericarp and eight selected maize accessions for resistance to corn earworm (Lepidoptera: Noctuidae) silk feeding. J. Econ. Entomol. 88: 755-758.

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: 326-331.

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: 1044-1048.

Brust, G., J. Palumbo, A. York, and R.L. Wilson. 1995. Squash and Pumpkins. pp. 169-178. In Foster, R. and B. Flood, Vegetable Insect Management with Emphasis on the Midwest. Meister Publishing Company. Willoughby, OH.

Binder, B.F., J.C. Robbins, and R.L. Wilson. 1995. Chemically mediated ovipositional behaviors of the European corn borer, Ostrinia nubilalis (Lepidoptera: Pyralidae). J. Chem. Ecol. 21: 1315-1327.

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

Germplasm Collections

Acquisition:

Seventy-three new accessions of ornamentals and 1 accession of mint-family plants were received during 1995. Most of these accessions came from two explorations, one to China and the other to Mongolia. The number of accessions under my care also increased late in 1995 with the transfer of 70 accessions from the "catchall" site-crop to ornamentals. The largest groups were the collections of Hyoscyamus and Thalictrum.

In September, Mark Widrlechner spent three weeks in China on a bilateral forestry exchange, with the goal of introducing disease-resistant, hardy Ulmus germplasm to the United States. Although no samples were collected during the trip, it is likely that collections of Ulmus and other priority genera will be forthcoming in the next few years through the efforts of local contacts made in China on this trip.

Maintenance:

Available for distribution:

Ornamentals (NC-7 priority site) 571/1696 (34%) (128 genera).
Ornamentals (For trials or transfers) 66/211 (31%) (77 genera).
Mint-family Plants 34/143 (24%) (15 genera).

Distribution:

Twelve plants, 106 cuttings and 126 seed packets of ornamentals were distributed to meet germplasm requests, and 11 plants as part of the NC-7 Trials. Requests for seed of ornamental germplasm were well below the record levels of 1994. There were 39 seed packets of mint-family plants distributed in 1995.

Duplicated at NSSL

Ornamentals (NC-7 Priority Site) 409/1696 (24%)*
Mint-family Plants 3/143 (2%)**

* This is an increase of 278 accessions over 1994. The rate of future backups will depend upon NSSL policy and decisions made after counting the seeds in all packets marked as "1 pk" in inventory. 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 (NC-7 Priority Site) 61/1696 (4%)*
Ornamentals (For trials or transfers) 0/211 (0%)
Mint-family Plants 13/143 (9%)**

* This includes 38 successful cage increases, 7 woody ornamental seed increases, and 16 woody plant grow-outs.

** Regeneration activity for this group was revived in 1995-96, with the establishment of a two-year field increase plot. More accessions should become available in 1996.

Tested for Germinability/Viability

Ornamentals (all accessions held as seed) 294/1696 (17%)*
Mint-family Plants 35/143 (25%)

*** These data are cumulative and do include tests conducted in Dec 95 - Jan 96.**

Significant Progress

We had a reasonably successful year for caged seed increase from herbaceous ornamentals, considering the wide fluctuations in temperature in late spring, the exceptionally warm summer, and a fairly early killing frost in September. Updated seed lists were completed and distributed to cooperators and to institutions providing Indices Seminum early in 1995, after all inventory data were proofed on GRIN and PI numbers assigned to all available accessions. At the end of 1995, the plant inventory data on GRIN were also brought up to date.

Characterization/taxonomy:

During 1995, there were no large-scale characterization/taxonomy projects on the crops that we curate. However, all herbaceous ornamentals in the cage-increase field were checked to verify identifications, including 20 accessions of Calendula and 14 accessions of Agastache. In all, 15 accessions were re-identified.

Evaluation:

In 1995, Roger Fuentes-Granados, a Ph.D. candidate under Mark Widrlechner's joint direction (along with Lester Wilson of the ISU Food Science Department), analyzed Agastache seedlings from controlled crosses and established 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 also has taken leaf samples from these plants for DNA-marker analysis in 1996.

Evaluation of a population of Salvia azurea selected for adaptation to early flowering and seed production under local conditions completed its final year against two other populations at four midwestern test sites.

Enhancement:

There was no major progress to report with enhancement activities in 1995.

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - The regular plant distribution was suspended for one year, because a shortage of labor and sufficient plant materials. Eleven replacement plants were sent to cooperators.

Computer-generated "First-year Performance Report," "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 was organized and entered into dBase late in 1995 and early in 1996.

Four newsletter updates and a special letter were sent to trial site cooperators in 1995, to keep them informed about current developments at Ames and throughout the program. Mark Widrlechner also held an informal meeting with cooperators at the ASHS meeting in Montreal in July.

Research on the floristics, soils, plant communities, and climates of Eastern Europe (especially of Ukraine and neighboring states) has been temporarily suspended until Mark Widrlechner can establish better communications with Ukrainian institutions involved with native seed collections. He will be devoting time to this effort in 1996.

Mark Widrlechner worked with Robert Schutzki, the cooperator from Michigan State University, to prepare a manuscript featuring six landscape plant accessions that have performed particularly well in East Lansing. This manuscript was recently accepted for publication in the American Nurseryman.

Only the trial site in Fort Collins, Colorado was visited in 1995. Sites in Missouri, Illinois, and Indiana will be visited in 1996.

The trial program received a boost in July with the hiring of Paul Ovrom as an ARS Agricultural Science Research Technician. Paul has dealt with the large backlog of evaluation data and is working with cooperators to bring all records up to date. He is also preparing for the resumption of shipping in April, 1996.

Germplasm activities in crops other than those curated:

Four requests for accessions with special horticultural characteristics were handled, resulting in the distribution of 35 packets of seed.

In May, Ryan Jeffryes was hired as an ARS Germplasm Program Assistant, responsible for the entry and proofing of passport and other data associated with NCRPIS accessions. Before his hiring, there was a large backlog of data to be entered into GRIN for accessions that had been received since 1993. In the first few months of 1995, Mark Widrlechner worked with Lisa Burke to reduce this backlog and to learn enough about data entry on the new version of GRIN to be able to help Ryan start reducing this backlog.

During 1995, Mark Widrlechner led the curatorial team through an analysis of our needs for passport-data proofing and updating. This process has given Ryan direction and has helped curatorial planning.

This spring, following Bill Roath's retirement, Mark Widrlechner also assumed official responsibility for the Cuphea effort. Under Mark's supervision, Bill Van Roekel is now managing Cuphea and Euphorbia accessions, as a logical outgrowth of his experiences gained on Dr. Roath's project.

Mark Widrlechner was invited by IPGRI to participate in an international meeting on seed regeneration, which was held at ICRISAT in December 1995. About 35 researchers from national genetic resource programs and international centers participated in this meeting by presenting papers and by collaborating to develop guidelines that genebanks could use to prioritize and conduct seed regenerations. Before preparing his talk, he surveyed other NPGS curators to learn more about the factors that influence their regeneration plans and topics that may require additional research. He then prepared a talk that summarized my survey findings and described some of our local experiences with regeneration.

Other research and training activities:

Research continued on the taxonomy of Rubus in Iowa. Mark Widrlechner has identified blackberries from Iowa collections, representing five sections of the subgenus Rubus, and has completed collecting morphological data to prepare keys for field identifications and to develop systematic hypotheses that can be tested via cytogenetic and molecular approaches. Field work was completed in 1995. A manuscript will be ready for peer-review early in 1996.

During the late summer and fall, we participated in a series of one-on-one and group meetings conducted by Bob Farquhar of the Leadership Development Center. There we learned more about our organizational culture and how we can make personal and organizational changes to foster teamwork and to improve morale and effectiveness. Through discussions and recommendations from these meetings, work habits were modified and the ways we interact with other employees were changed.

Meetings attended:

March - Shade Tree Short Course (Ames, IA)

May - Geographic Information Systems Working Group for the NPGS (Fort Collins, CO)

May - American Rhododendron Society annual meeting (Portland, OR)

June - Woody Landscape Plant CGC (Beltsville, MD)

June - NC-7 Regional Technical Committee (Ames, IA)

July - AABGA Annual Meeting (Montreal, PQ)

August - ASHS Annual Meeting, including Leafy Vegetable CGC, Root & Bulb Vegetable CGC, Herbaceous Ornamental CGC (Montreal, PQ)

August - Plant Germplasm Operations Committee (Ames, IA)

October - Third National New Crops Symposium, New Crops CGC (Indianapolis, IN)

December - IPGRI consultancy on Seed Regeneration (ICRISAT, Hyderabad, India)

Presentations and seminars:

March - Bretting, P.B. and M.P. Widrlechner. Managing risk and change for plant germplasm management. Presented to the ISU Agronomy Department Plant Breeding Seminar by junior author.

July - Widrlechner, M.P. Accessioning, inventory lots, and bar coding. Invited presentation for a workshop, Keeping Plant Records for Difficult Collections, held at the 1995 Annual Meeting of the American Association of Botanical Gardens & Arboreta, Montreal, Quebec.

September - Widrlechner, M.P. An overview of the U.S. National Plant Germplasm System with emphasis on horticultural crops. Invited presentation given to Nanjing Forestry University, Nanjing, China.

September - Widrlechner, M.P. An overall view on the National Plant Germplasm System of America and regional testing of woody introductions. Invited presentation given to the Chinese Academy of Forestry, Beijing, China.

December - Widrlechner, M.P. Managerial tools for seed regeneration. Invited presentation given to an IPGRI consultancy on seed regeneration at ICRISAT, Hyderabad, India.

Publications which appeared in print in 1995:

Bretting, P.K. and M.P. Widrlechner. 1995. Genetic markers and plant genetic resource management. Plant Breeding Rev. 13:11-86.

Bretting, P.K. and M.P. Widrlechner. 1995. Genetic markers and horticultural germplasm management. HortScience 30:1349-1356.

Charles, D.J., J.E. Simon, and M.P. Widrlechner. 1995. Characterization of essential oil of dill (Anethum graveolens L.) J. Essential Oil Res. 7: 11-20.

Fuentes-Granados, R.G. and M.P. Widrlechner. 1995. Evaluation of Agastache and other Lamiaceae species for reaction to Verticillium dahliae. J. Herbs Spices Med. Pl. 3:3-11.

Fuentes-Granados, R.G. and M.P. Widrlechner. 1995. Diversity among and within populations of Agastache foeniculum. pp. 1-8. Prairie Biodiversity: Proceedings

of the 14th North American Prairie Conference, D.C. Hartnett (ed.). Kansas State Univ. Press, Manhattan.

Lewers, K.S., S.K. St. Martin, B.R. Hedges, M.P. Widrlechner, and R.G. Palmer. 1995. Comparison of three methods of hybrid soybean seed production. Agronomy Abstr.: 72.

Thompson, A.E., W.W. Roath, and M.P. Widrlechner. 1995. 'Starfire' Cuphea hybrid. HortScience 30:166-167.

Widrlechner, M.P. 1995. A new look at prairie plant germplasm. pp. 207-210. Prairie Biodiversity: Proceedings of the 14th North American Prairie Conference, D.C. Hartnett (ed.). Kansas State Univ. Press, Manhattan.

Other items:

Following up on his 1993-94 role as a USDA collaborator on an 1890 Capacity Building Grant Proposal to create "A Centralized Research Support and Technology Delivery System for Flavor and Fragrance Plants," at Delaware State University (which was not funded, but recommended for revision), Mark Widrlechner helped Arthur Tucker revise the project proposal. It was submitted in January, 1995, but rejected in September. He has agreed to assist USDA/CSREES by serving as a reviewer for Capacity Building Grants in April, 1996.

Conclusions:

Curation

1995 was an fairly productive year for germplasm increase, with seed quantities and quality varying more widely than usual, due to climatic fluctuations during the growing season and an early killing frost. Many of the seed samples harvested this year seem to be exhibiting post-harvest dormancy that may involve after-ripening.

One of the main areas of curatorial progress was the increase in NSSL backup for ornamental accessions. More than twice as many accessions were sent to NSSL in 1995 than were sent in the sum of the previous ten years. Improvements in backup in the coming year probably will not be as striking, but should greatly exceed the levels achieved in previous years. In addition, during 1995, GRIN3 was checked to verify that all passport data for ornamentals were accurately and fully transferred from GRIN2.

After a short hiatus, regeneration work resumed on mint-family plants in 1995, with the help of Roger Fuentes-Granados. During seed storage in January, 1996, many mint-family accessions will also be samples for backup at NSSL.

Curatorial plans for 1996 include the regeneration of annuals (including some from NSSL) to fill in spaces in the existing cage field, major efforts devoted to reducing the backlog in inactivating ornamental accessions and to determining seed counts for all ornamental seed packets, and the verification of locations (and mapping) of permanent plantings.

Research

Mark Widrlechner's level of publication activity in 1995 was similar to that in 1994: seven papers and an abstract for a poster presentation. For 1996, he is sole author for one paper that should appear within the year, coauthor on two others to be published in 1996, and coauthor on another paper on the genetics of Agastache rugosa that is now undergoing internal review.

Other research plans for 1996 include: submitting a manuscript on the Rubus of Iowa, writing an article on demand for ornamental germplasm, preparing a talk on suggested woody plant breeding projects for the Landscape Plant Development

Center, and helping Kathy Reitsma write an article on umbel germplasm. The balance among the time spent on research, curation, and supervision will likely shift toward supervision in 1996, with the recent increase in my supervisory responsibilities. More of the research that Mark Widrlechner is involved with will need to be of a collaborative nature. He plans to meet with Craig Abel and Dick Wilson to discuss opportunities for plant-pollinator research.

C. Plant Pathology (C. Block)

Disease notes on seed increase plantings:

Regular inspections of field and glasshouse plantings are an important component of the pathology program, particularly for those diseases which pose a risk of seed transmission.

Work began on sorting through old pathology field notebooks dating from the 1950s-1970s. Many of the books were blank (no notes). Any information judged to be of potential value will be entered into a database.

Amaranthus and Chenopodium

No disease problems were observed on the Amaranthus and Chenopodium glasshouse seed increase.

Brassica and Related Genera

One hundred and eighteen accessions were inspected during June and July. Several diseases can be transmitted by seed in the Brassicaceae including downy mildew caused by Peronospora parasitica (Pers.) Fr., black rot caused by Xanthomonas campestris pv. campestris (Pammel) Dowson, blackleg caused by Leptosphaeria maculans (Desm.) Ces & de N., and Alternaria diseases caused by A. brassicae (Berk.) Sacc. and A. brassicicola (Schw.) Wilt. All accessions were free of Alternaria diseases, downy mildew and blackleg. Black rot was common on leaves of the majority of accessions.

Cucurbita pepo

All transplants are tested with an ELISA procedure for squash mosaic virus before being moved from the glasshouse to the field. For many years, seedlings were visually inspected for symptoms. We have since found that infected seedlings are often symptomless. In 1995, the ELISA assay was modified to test cotyledon tissue rather than the first true leaf. Virus titer was found to be higher in the cotyledons. Nine of 106 accessions contained infected plants (12 plants of approx. 1600). It was interesting to note that 7 of the 9 positive accessions were being grown from original seed (primarily from Mexico). Seed from the other two accessions were from previous Ames increases.

This program has not completely eliminated infected plants in the field. In 1994, a few accessions had virus symptoms at harvest. In 1995, one infected accession was observed. Source of the virus could be a late-germinating plant that escaped the initial screen, a false negative in the initial screen, or virus introduction to the field by overwintering or migrating beetles.

In 1995, a concerted effort was made to repeatedly check slowly germinating accessions for 1-2 weeks after the first plants were tested. Insecticide applications were also made more frequently to the field plants throughout the season. It is not known how plant age at the time of infection relates to resulting seed infection. We have found that seed coats are often infected, but not necessarily the cotyledons. In tests to date, only seeds with infected cotyledons resulted in infected plants.

Zea mays

The seed increase plots were inspected for rust, northern corn leaf blight, Stewart's bacterial disease, gray leaf spot and northern corn leaf spot. Because of rapid onset of maturity among the inbreds, only 101 of 171 accessions were evaluated. Stewart's disease was detected on 12 of 101 accessions by September 1. In mid-August there was no Stewart's disease visible. Gray leaf spot (Cercospora zea-maydis) was observed in greater amounts than any previous year, causing damage of up to 35% of the leaf area on the more susceptible inbreds. The two most susceptible inbreds were B73 and CO109.

In addition, 41 accessions in Mark Widrlechner's experimental plots were inspected for the same diseases. Stewart's disease was detected on eight accessions and rust severity (primarily southern rust caused by Puccinia polysora) was fairly high.

Helianthus

The sunflower increase plots were inspected twice during the growing season, primarily for downy mildew, caused by Plasmopara halstedii (Farl.) Berl. and deToni. A single infected plant was detected. Some Alternaria leaf blight developed in August, but caused little leaf damage.

RESEARCH NOTES:

Sunflower Genetic Enhancement:

Genetic enhancement of wild Helianthus annuus for resistance to Alternaria helianthi and Septoria helianthi blight.

Statement of problem:

Evaluating accessions of wild H. annuus for Alternaria leaf blight resistance is very difficult. In the wild accessions, there is often as much variability for disease reaction within an accession as among accessions. Rating accessions (trying to derive a single number or a weighted average to describe an accession) for disease response is ineffective if done in the same manner as for the cultivated accessions.

Objective:

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

Year 1

Thirty-eight accessions of wild H. annuus that had previously shown resistance to one or both diseases were selected. Of the original 38 accessions, 28 had sufficient seedlings to plant in the field with 32 plants per accession. The field was spray inoculated with a liquid suspension of the two pathogens. As susceptible plants were identified, they were marked with spray paint. Plants exhibiting resistance to both pathogens were tagged and numbered. Plants were allowed to open pollinate, but flowers were pinched from the susceptible plants and the border rows at least twice a week to minimize their pollen contribution.

One hundred fifteen plants were tagged (of 896), and seeds were harvested from 91. Additional selections will be made from this population.

Seed Transmission Research

Seed transmission of Erwinia stewartii in maize:

The objective of this research was to examine the role of seedborne Erwinia stewartii in the disease cycle of Stewart's disease of corn.

Studies were designed to: (1) determine the efficiency of seed-to-plant transmission; (2) relate the amount of leaf infection on the parent plant to the percentage of infected kernels at harvest; and (3) to use the data to assess risk of seed transmission.

In field growout tests, seed transmission, as measured by individual plant assay, was detected only from seed lots with greater than 35% seed infection by Erwinia stewartii. The transmission efficiency or 'rate' was estimated at 1.5 seedlings per 1000 infected kernels. The 95% upper confidence limit was 0.00217 or about 2 seedlings per thousand. In glasshouse growout tests, the transmission rate was nearly identical to that observed in the field. As in the field, the only seed transmission detected was from seed lots with >35% kernel infection by Erwinia stewartii, except for one plant from >8000 of a 10% seed lot. The estimated transmission rate is ten-fold lower than the commonly presumed rate of 2%.

Powdery mildew testing of Cucumis sativus collection

Pathogen - Sphaerotheca fuliginea (Schlect.:Fr.) Pollaci

Screening was conducted on cucumber accessions in the greenhouse using 10 plants per accession. Accessions expressing some degree of resistance were re-tested twice in a similar manner. A culture of Sphaerotheca fuliginea was maintained on the cultivar National Pickling. Plants were inoculated three times with a conidial suspension; the first when the cotyledons were fully expanded and subsequently every 3-4 days.

Disease reaction was recorded for individual plants. Each accession was examined twice, at 14 and 18 days. If the accession was obviously susceptible, it was evaluated once. The rating scale used was an S-I-R scale, similar to that described by Shanmugasundaram et al. (1971), based on hypocotyl and leaf reaction. Table 1 contains a summary of the results. One hundred and thirty-two (132) previously untested accessions were screened in 1995 along with 112 re-tests. In total, 899 cucumber accessions have been evaluated, representing the bulk of the collection.

Table 1. Summary of powdery mildew reaction for cucumbers in the NCRPIS collection.

Reaction type	# of accessions	% of accessions tested
Susceptible	819	91.1
Segregating - susc. + intermed.	16	1.8
Segregating - susc. + resistant	11	1.2
Intermediate	31	3.4
Segregating - intermed. + resistant	9	1.0
Resistant	13	1.4

REFERENCES:

Shanmugasundaram, S., P.H. Williams, and C.E. Peterson. 1971. Inheritance of resistance to powdery mildew in cucumber. Phytopathology 61:1218-1221.

Meetings/presentations:

January: Sunflower Research Forum (Fargo, ND).
February: 17th Annual Seed Technology Conference at ISU.
August: American Phytopathological Society Meeting (Pittsburgh, PA). 'Seed Pathology' and 'Collections and Germplasm' committee meetings were held.
August: PGOC meeting and field tour at Ames.
October: Team Building Workshop.
Served on the Agronomy Department's Greenhouse and Growth Chamber Committee.

Training Sessions:

January 24: Lab Safety Training
March: Tractor Safety
March: Dust Mask Training
November 13: Pesticide Applicator Continuing Education, Categories 3G,3O, 1D, 10
December 12: Pesticide Applicator Continuing Education, Categories 1A,1B,1C, 10

Research and service plans:

Phytosanitary inspections of seed increase plots will continue for many crops. Additional crops will be added as feasible.

Due to the number of international requests for maize seed requiring certification that the seed is free of Erwinia stewartii, ELISA seed health assays will be conducted on frequently requested accessions that were not increased (and therefore not examined in the field) at NCRPIS.

Enhancement selection will continue toward developing a wild sunflower population with resistance to both Alternaria leaf blight and Septoria leaf spot.

A range of genotypes within the Cucumis melo collection will be screened for their reaction to the bacterial disease with the intent of identifying sources of resistance.

Attend the 7th Interregional Corn Conference at St. Louis and the NCR-25 Corn and Sorghum diseases committee meeting, Feb, 1996.

Attend the Regional Seed Quality Workshop at Urbana-Champaign, IL on Mar. 14-15, 1996.

Attend the APS National Meeting Indianapolis, IN July, 1996.

Presentations:

February: Plant Pathology Department's Practical Plant Pathology Workshop. Teach two classes on ELISA techniques for identifying plant pathogens.

March: Plant Pathology Seminar on "Biology of seed transmission of Erwinia stewartii in maize."

March: Oral presentation of seed-related research at NCRPIS - Regional Seed Quality Workshop at Champaign-Urbana.

August: Poster or oral presentation on "Biology of seed transmission of Erwinia stewartii in maize at APS meetings."

D. Farm (L. Lockhart, M. Czajkowski, J. Scheuermann)

General:

We supervised and coordinated daily operations at the NCRPIS. This includes management of all facilities, fields, and greenhouse space. We supervised or conducted 62 pesticide applications in the field and/or greenhouses. We fully implemented the Worker Protection Standard this year. This included training all staff and students and posting all fields and greenhouses before applications were made. This program has slowed field work on occasion, but it does seem to be keeping employees out of the fields during the re-entry time which should lead to safer working conditions. We coordinated and scheduled the student labor force of 22.7 FTE's. We coordinated facility construction and upgrades.

Labor:

During the calendar year 1995, 163 applications for hourly employment were received and reviewed. There were 76 interviews resulting in 53 hourly employees hired. Four employees were dismissed for poor work performance and three for habitual tardiness. Currently there are 37 (15.8 FTE) part-time hourly employees working at the NCRPIS.

NCRPIS Farm Crew:

During the past year the farm maintenance crew and I decided to divide certain duties to allow each person to focus on areas where his strengths would be the most beneficial to the NCRPIS.

Jerry Scheuermann is handling the general farm equipment and vehicle maintenance. He successfully designed and constructed a furrow opener, round-up applicator, redesigned a used planter purchased from Charlie Martinson (ISU Plant Pathology) to use to plant sunflowers, overhauled the 1981 Suburban engine and 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. Mike is primarily responsible for pesticide applications in the field and greenhouses. He is also scheduling vehicle inspections and approves all repairs.

There is considerable overlap and cooperation in this new arrangement and the system seems to be working quite well. "Brainstorming" sessions are also conducted whenever needed. These sessions have proven quite valuable in providing ideas and creative solutions to the day-to-day problems encountered by the NCRPIS.

Maintenance projects completed:

Seed Storage lab renovation
Installation of -20° freezer
Two 250' lengths of chain-link fence were constructed as a trellis system for perennial vines

Tours:

This past year Larry Lockhart organized and conducted 33 tours. There were approximately 335 visitors to the NCRPIS during 1995.

Conferences, training, etc. attended:

Worker Right-to-Know Update, ISU
Respirator Training Certification, EH&S, ISU
CPR and First 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. We are currently designing a new logo in preparation of the 1998 fiftieth anniversary of the NCRPIS. Larry served on a selection committee to hire a safety officer for the Iowa Agriculture and Home Economics Experiment Station. 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.

Goals and plans for 1996:

Construction:

Coordinate installation of the fire suppression system in the shop/machine storage and entomology buildings.

Evaluate and complete preliminary plans for corn work room remodeling.

Re-roof cave annex.

Other:

Re-evaluate current hourly employee hiring and promotion policies with the goal of increasing the length of time that students work for the NCRPIS.

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

Progress:

Cage pollinations: Seven hundred and thirty-eight cages were supplied with pollinators for controlled pollination of 798 plant germplasm accessions. Honey bees were used to control pollinate 785 accessions. *Bombus bimaculatus* were used to control pollinate one accession of crownvetch, three accessions of *Cuphea*, and four accessions of *Antirrhinum*. *Osmia cornifrons* was used to control pollinate three accession of *Brassica napus*, one accession of *Aronia*, and one accession of *Spirea*.

Beekeeping: Because of the success of the bee overwintering facility, no honey bees were purchased from Texas this year.

Four hundred and twenty-one nucs were successfully overwintered in the indoor wintering facility. Nuc survival was 69.0%, which is comparable to the 75.4% survival rate last year. This fall, 304 nuc hives are overwintering indoors.

One hundred and twelve large hives were successfully overwintered in the indoor wintering facility. Hive survival was 96.6%. This fall, 169 large hives are being wintered indoors.

After three years of research, it was concluded that the following conditions are requisite for successfully overwintering nucleus hives in the facility: continuous feeding of corn syrup and pollen to nucleus hives beginning in early August to insure populations of bees that are comparatively young and only overwintering nucleus hives with more than 5,000 worker honey bees.

A Varroa mite infestation of our hives was identified 16 March 1995. All hives were treated with Apistan strips. A random sample of 30 hives were treated this fall with Apistan to detect Varroa mite levels in the hives. Population levels were not high so hives were not treated this fall. Hives will be analyzed for Varroa population levels next spring.

No tracheal mite infestation was found after analyzing 750 worker honey bees. Infestation levels have remained <1% for the past four years despite not treating, for the mite. A level of resistance to the tracheal mite in our 'Buckfast' honey bees is believed to exist.

Bombus: Sixty-two Bombus bimaculatus queens were captured this spring. Twenty-four colonies were established from these queens. Twenty colonies were used in cages for control pollinating entomophilous accessions for seed increase and for pollinator studies.

On 25 July, the first mating of Bombus bimaculatus was observed in a pollination field cage. The queen was seen a few days later burrowing into the paper mulch within the cage. Buckets of moistened sphagnum were placed in the southeast corner of the cages containing Bombus colonies. The buckets were checked every two weeks. Five diapausing queens were recovered using this method.

Bombus males, which fly in clusters within the cages days before the queens begin flying, will be removed and placed into different cages to avoid inbreeding with sister queens. These developments are significant because they may enable us to use Bombus as pollinators in glasshouses during the winter.

A Bombus flight cage in the Entomology shop was erected for mating lab reared queens. Two queens successfully mated and were recovered.

The seven mated diapaused queens were placed in moistened sphagnum and stored at 4-5˚C until next spring.

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

Osmia cornifrons: It was found that Osmia cornifrons wintering survival was highest when stored at 34˚F and 70-85% RH.

Osmia cornifrons, previously thought to be an oligolectic species that only reproduces itself on rosaceous plants, was found to reproduce itself on a diverse number of plant species within different families.

We discovered that Brassica rapa is a suitable bee pasture crop for rearing Osmia cornifrons.

Pollinator Studies: Honey bees, ALC, Bombus bimaculatus, and Osmia cornifrons were used in Cucumis sativus and Cucumis melo pollinator studies. There was no significant difference in grams of seed harvested from plants pollinated by each type of bee.

Honey bees, ALC, and Osmia cornifrons were used in a Brassica rapa pollinator study. Plants pollinated by Osmia cornifrons produced significantly (P = 0.05) more seed on a per plant basis.

Additional comparative pollinator studies were performed on Brassica napus, Brassica rapa, Sinapus alba, Cucumis sativus, Cucumis melo, Helianthus petiolaris, and Coriandrum. Results are pending.

Personnel:

Nathan Bye was accepted into the College of Veterinary Medicine at Iowa State,

consequently, he discontinued working for us this fall. His service to NCRPIS while working for the pollinator management program has been invaluable. He was a tremendous asset to the program. Ron Schweppe (Biological Science Lab Technician) was promoted from the GS/3 to the GS/4 level. Brett Roberts, currently a junior majoring in biology at Iowa State, has provided excellent help and is especially gifted at advancing the Bombus bimaculatus rearing research.
Future plans:

Perform lab rearing studies B. bimaculatus and publish procedures.

Co-author paper with Richard Wilson on indoor wintering of honey bee nucleus hives.

Perform a second year of research on the polylectic behavior of Osmia cornifrons. Analyze the data for publication.

Acquire, manage, and evaluate Peponapis pruinosa, Xenoglossa strenua, and Xylocopa fenestrata [Anthophoridae:Hymenoptera] for use in Cucumis pollinator studies.

Acquire, manage, and evaluate Nomia triangulifera [Halictidae: Hymenoptera], a specialist pollinator of sunflower, for use in sunflower pollinator studies.

Work cooperatively with Suzanne Batra (Bee Research Laboratory, USDA-ARS) and Bob Cox (State Apiarist, Iowa Department of Agriculture) on importing Anthophora pilipes villosula for Brassica spp. pollination.

Continue research on pasture plantings for rearing Osmia cornifrons and other pollinating insects.

Collect Iowa-native pollinators from plots of entomophilous plant species maintained by NCRPIS. Collected insect species will be evaluated for their potential use as control pollinating agents.

Continue to perform research on the biology of Osmia cornifrons. Currently a research program is underway to investigate the diapause requirement for this insect. Research is also being performed to correlate Osmia straw weight with live diapaused adults within the straw.

Develop management procedures for using Osmia cornifrons in Brassica spp. increase cages.

Collaborate with Richard Wilson and Mary Brothers to evaluate honey bees and Osmia cornifrons as pollinators of Helianthus petiolaris.

Collaborate with Richard Wilson and Kathy Reitsma to evaluate four pollinators on vegetable crop species.

Collaborate with Richard Wilson and Bill Van Roekel to evaluate four pollinators on Cuphea spp.

Collaborate with Richard Wilson and Rick Luhman to evaluate three pollinators on Brassica spp.

Miscellaneous:

Hosted Sun Huan, Vice President of the Jilin Academy of Agricultural Sciences, on 3/2/95, 5/31/95 and 8/26/95. Discussed the use of various insect pollinators for use in the development of hybrid soybean using a cytoplasmic male sterile line he developed.

Hosted Merv Rettke, Queensland, Austrialia from 7/24-7/26.

Served as a consultant for Brad Morris, USDA-ARS, SRPIS, on the pros and cons of leasing bees from a beekeeper for control pollinating plant germplasm.

Gave 21 presentations to visiting individuals, groups, and classes.

Completed course work in Plant Physiology, and Insect Pest Management.

Publications:

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.

Wilson, R.L. and C.A. Abel. 1995. Storage conditions for maintaining Osmia cornifrons (Hymenoptera: Megachilidae) for use in germplasm pollination. J. Kan. Entomol. Soc. (In Press).

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.

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

Activities

Curatorial Information

Significant events

Significant progress in making image acquisition of maize germplasm more efficient began in 1995. The cooperative maize ear imaging project conducted during the last few years with Iowa State University's Seed Science Center has determined that adequate images of maize ears, ear cross sections, and seed can be obtained with an ordinary color flatbed scanner. An HP4C flatbed scanner was purchased in October 1995. Together with the HP3C scanner operated by the Center, we have obtained images of 25 ears, 5 cross sections and loose seed in less time than required for one photograph of 25 ears. One hundred accessions have been imaged in this way. Images are bright and crisp with consistent lighting and color. This is the beginning of a working database of maize ear images which can be used for quality control, data acquisition, and reference.

Tim Le was hired as Computer Systems Support Specialist II in early 1996 to replace the Systems Support Specialist II who resigned in June of 1994. Since 1994, many computer duties reverted back to Mark Millard. Assistance was given by the Brassica curator and the seed storage technician and several others. This is a significant event for the maize curatorial effort because now Mark Millard can spend more time on the maize collection.

We checked purity and are able to distribute 40 of the 44 PVP accessions. H84 and ND246 were increased during the last summer to adequate amounts and are ready for analysis. W117 and W153R remain to be increased to adequate amounts. They both flowered during 100 degree heat during the last summer resulting in only a small incremental increase in quantity. Seed quality may also be poor as many kernels appear to have aborted development. We are planting another increase in the greenhouse and will plant the resulting increase in the summer in more than one location if seed quantities permit.

The Galinat-Mangelsdorf collection obtained from Dr. Walt Galinat has been moved from normal storage of 35°F-30% relative humidity into recently completed 0° F storage. The seed was also sealed in plastic pouches. This should provide

optimum storage for these accessions during the extended time necessary for greenhouse increase of more than 1600 accessions of mostly tropical material.

The Plant Germplasm Operations Committee (PGOC) and the Germplasm Resources Information Network (GRIN) groups met in Ames at the NCRPIS in August. These two national groups of germplasm managers and germplasm information managers were educated in ongoing procedures at the NCRPIS. It was the first time both groups were able to visit the Ames facilities. Significant exchanges of information and concerns were made. These meetings should help us work more efficiently within the National Plant Germplasm System and GRIN, ultimately allowing more work to be performed in the maize program.

Acquisition:

New accessions received

During 1995, 181 Zea accessions were acquired. Among those acquired 18 were the result of seed requests for accessions previously held only at NSSL. Thirty one were for important Latin American Maize Project (LAMP) accessions. Forty-five were from Crop Science Registered (CSR), accessions. Eighteen were sweetcorn populations gleaned from the Seed Savers Exchange listings by Dr. W. Tracy at the University of Wisconsin. The largest proportion was 64 previously-quarantined accessions regenerated on the island of St. Croix in a cooperative ARS-APHIS program.

Maintenance and distribution:

#/% available for distribution--71% percent (10,050) of the 14,129 accessions held in December 1995 were available for distribution (figures for 1994 were 70% (9726) of the 13,940). The largest portion of unavailable accessions continues to be the 1600 accessions in the Galinat-Mangelsdorf collection. Evidently, fewer than 50% of these accessions are viable.

#/% distributed---We distributed 4339 packets of Zea seed in 1995. This represents 19% (2636) of all Zea accessions held at the NCRPIS. Last year's figures were 3750 packets representing 16% (2223) of the collection. Packet distribution increased 16% from 1994. Accessions were sent to 130 cooperators in 187 orders, an increase from 116 cooperators and 156 orders in 1994. Many of these distributions were the result of providing seed of the 50 GEM accessions for enhancement and evaluation.

#/% duplicated at NSSL--NSSL has seed of 68% (9539) of the Zea accessions held at NCRPIS. 9188 of the 10111 (91%) of the PI'ed accessions are backed up at NSSL! No backup shipments of Zea were made in 1995. In 1995, the NCRPIS emphasized backing-up other crops with much fewer accessions duplicated at NSSL.

#/% accessions regenerated--In 1995, 425 accessions were grown for regeneration. This represents just under 3% of the total Zea collection. 261 of these growouts were planted in Ames field plantings, 100 accessions were grown in Puerto Rico and 64 accessions were regenerated at the St. Croix quarantine nursery.

Seed was harvested in 1995 from 36 of the 123 accessions from the Mangelsdorf-Galinat collection that germinated. These were started in the growth chamber in 1994 and transplanted to the greenhouse. David Kovach, our seeds technician, is refining rescue procedures for the Mangelsdorf-Galinat collection in 1996. We plan to increase attempts to germinate these accessions in late 1996 after a better protocol is developed.

#/% tested for viability--We tested 8% (1165) of the Zea accessions for viability in 1995. This compares with 12% (1687) in 1994 and 20% in 1993. The reduction is of concern. Several temporary factors contributed to this decline. There were fewer regenerations in 1993 and 1994, hence, fewer germination tests for quality

control. There was a delay in a new germination data-capturing program being prepared by another site. Extra temporary help was dedicated toward implementation of ear imaging during processing in the fall of 1995. All of these factors should be alleviated in 1996. There were more regenerations in

1995, the NCRPIS is working on its own germination capturing program, and imaging should take fewer person-hours after 1995's initial implementation.

#/% of collection with permanent PI accession numbers is 72% (10111) of the total Zea accessions. Few temporary numbered accessions were PI'ed in 1995 while the new Germplasm Program Assistant focused on other computer documentation issues and assigning permanent numbers in other crops. Zea will become the priority crop for assigning permanent numbers in early 1996.

Significant progress--The nursery on St. Croix produced excellent quality seed. The Puerto Rico nursery was planted much later than usual for administrative reasons. This nursery, which was pollinated in early summer, produced seed of very good quality. The quality of this seed, ranking with the best NCRPIS-Puerto Rico nurseries, indicates that nurseries can be successfully planted all year round at that site if resources permit. The numbers of accessions increased in 1995 approached numbers necessary to maintain the collection in a 20-30 year regeneration cycle. Past viability tests indicate that most accessions of Zea will remain viable for this period of time in the cold storage at the NCRPIS.

Characterization/taxonomy:

#/% characterized/classified--Only the accessions grown in 1995 were characterized in a cursory fashion. Little progress was made in computerizing old data; however, conversion of double-record, maximum-minimum type observations to the GRIN3 single-record type was completed in 1995. The GRIN3 observation record allows for minimum, maximum, mean, and population size information to be contained within the same record. Previously, many Zea data were entered as two records, one for the maximum observation for that trait and one for the minimum observation for that trait. Over 67,000 observation records of the 115,000 maize observation records in GRIN were modified in 1995.

At the GRIN meetings in August, Mark Millard became part of two committees which will help enter more maize characterization data into the GRIN database. One committee will examine molecular marker data organizational needs in the GRIN database. Mark Millard volunteered for this committee because there is a multitude of isozyme data collected at North Carolina State on accessions held by the NPGS. Mark Millard also volunteered for an image standards committee to help set standards for accession-related images placed on the GRIN computer.

A pilot project was initiated in cooperation with Dr. Pat Schnable at Iowa State University to characterize the diversity of cytoplasmic male sterility in the collection. 600 accessions from the trial core subset were planted in Ames along with testers which were crossed to the accessions either as a male or as a female. Seed of the testers was limited as were maturity data on the trial core. Seed of the testers was multiplied for future crosses and an estimate of the time necessary for such a project was made. Several crosses were made. It was hoped that crosses could be made within marked plants of the regeneration plots as with regeneration pollinations. We will delay any further work on this project until more resources are available. Although it may be quite efficient to make these crosses during the regeneration project, the manual labor available during the pollination period is already stretched too thinly.

Significant progress--As mentioned earlier, accessions have been imaged with a color flatbed scanner and an image database is in development. Photographs of regenerations were discontinued at the end of 1995 when they were replaced by digital images obtain with the scanner. These images can be used in the future for precise characterization of ear and kernel traits.

William González, a graduate student working with Dr. Bretting, made a planting of important accessions representing native racial diversity of the northern United States and, for comparison, related races in Mexico. He measured morphological traits from this material and will examine molecular marker

variation also. Resist Ilarslan, a visiting scientist, is also working in the same way on the maize from Turkey to develop methodology to determine core subsets in temperate zone maize.

Evaluation:

#/% evaluated-- 795 accessions were evaluated for resistance to first generation European corn borer feeding by the NCRPIS entomology group. 65% (9244) accessions in the collection have been evaluated for resistance to this pest.

Second generation European corn borer feeding resistance screening was performed on 198 accessions. These data will be loaded into GRIN in 1996. Data from 190 accessions performed by the NCRPIS entomology group were loaded in 1995.

Additional preliminary screening for corn earworm resistance expressed as reduced weight gain by larva fed diets derived from corn silk was performed in 1995 by the NCRPIS entomology group.

Evaluation data sets have been received from multiple sites in 1995 for possible entry into GRIN. Additional data sets, mostly related to evaluation of the original GEM accessions, also exist. Dr. Linda Pollak has hired computer help in 1995 to manage GEM data. The NCRPIS maize curatorial team and Dr. Pollak's group will cooperate to enter the evaluation data from the original GEM accessions into GRIN.

During the last four years, the Plant Pathologist has screened our 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 them. The Pathologist is researching the importance of Stewart's wilt to distribution of maize kernels.

Significant progress--Resistance to first generation European corn borer has been evaluated for the highest percentage of accessions in the collection of any trait.

Enhancement and/or utilization:

#/% enhanced--No enhancement program has been undertaken with Zea at the NCRPIS. However, the NCRPIS provided seed of most of the 50 accessions used in the first stages of the GEM in 1995. The NCRPIS is also providing seed storage space for populations representing the intermediate stages of this program.

Significant progress-- We have provided seed for the initial stages of GEM. We expect little more NCRPIS resources will be needed until finished populations are released to the public. GEM has sparked renewed interest in evaluating those and other accessions for future enhancement.

Support/administrative personnel:

Significant accomplishments--Taiby Ladjahasan continues to become more proficient with computers. This can only help the maize project move forward.

Doug Fuller, a Research Associate working with Iowa State University's corn yield test program, joined the Zea curatorial effort in the fall of 1995. He will spend 4 months a year working with the program.

Travel and Meetings attended:

The 1995 Maize CGC meeting was held at the American Seed Trade Association meetings in December in Chicago. Highlights of that meeting affecting the NCRPIS curatorial effort were:

1. A non-compulsary three-year rotation of non ex-officio members was set up.

2. The schedule for updating the CGC Maize Crop Germplasm Report was set for 1996.

3. An initiative to evaluate the NCRPIS collection en masse for diseases was tabled due to lack of funds.

4. A proposal from NSSL was discussed to remove CIMMYT accessions backed up at NSSL and not yet at the active site at Ames from NSSL's "BASE" collection and to put them in an "INACTIVE" category. Accessions could be removed from this status by the maize curator. Orders for accessions under this status would be referred to CIMMYT. After a thorough discussion, the CGC approved the proposal, with some future refinements.

5. Mark Millard proposed adding all important publicly-released inbred lines to the active collection at Ames. This would only occur with the permission of the releasing institution. The committee suggested presenting this proposal to the appropriate maize breeding research committees.

6. The CGC committee reinforced the need for the NCRPIS to obtain samples of all accessions originating in the Caribbean area held in the CIMMYT bank.

The National Sweet Corn Breeders Association was held in conjunction with the American Seed Trade Association Meetings.

The NCRPIS RTAC meeting, Ames.

The PGOC meeting, Ames, in August 1995.

The GRIN meeting, held in conjunction with the PGOC, meeting.

Presentations or seminars:

Mark Millard joined the rest of the NCRPIS staff in hosting informative tours stressing practical management issues, of the NCRPIS facilities and plantings for the PGOC and GRIN groups. He also demonstrated the new computer communications router obtained in 1995 to replace the device (PAD) used previously by the NCRPIS and most sites to communicate with the GRIN computer in Beltsville, Maryland over FTS phone lines. This new router allows sites to economically communicate over the Internet. This allows site users to access the World Wide Web information resources.

Conclusions:

State of the program

In summary, we are keeping up with accession maintenance tasks, but again in 1995, just so. Regeneration numbers must be increased and we must 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 key accessions representing all the variability in maize.

Strengths and weaknesses: what facilitated or hindered progress

The maize collection requires a full time curator, 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 satisfy previous CGC recommendations that all Caribbean accessions held by CIMMYT should also be available at the NCRPIS. An import permit was obtained in 1995. We will try to procure some of this material in 1996, as the budget allows.

Maize from Guatemala, Bolivia, Ecuador, Paraguay, Venezuela and Brazil is not well-represented in the NCRPIS collections. We did receive some accessions from NSSL which improved this situation in 1994, but passport information must be reviewed to determine the background of these accessions. In 1995, the LAMP top 5% accessions were received via CIMMYT and NSSL from Guatemala, Bolivia, and Venezuela. The NCRPIS must obtain at least the racial type collections from these countries to round out their representation relative to other countries in the active collection.

Tropical inbred lines or elite breeding material is not well-represented in the NCRPIS maize collection. I will procure some of these materials from CIMMYT and the University of Hawaii. The CGC recommended obtaining commercial tropical hybrids for the collection.

An orderly procurement of important older public inbred lines will begin in 1996 with the exchange of accession lists of lines currently held in the NPGS with public breeders. Next, those breeders will indicate which inbred lines they feel should be preserved. The focus will be on the northern corn belt because the southern region started this exercise some year ago.

Maintenance:

A top priority in 1996 will be to maintain regeneration numbers nearer to levels achieved in the late 1980s and early 90s.

Dr. Bill Tracy spent considerable time selecting the most important materials from the Crookham collection now at NSSL. In 1996 we will begin regeneration of his selections.

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 1996 will be to regenerate accessions not successfully regenerated in previous Puerto Rico nurseries in order to secure the population size necessary.

Characterization and evaluation work

Mark Millard will continue entering field book data into GRIN. Cooperator evaluation data which have arrived will be loaded in 1996. 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 ends this fiscal year. We will continue to incorporate the technology developed into the curation effort.

Travel

Mark Millard plans to attend the Seventh Interregional Corn Conference February 11-14, 1996 to help develop the protocol for procuring old publicly-released inbred lines.

The Puerto Rico winter nursery will again require 2-3 weeks of Mark Millard’s

time in the spring of 1996. One or two other staff will also be needed.

There may be a Germplasm Resources Information Network (GRIN) meeting in the summer of 1996. Mark Millard may have to attend in his capacity as GRIN liaison and advisory committee member from the NCRPIS.

Mark Millard will attend the American Seed Trade Association and the Maize Crop Germplasm Committee meetings in December.

Mark Millard will attend the Sweetcorn Breeders Meeting to help arrange increases by the sweetcorn industry of important accessions in the Crookham collection.

G. Vegetables (K. Reitsma)

Activities--General Summary

Acquisition:

New accessions: We received 134 new accessions in 1995, and an additional 43 accessions were transferred from the SRPIS as a result of reidentifications.

Status: There are currently 7661 vegetable accessions (5657 PI numbers, 2004 Ames numbers) with 4290 accessions (56%) available for distribution. In 1995, 2076 packets were distributed, with 449 packets distributed for foreign requests and 1628 packets distributed for domestic requests. An additional 455 accessions were sent to NSSL for back up to total 3222 accessions (42%) duplicated at NSSL.

Activities--Specific Crop Summaries

ASPARAGUS

Acquisition:

New accessions received: Two wild accessions from Mongolia.

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

Maintenance and distribution:

#/% available for Distribution: In 1995, 33 (20%) of 160 accessions are available for distribution.

#/% distributed: Nine packets (7 accessions, 4% of collection) were distributed in 1995. (4 packets domestic, 5 packets foreign.)

#/% duplicated at NSSL: No asparagus accessions are currently duplicated at NSSL. Twenty-six accessions have enough inventory on hand to send approximately 1000 seed to NSSL for back-up. This material may be sent for backup in 1996.

#/% regenerated: 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 is due in 1996.

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 male sterile). Greenhouse space at the NCRPIS is limited and

therefore the NCRPIS is not a good site for maintaining the Asparagus 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: Eighteen accessions, 5 C. endivia and 13 C. intybus, were received in 1995: 5 landrace accessions from Italy, 6 cultivars from France, 2 wild accessions from Germany, 3 wild accessions from Hungary, 1 wild accession from Poland, 1 wild accession from Switzerland.

Status: 62 PI-numbers, 156 Ames-numbers, 218 total

Maintenance and distribution:

#/% available for distribution: Sixty-six (30%) of 218 accessions of chicory are available.

#/% distributed: In 1995, 99 packets (46 accessions, 21% of collection) were distributed. (43 packets domestic, 56 packets foreign.)

#/% duplicated at NSSL: Nineteen chicory accessions (9% of collection) are duplicated at NSSL. Additional Ames numbered accessions will be sent to NSSL when PIs are assigned.

#/% regenerated: Regenerations were attempted on 54 accessions in 1995. Harvests were made on 12 of 27 cages. Most of the accessions were lost to Botrytis during the last two weeks of the vernalization treatment. (The biennials were treated with a fungicide before being moved to the vernalization room.) The vernalization room was thoroughly cleaned and disinfested in the spring of 1995, and a regular spray program has been initiated to control new infestations.

#/% tested for germinability/viability: Germinations will be performed on the increase seed in 1996.

Characterization/taxonomy:

#/% characterized/classified: Only 33% of the chicory collection has the country of origin specified on GRIN. Additional passport data were provided by Dr. E. Ryder, USDA-ARS, California, for Ames numbered accessions he donated in 1986. This information was entered into GRIN in preparation for assignment of PI numbers.
Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS MELO

Acquisition:

New accessions received: 31 accessions from China

Status: 2408 PI-numbers, 760 Ames-numbers, 3168 total.

Maintenance and distribution:

#/% available for distribution: As of January 1996, 1698 (47%) of 3168 accessions are available for distribution. This includes 121 Ames numbers.

#/% distributed: In 1995, 805 packets were distributed, 674 packets as domestic requests and 131 packets as foreign requests. (Data for number of accessions and % of collection distributed are not available.)

#/% duplicated at NSSL: The total number of melon accessions duplicated at NSSL is 1271 (40% of the collection).

#/% regenerated: The 148 accessions for the 1995 melon regenerations again focused on the new germplasm collected in India in 1993 and China in 1994. Harvests were made of 133 melon (132 cage, 4 greenhouse) regenerations. Actual results of the 1995 increases will not be known until the crop is stored.

#/% tested for germinability/viability: We are currently working on the germinations for the 1995 regenerations.

Characterization/taxonomy:

#/% characterized/classified: Along with photographing the fruit, an intensive effort was made to record 20 plant, flower, and fruit descriptors for all Cucumis accessions regenerated this year. These data will be loaded into GRIN once we determine the appropriate format for GRIN 3. Secondary identifier information still must be loaded into GRIN for all of the NCRPIS cucurbits.

Significant progress--None.

Evaluation:

#/% evaluated and significant progress: Drs. C. Thomas and E. Jourdain, U. S. Vegetable Laboratory, Charleston, S.C., continue to evaluate the melon germplasm for downy and powdery mildew resistance as previously unavailable and new accessions become available. Additional gummy stem blight resistance data, provided by Dr. M. Kyle (Cornell University, Ithaca, NY), must be loaded into GRIN.

Enhancement:

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

CUCUMIS SATIVUS

Acquisition:

New accessions received: Three cultivars from Nepal and 50 accessions from China were received for a total of 53 new accessions.

Status: 961 PI-numbers, 402 Ames-numbers, 1363 total.

Maintenance and distribution:

#/% available for distribution: As of January 1996, 983 (72%) of 1363 accessions are available for distribution, 140 of which are Ames numbers.

#/% distributed: In 1995, 1562 packets were distributed, 1460 packets as domestic requests, 102 packets as foreign requests. (Data for number of accessions and % of collection distributed are not available).

#/% duplicated at NSSL: There are 752 (55%) accessions duplicated at NSSL.

#/% regenerated: The 1995 regenerations includes 235 cucumber accessions with harvests from 173 caged increases and 8 greenhouse increases.

#/% tested for germinability/viability: We are currently working on the germinations for the 1995 regenerations. Twenty accessions received in 1991 from Cheyenne, Wyoming will be inactivated because the seed is 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.

Significant progress: Due to insufficient crew, photographing fruit at harvest was stopped, and characterization notes were taken only on the harvested fruit. These data will be loaded into GRIN once we determine the appropriate format for GRIN 3.

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS species (wild Cucumis)

Acquisition:

New accessions received: 1 Cucumis figarei (Russian Federation)

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

Maintenance and distribution:

#/% available for distribution: As of January 1995, 109 (37%) of 289 accessions are available for distribution.

#/% distributed: In 1994, 130 packets (94 accessions, 32% of collection) were distributed. (8 packets domestic, 122 packets foreign)

#/% duplicated at NSSL: Twenty-two accessions are currently duplicated at NSSL. After the inventory is completed this year, an additional 20-30 accessions should be duplicated at NSSL.

#/% regenerated: No regenerations were attempted in 1995

#/% 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: One new accession from Nepal was received. An additional 43 accessions were added to the collection through the transfer of misidentified Cucurbita moschata accessions from the SRPIS in August 1995. The transferred accessions were primarily from an IBPGR sponsored collection trip in Spain in 1987.

Status: 826 PI-numbers, 164 Ames-numbers, 990 total.

Maintenance and distribution:

#/% available for distribution: As of January 1995, 687 (69%) of 990 accessions are available for distribution.

#/% distributed: A total of 63 packets (39 accessions, 4% of the collection) were distributed. (40 packets domestic, 23 packets foreign)

#/% duplicated at NSSL: There are 468 accessions (47% of the collection) duplicated at NSSL.

#/% regenerated: Regenerations were attempted on 101 (10%) accessions, with 87 accessions transplanted to the field for hand pollination. The 1995 regenerations focused on new accessions and, unfortunately, 61 accessions were very late flowering and fruit did not mature before frost. Harvests from the remaining 26 accessions were dismal. Developing fruits were extensively damaged by crows which reduced yields.

#/% tested for germinability/viability: We are preparing to perform germination tests on the 1995 regenerations.

Characterization/taxonomy:

#/% characterized/classified: Basic characterization notes for plants and fruits are recorded each year an accession is regenerated, and fruits also are photographed. All accessions have the country of origin specified on GRIN, and 72% of the accessions have an alternate id.

Significant progress--None.

Evaluation:

#/% evaluated and significant progress: The Plant Pathologist visually inspects cucurbit seedlings before transplanting them to the field for regeneration each year. Because of the increasing concern about seed borne diseases in the cucurbits, we have begun to screen all Cucurbita seedlings for virus infection with an ELISA protocol before transplanting accessions to the field.

Enhancement:

#/% enhanced and significant progress: None.

DAUCUS

Acquisition:

New accessions received: Seven new accessions were received: 3 from Nepal, 2 from Hungary, 2 from Poland.

Status: 570 PI-numbers, 211 Ames-numbers, 781 total.

Maintenance and distribution:

#/% available for distribution: As of January 1995, 512 (65%) of 781 accessions are available for distribution.

#/% distributed: In 1994, 865 packets (465 accessions, 54% of the collection) were distributed. (836 packets domestic, 29 packets foreign)

#/% duplicated at NSSL: Storage of the Daucus collection was just completed in January 1996 and an additional 311 accessions were sent to NSSL for back up. This brings the total to 594 (76%) accessions at NSSL.

#/% regenerated: Regenerations were attempted on 33 accessions of carrots. Most of the accessions were lost to Botrytis during the last two weeks of the vernalization treatment. (The biennials were treated with a fungicide before being moved to the vernalization room.) The vernalization room was thoroughly cleaned and disinfested in the spring of 1995, and a regular spray program has been initiated to control new infestations. Ten accessions were sent to Roger Freeman, Sun Seeds, Brooks, Oregon for increase. Also, 25 accessions were sent to Larry Baker, Asgrow Seed, Sun Prairie, Wisconsin for increase.

#/% tested for germinability/viability: Eighty-nine accessions received in 1991 from Cheyenne, Wyoming will be inactivated because the seed is 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--None.

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

OCIMUM

Acquisition:

New accessions received: None.

Status: 70 PI-numbers, 5 Ames-numbers, 75 total.

Maintenance and distribution:

#/% available for distribution: As of January 1995, 41 (55%) of 75 accessions are available for distribution.

#/% distributed: In 1995, 69 packets (40 accessions, 53% of the collection) were distributed. (20 packets domestic, 49 packets foreign)

#/% duplicated at NSSL: Thirty-nine accessions (52%) 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 onto GRIN and its format.)

Significant progress: None.

Evaluation:

#/% evaluated and significant progress: None.

***Enhancement:* None.**

#/% enhanced and significant progress: None.

UMBELS

Acquisition:

New accessions received: We received 21 new umbel accessions: 2 Angelica, 1

Astrantia, 3 Carum, 1 Crithmum, 6 Eryngium, 1 Pastinaca, 4 Pimpinella, 2 Torilis, 1 Trachymene.

Status: The NC7-umbels sitecrop has 337 PI-numbers, 278 Ames-numbers, for a total of 615 accessions including: 6 Ammi, 81 Anethum, 19 Angelica, 3 Astrodaucus, 20 Bifora, 1 Bunium, 16 Carum, 1 Caucalis, 9 Chaerophyllum, 128 Coriandrum, 21 Cuminum, 1 Ducrosia, 14 Eryngium, 6 Ferula, 42 Foeniculum, 1 Levisticum, 1 Muretia, 42 Pastinaca, 148 Petroselinum, 34 Pimpinella, 1 Schumannia, 2 Sium, 8 Torilis, 1 Trachyspermum, and 9 unidentified Apiaceae.

Maintenance and distribution:

#/% available for distribution: As of January 1996, 161 (25%) of 615 accessions are available for distribution.

#/% distributed: Of 36 packets distributed (33 accessions, 5% of the collection), 3 packets were shipped for domestic requests, and 33 packets for foreign requests.

#/% duplicated at NSSL: Only 57 accessions (10%) are duplicated at NSSL.

#/% regenerated: In 1994, we attempted to regenerate 6 Ammi, 13 Carum, 49 Coriandrum, 23 Cuminum, 15 Eryngium, and 31 Pimpinella. Several of these accessions are perennials and plants were left in the field with the hope of harvesting additional increase seed in the fall of 1995. Six Pimpinella and 1 Carum were harvested in 1995.

#/% 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.

Significant progress: 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.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

Conclusions:

Meetings attended:

June 27-28, I attended the NC-7 Technical Advisory Committee meetings.

July 30 - 2 August, I attended the following meetings held in conjunction with the American Society for Horticultural Science (ASHS), Montreal, Quebec, Canada:

-Root and Bulb Vegetable Crop Germplasm Committee
-Leafy Vegetable Crop Germplasm Committee
-Cucurbit Genetics Cooperative
-Genetics and Germplasm Working Group (GG)
-Vegetable Breeders Working Group (VGBR)

August 23-24, I also attended the Plant Germplasm Operations Committee meeting in Ames, Iowa and the Germplasm Resources Information Network meetings that followed PGOC on 25 August.

In August, the staff of the NCRPIS began a teamwork training program in Ames, provided through the Leadership Development Center (Peoria, IL), to improve personal and NCRPIS staff teamwork skills. We participated in individual and group teamwork training sessions through November.

H. Crucifers and Grasses (R. Luhman)

Acquisition:

In 1995 the NCRPIS logged into the GRIN database 22 new Brassicaceae accessions, three new millet accessions and 14 new Linum accessions (Table 1). These accessions were given local Ames numbers and will be considered for formal entry into the National Plant Germplasm System.

Table 1: Numbers of Accessions Received in calendar 1995.

GENUS	TOTAL ACCESSIONS	ACCESSIONS ACQUIRED	% ACQUIRED
Alyssum	35	3	8.6
Brassica	3097	9	0.3
Camelina	19	3	15.8
Echinochloa	219	1	0.5
Hesperis	16	1	6.3
Iberis	3	1	33.3
Lepidium	113	2	1.8
Linum	112	14	12.5
Panicum	982	1	0.1
Setaria	975	1	0.1
Sinapis	146	1	0.7
Thlaspi	13	2	15.4
All others	686	0	0
TOTAL	6416	39	0.6

Maintenance and distribution:

About 65% of the accessions that I maintain have Plant Introduction numbers and about 55% are available for distribution (Table 2). One-thousand three-hundred thirty-one Brassica accessions received from the National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois in 1988 lack Plant Introduction numbers. Oil analysis information has been requested from the NCAUR for this 1988 Brassica shipment. When this information arrives, decisions will be made about formal entry of these accessions into the NPGS.

In 1987, a large shipment of Indian millet seeds (ca. 5700 packets) were forwarded to us from the Plant Introduction Office. Based solely on identifiers, about half of these packets appeared to be duplicates of material that was already in the system. The remainder of the packets were given local Ames numbers. During calendar year 1995, most of these locally numbered accessions were inactivated due to one or several of the following reasons:

(1) We already have a large millet collection from India.
(2) Demand for these millets are low.
(3) Based on secondary identifiers, 336 of the accessions in the locally numbered group had some sort of species identification discrepancy.
(4) The passport information was questionable.
(5) The Setaria accessions had poor seed quality.
(6) At least 150 Panicum packets in the locally numbered group appeared to have poor seed quality.
(7) Of the 26 Setaria italica accessions grown in 1988 for comparison purposes only two of the accessions appeared to match morphologically other inventories with the same secondary identifier and the same species identity.
(8) Based on points one through seven, the cost to regenerate all of this material in quarantine would have been excessive, relative to their short-term and long-term value to the scientific community.

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	3097	1528	49.3	1365	44.1
Echinochloa	219	160	73.1	136	62.1
Linum	112	74	66.1	12	10.7
Panicum	982	911	92.8	821	83.6
Setaria	975	948	97.2	785	80.5
Other Crucifers	914	481	52.6	368	40.2
Other Grasses	117	45	38.4	14	11.9
TOTAL	6416	4147	64.6	3501	54.6

In 1995 we distributed seed from 11 of the 36 genera that I curate. Thirty-six U.S. and 12 foreign scientists received 1140 and 1210 packets of seed, respectively (Table 3).

Currently, about 73% of the accessions that I maintain are backed up at the National Seed Storage Laboratory (Table 4). This is an increase of 37% over 1994. A major effort in backing-up the Brassica collection and inactivating a large portion of the millet collection were the two factors that led to this increase.

Table 3: 1995 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	3097	1009	1125	857	991	2134	1225	40
Camelina	19	3	0	3	0	3	3	16
Crambe	220	34	17	28	16	51	38	17
Echinochloa	219	2	3	1	3	5	4	2
Eruca	161	10	19	10	15	29	18	11
Isatis	14	1	1	1	1	2	1	7
Panicum	982	21	10	21	10	31	30	3
Setaria	975	56	6	49	6	62	55	6
Sinapis	146	1	29	1	23	30	24	16
Tricholaena	6	1	0	1	0	1	1	17
Tridens	69	2	0	2	0	2	2	3
All others	608	0	0	0	0	0	0	0
TOTAL	6516	1140	1210	974	1065	2350	1401	22

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 1995
Alyssum	35	1	2.9	0
Brassica	3097	3007	97.1	1628
Crambe	220	68	30.9	0
Echinochloa	219	12	5.5	0
Eruca	161	111	68.9	0
Erucastrum	19	1	5.3	0
Hesperis	16	6	37.5	6
Iberis	3	2	66.7	0
Isatis	14	1	7.1	0
Lepidium	113	36	31.9	0
Linum	112	1	0.9	0
Panicum	982	760	77.4	0
Setaria	975	662	67.9	0
Sinapis	146	22	15.1	0
Thlaspi	13	1	7.7	0
All others	291	0	0.0	0
TOTAL	6416	4691	73.1	1634

The 1995 Brassicaceae regeneration attempts totaled 96 accessions (Brassica, Enarthocarpus, Erucastrum, and Sinapis) (Table 5). Two accessions failed to germinate and will be considered for the inactive file. The two attempted lots from a third accession were discarded due to a labeling error. The remaining 93 accessions were harvested and processed. Additionally, six accessions from an overwintering 1994 Brassicaceae field and three 1994 glasshouse-regenerated accessions were harvested and processed.

In 1995, we attempted to regenerate 38 millet accessions (Echinochloa, Panicum and Setaria) (Table 3). Fifteen attempted accessions did not germinate and will be considered for the inactive file. The remaining twenty-three accessions were harvested and processed.

Also in 1995, eight wild Linum accessions that we had been growing in the glasshouse were transplanted to the field and caged. Honeybees were used for pollinators and six of these accessions were harvested.

Table 6 indicates that 264 germinations (223 accessions) were completed during calendar year 1995. Most of these germinations were from the 1994 regeneration.

Table 5: 1995 Regeneration.

GENUS	TOTAL ACCESSIONS	ATTEMPTED REGENERATIONS (LOTS)	ATTEMPTED REGENERATIONS (ACCESSIONS)	HARVESTED REGENERATIONS (LOTS)	HARVESTED REGENERATIONS (ACCESSIONS)	GROWN FOR OBSERVATION
Brassica	3097	122	90	99	88	38
Echinochloa	219	8	8	2	2	0
Enarthrocarpus	3	2	2	2	2	0
Erucastrum	19	2	2	2	1	0
Panicum	982	19	18	17	16	43
Setaria	975	12	12	5	5	3
Sinapis	146	2	2	2	2	0
All Others	975	0	0	0	0	0
TOTAL	6416	167	132	127	116	84

TABLE 6: Germinations performed in calendar year 1995.

GENUS	TOTAL ACCESSIONS	PACKETS GERMINATED	ACCESSIONS GERMINATED	PERCENT ACCESSIONS GERMINATED
Alyssum	35	5	5	14.3
Berteroa	11	1	1	9.1
Brassica	3097	76	65	2.1
Camelina	19	2	2	10.5
Echinochloa	219	6	6	2.7
Eruca	161	1	1	0.6
Erucastrum	19	5	5	26.3
Erysimum	63	9	9	14.3
Lepidium	113	15	15	13.3
Matthiola	11	1	1	9.1
Panicum	982	33	24	2.4
Setaria	975	84	63	6.5
Sinapis	146	24	24	16.4
Thlaspi	13	1	1	7.7
Tridens	69	1	1	1.4
All Others	771	0	0	0.0
TOTAL	6416	264	223	3.5

Characterization/taxonomy:

During the 1995 Brassicaceae increase, flowering date, corolla color, silique arrangement, plant height, harvest date(s), and number of plants harvested were recorded. Since the approved descriptor list is now in the GRIN database these data will be entered into GRIN during 1996. 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.

Forty-three Brassica, 38 Panicum, and three Setaria accessions were grown for identification purposes only. Herbarium specimens were collected for these accessions and where appropriate will be sent to a specialist for identification.

Evaluation of pollinators for various Brassicaceae species continued. During 1995 we studied Sinapis alba (one accession), Brassica rapa (two accessions), and Brassica napus (one accession). This research is being done in cooperation with Richard Wilson and Craig Abel. The harvested weight of each accession was analyzed separately and in all cases the seed weight produced by plants pollinated by Osmia and Apis were not significantly different. The amount of seed produced by Osmia, Apis, and Megachile pollinators was not significantly different for three of the four accessions. In two cases, the control was not signifcantly different than some of the pollinators. One of these cases, Brassica napus, is probably due to a high degree of self pollination. Of the three pollinators, however, Osmia or Apis would be a better choice since Megachile normally works under warmer conditions.

Meetings attended:

I attended the Forage and Turf Grass Crop Germplasm Commitee Meetings. This meeting was in conjuction with the ASA meeting in St. Louis, MO. A great deal of time was spent during this meeting discussing how material could be expidited

through quarantine.

I attended Communication Training-conducted by The Leadership Development Center, Peoria, IL.

Publications:

None.

Other Activities:

In June 1994, our System Support Specialist resigned. Up until January of this year the Maize Curator, the Seed Storage Technician, and I attempted to compensate for this vacancy. I estimate that 30% of my time had been spent in this capacity. It is hoped that the time allocated to computers will diminish in the coming year. Various duties in 1995 included:

A. Kept up with new developments in GRIN III and passed those developments onto other NCRPIS GRIN users.

B. Helped install a Dynastar Router so that the NCRPIS farm could access the Internet by graphical means.

C. Configured our server to an SMTP gateway.

D. Configured many NCRPIS computers for Internet mail.

E. Loaded software (especially internet software).

F. Checked computers for memory configurations and possible conflicts.

I served on the following committees.

A. Computer Committee

B. Communications/Teamwork Committee

C. Curators' Committee

C. Extension Committee

Future Activities:

The 1996 field regeneration will include ca. 200 Brassicaceae accessions and ca. 50 grass accessions. We will use Osmia as pollinators in about half of the Brassicaceae cages.

I will be requesting several Brassica accessions from the Australian Temperate Field Crops Collection in Horsham, Victoria, 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. Amaranthus, Celosia, Chenopodium, Coronilla, Dalea, Galega, Marina, Melilotus, and Perilla (D. Brenner)

AMARANTHUS: 3,184 accessions.

Acquisition and inactivation:

63 accessions were acquired, including the following:

One Amaranthus tenuifolius accession was acquired from the germplasm system in India. Unfortunately seeds of this accession did not germinate. Three advanced selections from the Kabre Hills Crop Research Station in Nepal, with unusual dramatic coloring, four wild United States collections including one species new to the NPGS were acquired, Amaranthus californicus, collected by David Brenner, and 47 accessions collected by Christina Mapes in Mexico, where they were in use as vegetables, were also acquired.

Twenty-four accessions were inactivated or merged due to duplication within the collection.

Maintenance and distribution:

1995	#	% of collection
Accessions available for distribution	1797	56
Seed orders	58	NA
Packets distributed	853	NA
Accessions distributed	281	9
Accessions backed-up at NSSL	663	21
Accessions planted to regenerate in 1994	192	6
Accessions germination tested in 1995	750	23

Four hundred and seventy-five accessions were stored in 1995. One-hundred-ten accessions were sent for back-up at the NSSL.

Unfortunately, the lack of daylength control prevented summer plantings at the ISU campus location. A greenhouse contractor studied greenhouse structure and determined that automatic daylength control curtains could not be installed there.

A long-delayed distribution of Amaranthus pumilus to Canada was permitted after a review of endangered species regulations by the Fish and Wildlife Service. As a threatened species, export was allowed because the seeds distributed were regenerated from germplasm collections rather than wild-collected.

The field plantings were grown only for observation because the accessions adapted to our climate had already been regenerated.

Characterization/taxonomy/evaluation:

A characterization system with 30 descriptors was approved by the New Crops CGC in November, and was installed in GRIN in January 1995 by Mark Bohning from the DBMU office in Beltsville, Maryland.

One hundred and five accessions were re-identified. Most of the identifications were based on growouts during seed regenerations. One thousand and thirty-one Amaranths accessions are still identified only to genus.

Ryan Jeffryes was very successful at improving the passport data for 1,200 accessions that came from the Rodale Research Center since 1981. He concentrated on the secondary identifier and cooperator information. The narrative fields must be reviewed next.

Ronald Schweppe entered in GRIN the herbarium holdings for all of my crops, including the National Arboretum holdings which were entered from a list prepared by Richard Spjut. Brian Fries entered the harvest population sizes for the regenerations since 1988.

Leon Weber of the Rodale Institute donated approximately 600 photographic slides to better document some NCRPIS germplasm.

The backlog of unprocessed original amaranth seed packets was processed.

Enhancement and/or utilization:

In 1993 two non-shattering lineages were selected from an accession that has non-circumscissile utricles (PI 572261). In 1995 the two lines were crossed with shattering types to study inheritance of the non-shattering character. The non-shattering was present in 10 percent and 28 percent of two F_2 populations. This information would be useful to plant breeders that use non-shattering in crop improvement.

Plans:

Enter characterization data from the Rodale Research catalog into GRIN.

Utilize all available greenhouse space to make optimal progress with the germplasm that needs regeneration.

Edit the ninth issue of Legacy, the Amaranth Institute newsletter, which will be published in the summer of 1996.

CELOSIA: 20 accessions.

Acquisition: **None.**

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	11	55
Seed orders	6	NA
Packets distributed	19	NA
Accessions distributed	11	55
Accessions backed-up at NSSL	4	20
Accessions regenerated in 1994	1	5
Accessions germination tested in 1995	0	0

The only seed regeneration was done by cooperators in Hawaii, at the Molokai site, organized by Richard Hannan of the Western Regional Plant Introduction Station.

Characterization/taxonomy/evaluation:

One accession was assigned a PI number.

Plans:

Viable Ames-numbered accessions should be assigned PI numbers.

CHENOPODIUM: 197 accessions.

Acquisition: **2 accessions.**

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	65	33
Seed orders	16	NA
Packets distributed	84	NA
Accessions distributed	41	21
Accessions backed-up at NSSL	31	16
Accessions planted for regeneration in 1995	72	36
Accessions germination tested in 1995	0	0

None of the nine quinoa accessions in a small field planting set seed although some flowered at the correct time. High temperatures at flowering probably killed the pollen. One white seeded quinoa-like accession from Taiwan, PI 433379, set some seed. The wild Chenopodium berlanderi germplasm from Iowa, which is closely related to Chenopodium quinoa, set abundant seed.

***Enhancement*:**

Dr. Sarah Ward published information about use of male sterility from PI 510536 in crop improvement (Developing improved quinoa varieties for Colorado. Ph.D. Dissertation. Summer 1994. Colorado State University).

CORONILLA, DALEA, GALEGA, and MARINA: 165 accessions.

Acquisition: **None.**

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	88	53
Seed orders	4	NA
Packets distributed	13	NA
Accessions distributed	12	7
Accessions backed-up at NSSL	71	43
Accessions regenerated in 1995	24	14
Accessions planted for harvests in 1996	0	0
Accessions germination tested in 1995	1	1

Long-term field plantings of 24 accessions were harvested. They were established in 1994. Unfortunately the seed set was poor due to pollination problems, and the harvesting was too slow to harvest all the seeds at the optimal time, the last week of August. Our pollination problems could be related to a self-incompatibility mechanism, or because honey bees are not the appropriate pollinators. Seed regeneration on this scale should not be resumed until an improved protocol is developed.

MELILOTUS: 830 accessions.

Acquisition: 15 wild accession from Mongolia and Pakistan.

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	588	69
Seed orders	6	NA
Packets distributed	29	NA
Accessions distributed	21	2
Accessions backed-up at NSSL	550	65
Accessions regenerated in 1995	79	9
Accessions planted for 1996	0	0
Accessions germination tested in 1995	50	6

Greenhouse pollination trials using caged leafcutter (Megachile) bees, and Osmia bees were conducted in cooperation with Craig Abel and Ronald Schweppe on the Entomology staff. The Osmia bees were able to pollinate an otherwise hard-to-handle cultivar 'Israel' which is self-incompatible, late flowering, and annual.

Forty-one accessions were backed-up at the NSSL with control pollinated seeds, some of these were previously backed-up with open pollinated seeds.

Characterization/taxonomy/evaluation:

All data from the published Plant Inventory documentation for PI numbered accessions are entered in GRIN.

Five Melilotus officinalis from China were found to be annuals, which is unusual for that species.

Seven accessions were re-identified, one as a Trigonella which will therefore be transferred to Pullman, Washington. One obsolete French cultivar PI 275975 was re-identified as M. altissmus from M. officinalis, it is the only cultivated accession of its species.

Plans:

To fill in documentation gaps and secure PI numbers for the National Seed Storage Lab holdings of 19 un-duplicated cultivars.

To complete the entry of data in the "improvement status" GRIN field.

In accord with a Crop Germplasm Committee resolution I prepared a plan for reducing maintenance activities in low-demand legume genera. This plan was approved at the October 1995 committee meeting. Plantings to replace open pollinated seeds with controlled pollination seeds will be stopped, and plantings will be at intervals of two or three years rather than every year. "Low demand" is defined as less than ten seed orders per year, per genus, and no active plant

breeding projects in the U.S. Additional plantings would be of material not available for distribution in the priority of:

(1) cultivar, landrace, or breeding material
(2) core accessions
(3) questionable taxonomic identifications at the genus level
(4) novel material
(5) The others, mostly wild material, that are not available would have a much lower priority. They would wait for some kind of special interest or improvement in regeneration resources.

Categories 1, 2, 3 and 4 together are less than 40 accessions for these genera.

PERILLA (19 accessions).

Acquisition: None.

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	19	100
Seed orders	3	NA
Packets distributed	12	NA
Accessions distributed	10	53
Accessions backed-up at NSSL	15	79
Accessions regenerated in 1995	0	0
Accessions germination tested in 1995	0	0

Plans:

Viable Ames-numbered accessions should be assigned PI numbers.

SPINACIA: (304 accessions).

Acquisition: None.

Maintenance and distribution:

1995	#	% of total number of accessions
Accessions available for distribution	205	67
Seed orders	5	NA
Packets distributed	220	NA
Accessions distributed	217	71
Accessions backed-up at NSSL	260	85
Accessions planted for regeneration	104	34
Accessions germination tested in 1995	0	0

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. The plantings were healthy during my inspection tour in November 1995, and were reported to be healthy at the start of harvesting in January 1996.

Four accession were grown in the Iowa State University glasshouse in 1995. These plantings were made to gain experience with regenerating the crop in glasshouses.
Characterization/taxonomy/evaluation:

A draft characterization list of 20 Spinacia descriptors was distributed to two Leafy Vegetable CGC members, Dr. Jay Schafer (Alf Christianson) expressed interest in working on revisions.

All data from the published Plant Inventory documentation for PI numbered accessions were entered in GRIN.

The "CGN" number identifiers for 98 of our accessions that are also held by the germplasm collection at Wageningen, in The Netherlands, were entered in GRIN to improve cross-referencing and prevent duplication.

Plans:

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

From my conversations with experts and examination of the literature I learned that spinach is best grown for seed production under short daylength until the plants are well established, then are forced to flower with long daylength. This regimen is compatible with winter Amaranthus seed production, in glasshouses, with the modification that long days are provided for the Spinacia when the adjacent (short-day) Amaranthus plants are maturing seeds and are no longer daylength sensitive.

Two similar seed requests were made this year for Spinacia that would not bolt in

the far north (Alaska and Minnesota). Our material from similar or higher latitudes in Europe is not available, probably because successful seed production would require very long days. In some commercial production, the seed are produced at higher latitudes than the crop would be grown, in order to provide long days for flowering. Our high latitude (Russian and Scandinavian) accessions should have high priority for regeneration.

Miscellaneous progress:

I edited the 1995 issue of Legacy, the official newsletter of the Amaranth Institute.

I prepared three written progress reports for Crop Germplasm Committees.

Professional meetings attended:

August 14 to 24, The Amaranthus research group at the University of Hong Kong paid for and organized my tour of research projects in China and Hong Kong. I was able to identify some taxonomic errors in some Chinese field plantings.

October 22 to 26, National Symposium on New Crops, Indianapolis, Indiana.

October 29 to November 1, Agronomy Society of America, Annual Meeting, Saint Louis, Missouri.

November 1 to 5, Spinacia seed regeneration inspection and wild germplasm collecting, Salinas, California.

November 11, Amaranth Institute, Sioux City, Iowa.

Publications and presentations:

Williams, J.T. and D. Brenner. 1995. Grain amaranths (Amaranthus species). p. 129-186. *In*: J.T. Williams (ed.) Cereals and Pseudocereals. Chapman and Hall, London.

Brenner, D.M. 1995. Amaranthus germplasm at the North Central Regional Plant Introduction Station. Legacy 8:14.

Brenner, D.M. 1995. Perilla fact sheet. 1995. Permanent internet posting at: http://newcrop.hort.purdue.edu.

IN PRESS:

D. Brenner. Coronilla, Dalea, and Melilotus for the CGC-sponsored "Conservation Legume Varieties of the United States" handbook.

Acknowledgements:

Progress was disrupted by high turnover in the crew of hourly workers. Bryan Fries, a crew leader, left after 3 excellent years on the crew. David Frieden, the second crew leader, was with me for 6 months. Additional help was provided by Paul Maiefski, Steven Roach, and Sherry Weikum. Ronald Schweppe, from the Entomology project, provided valuable help and continuity with his amaranth work in the winter and late fall.

Ryan Jeffryes spent many weeks with GRIN passport documentation.

Linda Minor provided valuable help with merging duplicate accessions, and keeping track of seed orders.

Richard Luhman and David Kovach provided helpful computer guidance.

Important assistance was provided by Lisa Burke and others in seed storage.

Mark Widrlechner helped me to revise numerous manuscripts.

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

Acquisition:

New accessions:

In 1995, 57 new cultivated Helianthus accessions were received and logged into GRIN. The majority of these accessions are original open-pollinated varieties from various foreign countries.

Maintenance and distribution:

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

Eighty-four of the 263 miscellaneous asters (32%) are available for distribution. Fifty-four accessions (21%) have PI numbers.

#/% distributed--We received 79 Helianthus requests (18 foreign and 61 domestic) and distributed 3022 packets. Compared to 1994, germplasm requests and packet distribution increased 65% and 78%, respectively.

Twenty-four Vernonia packets were distributed to five requestors (three foreign and two domestic).

#/% duplicated at NSSL--39 Helianthus accessions were sent to NSSL; 28% (1016 accessions) of the total collection is now duplicated.

Twenty-one of the miscellaneous asters (8%) are duplicated at NSSL. No additional accessions were sent in 1995.

#/% regenerated--1995 greenhouse regenerations were conducted on 33 cultivated H. annuus accessions. Five of these accessions were from the Martinez collection, 27 were PIs donated from the Institute for Plant Production and Qualification, Hungary and the remaining accession was an Ames-numbered accession with low viability. Hand-pollinated, field increases were attempted on 108 accessions, including three accessions regenerated at Woodland, California by Pioneer Hi-Bred. One hundred and one (101) wild annual accessions were germinated for regeneration and 82 of these accessions were transplanted for controlled pollinations.

1995 field regenerations were attempted on three Vernonia accessions. One accession did not germinate and the two remaining accessions were transplanted into cages for controlled pollinations. Because of late flowering, these were relocated into a greenhouse on September 21, 1995. In addition, regeneration attempts on nine Vernonia accessions are being conducted at the U.S. Water Conservation Laboratory, Phoenix, Arizona.

#/% tested for germinability/viability--Viability tests were conducted on 396 Helianthus inventory lots.

Significant progress--Implementation of the perennial Helianthus field accession management program continued and 13 perennial plots were relocated in 1995. Twenty-five new sunflower cages (10x10x20) were fabricated, providing a total of 75 cages dedicated to regenerating wild Helianthus species. In addition 12 accessions of various wild annual species were increased in smaller cages (5x5x20). The 183 Vernonia accessions acquired in 1993 were cleaned, inventoried and stored.

Characterization/taxonomy:

Plant and achene characterization data were recorded for all increases. The field books have been converted to a spreadsheet format and characterization data are recorded with a 200 LX Hewlett Packard palmtop. The palmtop allows transfer of information to a PC and direct loading into GRIN with minimal manipulation.

Six Helianthus accessions were reidentified in 1995.

Significant progress--Passport information for the 1991 Great Plains Sunflower Exploration has been proofed and edited. PI numbers were assigned to 128 of the 140 accessions. The passport information for the 63 Helianthus accessions collected in Canada has been entered into GRIN, proofed and edited. PI numbers have been assigned to 56 of the 63 accessions.

Evaluation:

Several large sunflower evaluation data sets have been loaded into GRIN including fatty acid analysis of cultivated accessions, fatty acid analysis and percent oil of wild accessions, rust evaluation of cultivated accessions, Orobanche evaluation of cultivated accessions, and insect evaluation (Red Sunflower Seed Weevil and Banded Sunflower Moth) of cultivated and wild accessions. In total, 8376 evaluation observations were added to the GRIN database in 1995.

Significant progress--The backlog of evaluation data has been entered in GRIN. Curator knowledge of how to correctly format and enter evaluation data will allow for expedient entry of data in the future.

Research:

A pollinator study conducted jointly with the Entomology project was initiated in 1995. The objective of this study was to investigate the effectiveness of honey bees versus Osmia cornifrons as pollinators using two H. petiolaris accessions.

Conducting this experiment with H. petiolaris allows us to use the smaller 5x5x20 cages.

Support personnel:

The Helianthus Biological Technician, Irv Larsen, attended a forklift training seminar and Pesticide Applicator recertification courses for categories 1A, weed control; 1B, insect control; and 3G, greenhouse pest management. Irv also enrolled in Fundamentals of Soil Science (Agronomy 154) and Insect Biology (Entomology 370) at Iowa State University. In 1995, Irv's proficiency in recording plant and achene characterization data increased.

Meetings attended:

The 17th Sunflower Research Workshop, January 12-13, 1995 (Fargo, ND).

The NC-7 Regional Technical Advisory Committee, June 27-28, 1995 (Ames, IA).

Sunflower Crop Germplasm Committee, July 12, 1995 (Ames, IA).

Plant Germplasm Operations Committee, August 22-23, 1995 (Ames, IA).

Germplasm Resources Information Network (GRIN) meeting, August 24, 1995 (Ames, IA).

Participated in individual and group meetings with Mr. Bob Farquhar from The Leadership Development Center to improve teamwork at the NCRPIS.

Presentations or seminars:

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

Organized and hosted the Sunflower Crop Germplasm Committee meeting.

Planted a demonstration plot displaying the evolution of sunflower from traditional Native American landraces to modern hybrids. The demonstration plot included the over 20 Peredovik accessions in the collection. Additionally, small plots of many perennial and wild species were planted.

Future plans:

Regenerate 27 accessions in the greenhouse, and conduct hand-pollinated increases of 120 cultivated Helianthus accessions and caged increases of 75 wild annual Helianthus accessions. Future Vernonia increases will focus on accessions with low quantities of original seed.

Review passport information of all Helianthus accessions to correctly identify origin on GRIN.

Conduct the second year evaluation of honey bees versus Osmia cornifrons as effective pollinators of H. petiolaris.

Acquisition activities will emphasize obtaining ornamental sunflowers.

A concerted effort will be made to backup additional accessions at NSSL.

Sunflower characterization data from previous years remain to be loaded into GRIN. Older data must be reviewed and, if newer data exist, composite observations not linked to a particular inventory lot will be replaced with observation data linked to an inventory lot. Information linked to an inventory lot is more informative and the composite observation data will be archived.

Implementation of the perennial field nursery collection management plan will continue but emphasis will be on representing a greater diversity of perennial species in the nurseries.

Table 1. Status of the Helianthus collection (December 31, 1995).

		Available accessions		Accessions with PI numbers	
	Accessions	#	%	#	%
Cultivated accessions	1528	1042	68	875	57
Wild accessions	2163	674	31	1603	74
Total collection	3691	1716	46	2478	67

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

Acquisition:

Following Dr. W. W. Roath's retirement, 42 accessions of Cuphea were selected from improved breeding lines, sterile hybrids, and old breeding stock for inclusion in the "NPGS active collection." Those that were not formally added to the collection at that time will be recorded in the Germplasm Resource

Information Network (GRIN) when seed from this year's increase is stored.

In addition, seed from graduate student research, and selections from improved lines, have been inventoried, and placed in long-term storage for future use in any continuation of Cuphea improvement.

Maintenance and distribution:

Number and percentage of total number of 830 Cuphea accessions

1995	# of accessions	% of accessions in collection
Available	308	37
Distributed	154	19
Duplicated at NSSL	469	57
Regenerated	94*	11
Germinated	413	49

* Accessions grown for seed increase in 1995; seed is being processed at the time of this report.

Distribution consisted of 12 items from four accessions to domestic locations, and 174 items from 150 accessions to foreign locations. Distribution of Cuphea in 1995 (154 accessions) decreased from levels of 1994 (209 accessions). This may be due in part to the termination of the evaluation and enhancement portions of the project.

Significant progress: In 1995, 192 accessions were germinated for increase, leading to 94 regenerations. This was the first attempt to grow 134 accessions which included 22 species that had not previously been grown at Ames for increase.

Germination and dormancy testing were completed for 136 accessions.

Characterization/taxonomy:

Significant progress: Characterization data for 1995-increased accessions have been collected. This information as well as data from 1994-increased accessions will be entered into GRIN after seed storage of 1995-increased accessions.

The 1995 field-increased accessions have been photographed, and accessions being maintained in the greenhouse will be photographed while characterization data for those accessions are taken in 1996.

Eleven field-increased accessions and seven other accessions in the greenhouse are being grown for re-identification by Dr. Shirley Graham.

Seed oils from the 1994-increased accessions and 1995-increased accessions will be analyzed at The National Center for Agricultural Utilization Research in Peoria, Illinois.

Evaluation/Enhancement:

Although the evaluation and enhancement portions of the project have terminated, field evaluation for possible ornamental use of accessions planted for increase will continue to be performed by Dr. M. Widrlechner.

Meetings attended:

NC-7 Regional Technical Advisory Committee, Ames, Iowa.

Third National Symposium, New Crops, Indianapolis, Indiana.

New Crops CGC meeting, Indianapolis, Indiana.

American Society of Agronomy and Crop Science Society of America, St. Louis, Missouri.

EEO activities:

Recognizing and Preventing Sexual Harassment in the Agricultural Research Service, January 19, 1995.

Civil Rights Seminar, February 21, 1995.

Asian/Pacific Meal, May 31, 1995.

Gender Communications in the Workplace, July 25, 1995.

Ishi the Last Yahi, November 7, 1995.

Training:

Hazardous Waste Generator's Training, January 24, 1995.

Forklift Training, February 15, 1995.

Lab Safety Training, January 10, and 17, 1995.

Tractor Safety Training, March 22, 1995.

Fire Extinguisher Training, May 18, 1995.

Improving Teamwork Culture, Various dates in August, September, October 1995.

Completed Agronomy 354, and 354L, Soil Fertility, and Soil Fertility Lab, Iowa State University, December, 1995.

Extension/Outreach:

Gave presentation to fourth grade class on Honeybees, Beekeeping, and their Value in Pollination. October 10, 1995.

Plans:

The NC-7 CATCHALL crops were transfered to Dr. Widrlechner from Mark Millard. One of the genera, Euphorbia, which is being researched as an oilseed crop, will be added to my curatorial responsibilities.

For the 1996 growing season, a study of pollinators is being planned to test the effectiveness of Osmia in pollinating Cuphea.

I am currently enrolled in a microbiology course at Iowa State University to increase my knowledge of microbial interactions with plants. This will help me to identify problems with growing crops, and give me a better background for maintaining some species vegetatively.

L. 1995 Seed Storage and Order Processing (D. Kovach, L. Burke, L. Minor)

Abstract:

This year was again one of high activity. Order Processing had just over 750 seed orders composed of nearly 20,000 germplasm order items and about 100 hours devoted to answering information only requests. In addition to the seed requests and storing of seed, Seed Storage moved from the temporary location to the newly renovated laboratory in May, 1995. A 'Walk-In' freezer was also installed for our original seed collections in August, 1995. Lastly, it was determined that, while moving the original seed to the freezer, Seed Storage would also back up at NSSL as many accessions as possible. These factors made for a heavy workload in both Order Processing and Seed Storage this past year.

Seed Storage and Shipping:

The renovations to the Seed Storage room were finished in May, 1995. This included new electrical wiring, new walls and ceiling, new furniture and shelving. The new facilities not only enable more efficient use of the space but also add a look of professionalism. Five work stations were installed as well as three germinators for research purposes.

A -18 °C walk-in freezer was also installed to store the original seed collections or other rare collections, such as the Galinat maize collection. Special freezer packaging was used to allow safe storage while allowing curators to view the contents without opening the bags.

The special freezer trays, purchased in 1994, have proven to be very useful, especially when the need for rearranging arises.

A total of almost 20,000 seed packets were filled this year. Of those approximately 15,000 left the station for distribution or evaluation (see Table 1). Almost 3,500 seed packets were distributed overseas. The NCRPIS received just over 570 new accessions this past year. Seed Storage stored over 4,100 lots of seed while sending over 2,300 accessions to the National Seed Storage Laboratory (NSSL) in 1995. An effort to backup as many accessions as possible was initiated this past year. The effort began with the Crucifer and Millet collections. For example, by sending 1,632 accessions of Brassica (mostly Ames accessions) to NSSL, the proportion of accessions backed up for this sitecrop went from 47% in 1994 to 97% in 1995 (see Table 2). The NCRPIS's backup status is currently at 52%. This should increase substantially over the next two years. Our goal is to have >90% of the station's accessions backed up by the third quarter of 1998.

A fair amount of effort was also invested in developing a national policy for backing up seeds at NSSL. There was much disagreement at first, but after about 6 months effort there appears to be agreement among all parties involved.

Much investment of time was also placed on properly storing seed and updating the Germplasm Resources Information Network (GRIN) for accessions that have been deactivated for some time, some since 1949. This task has a moderate priority and we estimate that it will require approximately one year to complete, as other priorities allow.

Lisa Burke's position was upgraded from a GS-5 to a GS-6 as her responsibilities were more congruent with that of the higher grade level. In addition, Seed Storage was assigned three new Iowa State University student employees. They have proven to be our best crew yet. Without this staff we would not be able to report as much progress as we have.

Order Processing:

Order Processing assigned and entered into GRIN 751 orders during 1995. In addition to the regular duties associated with order processsing, a committee was established on November 21 to begin work in the "Archives Room". A preliminary review of materials, labeling of files, and identification of material outside of the file cabinets occured on November 22. Beginning November 27, reorganization and consolidation of the file cabinets was initiated. Thus far, more than 200 hours have been devoted to this project.

Seed Research:

Research into breaking dormancy of Cuphea viscosissima proved successful this past year. A two week 'accelerated after-ripening' treatment of dormant seeds raised germination from 2% without the treatment to approximately 95% germination. Other species were also tested with the accelerated after-ripening treatment and other temperature regimen. It is our goal to find quick, easy, and inexpensive methods of breaking seed dormancy for both viability testing and regeneration. These methods would be useful here and in other countries where some chemical agents may not be available. Success was obtained in breaking dormancy in Echinochloa walteri and in a Setaria species, species name not given in GRIN. Moderate success has been obtained in Amaranthus pumilus. Two week treatments thus far tested have raised the germination from 0% germination without treatment to 54% germination. Other treatments for this and Helianthus niveus are planned for 1996.

Special Training:

During this past year, additional training in data entry and information management was given to personnel in Seed Storage and Order Processing as the Germplasm Resource Information Network national meetings were held at Ames in July, 1995. Also, training was given to all permanent staff at NCRPIS in Leadership Development.

Table 1. Order Items Sent / Accessions Received Report
From 01-JAN-95 to 31-DEC-95

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
NC7-amaranth	110	837	190	24	192	1353	861	410	451	69	1454
NC7-amaranth.csr		20		1		21	21	9	12		
NC7-asparagus		9				9	9	4	5	2	2
NC7-asters		24			12	36	24	6	18		205
NC7-brassica	1632	1370		764		3766	2134	1009	1125	9	172
NC7-celosia		21				21	21	17	4		
NC7-chicory		99			54	153	99	43	56	12	18
NC7-corn.kin		7		1		8	8	4	4	1	1
NC7-crucifers	6	115	2			123	115	49	66	12	14
NC7-cucumis.cucs	34	1302		260	234	1830	1562	1460	102	53	107
NC7-cucumis.melo	49	787		18	149	1003	805	674	131	31	669
NC7-cucumis.wilds		130				130	130	8	122	1	3
NC7-cucurbita	60	38		25	101	224	63	40	23	45	213
NC7-cuphea	118	186		1	46	351	187	12	175		67
NC7-daucus		865			35	900	865	836	29	7	7
NC7-echinochloa		3		2		5	5	2	3	1	27
NC7-euphorbia		14				14	14		14		
NC7-grasses		3				3	3	3		1	2
NC7-legumes		12	1	1		14	13	7	6		5
NC7-maize		1694		1381	26	3101	3075	2940	135	120	396
NC7-maize.csr		4			12	16	4	4		24	24
NC7-maize.pvp		138		25		163	163	161	2		4
NC7-maize.t		253		596	54	903	849	832	17	3	3
NC7-maize.ta		80		36	10	126	116	107	9		46
NC7-maize.wilds		170		2	5	177	172	154	18		
NC7-melilotus	41	19	50	10		120	29	17	12	14	66
NC7-mints		40			29	69	40	26	14		2
NC7-ocimum		69				69	69	20	49		
NC7-ornamentals	283	147	100		104	634	147	21	126	75	81
NC7-ornamentals.p		16				16	16	15	1	4	
NC7-panicum		31				31	31	21	10	1	49
NC7-perilla		12				12	12	5	7		
NC7-quinoa		60		9	72	141	69	32	37	4	14
NC7-quinoa.csr		4		1		5	5	2	3		
NC7-setaria		60		2		62	62	56	6	1	101
NC7-spinach		217		2	104	323	219	216	3		2
NC7-sun.csr					10	10	0			1	1
NC7-sun.cults	10	916	343	1313	138	2720	2229	1876	353	59	250
NC7-sun.tubers		53				53	53	53			
NC7-sun.wilds	29	586	285	154	101	1155	740	468	272	1	107
NC7-umbels		35		1	2	38	36	3	33	21	23
TOTALS	2372	10446	971	4629	1490	19908	15075	11622	3453	572	4135

Table 2. Accessions Backup Status

Site Crop	Total Number of Accessions At NC7	Total Number Available At NC7	At NSSL	Percent Backup
NC7-amaranth	3183	1791	661	21
NC7-amaranth.csr	4	1	4	100
NC7-asparagus	160	32	0	0
NC7-asters	263	84	21	8
NC7-brassica	3087	1365	2994	97
NC7-brassica.csr	13	0	13	100
NC7-bryonia	3	0	0	0
NC7-celosia	20	11	4	20
NC7-chicory	218	66	19	9
NC7-corn.kin	29	1	3	10
NC7-crambe.csr	5	0	5	100
NC7-crucifers	909	361	244	27
NC7-cucumis.cucs	1363	842	742	54
NC7-cucumis.cucs.csr	1	0	1	100
NC7-cucumis.melo	3175	1697	1257	40
NC7-cucumis.wilds	291	106	22	8
NC7-cucurbita	1008	631	470	47
NC7-cuphea	830	308	469	57
NC7-daucus	781	457	283	36
NC7-echinochloa	221	136	11	5
NC7-echinochloa.csr	1	0	1	100
NC7-euphorbia	17	6	4	24
NC7-flax	141	12	1	1
NC7-grasses	115	14	1	1
NC7-legumes	166	85	72	43
NC7-maize	6763	5308	4954	73
NC7-maize.csr	89	0	89	100
NC7-maize.g	1644	0	0	0
NC7-maize.molecular	1	0	1	100
NC7-maize.pvp	31	14	8	26
NC7-maize.t	5146	4393	4253	83
NC7-maize.ta	254	233	220	87
NC7-maize.wilds	238	88	36	15
NC7-melilotus	826	585	514	62
NC7-melilotus.csr	36	0	36	100
NC7-mints	143	23	3	2
NC7-ocimum	75	41	39	52
NC7-ornamentals	1669	383	414	25
NC7-ornamentals.csr	2	0	2	100
NC7-ornamentals.p	259	11	11	4
NC7-panicum	982	821	758	77
NC7-panicum.csr	3	0	3	100
NC7-perilla	19	19	15	79
NC7-quinoa	197	63	31	16
NC7-quinoa.csr	1	1	1	100
NC7-setaria	980	785	660	67
NC7-setaria.csr	3	0	3	100
NC7-spinach	304	202	260	86
NC7-sun.csr	67	0	67	100
NC7-sun.cults	1462	1041	743	51
NC7-sun.tubers	8	0	0	0
NC7-sun.wilds	2158	671	215	10
NC7-umbels	615	160	57	9
TOTALS	39979	22848	20695	52

M. Information Management: Germplasm Program Assistant (R.J. Jeffryes)

(Note: Numbers represent full calendrical year of 1995, though reclassified position has only been filled since May 14th, 1995.)

Germplasm Collections

Acquisition:

The North Central Regional Plant Introduction Station acquires accessions from both within and outside the National Plant Germplasm System. We received 160 accessions from within the NPGS. One hundred and twelve of these were maize accesssions which arrived from NSSL with both PI and NSSL numbers. Forty-three were Cucurbita pepo, which we received from SRPIS where they had been misidentified as Cucurbita moshata. For accessions such as site-specific inventory lot codes, site-specific taxonomic groupings, backup flags and distribution flags (if applicable) were recorded on GRIN.

We received 416 accessions from outside the NPGS. For these accessions, source history information, pedigrees, habitat information, cooperators, secondary identifiers, collection notes, and inventory records were recorded on GRIN. In some cases, descriptor information also arrived with the seed and was recorded.

Maintenance:

I assisted the curators in maintaining their accessions by processing taxonomic re-identifications and inactivations. There were approximately 250 taxonomic re-identifications. One hundred and three were for Ames-numbered material; the rest were re-identifications of PIs. Of the PI accessions, 60% were amaranth. There were about 2150 inactivations of NC-7 material, 2057 of which were grasses and 61 were transfers to other NPGS sites.

Passport information proofing:

In May 1995, when this position was filled, there was a backlog of passport information dating back to October 1993. Backlog passport data for approximately 400 accessions were reviewed and added to the existing skeleton records which were present on GRIN. The information listed under Acquisition (above) described the fields that were updated.

There are fields in GRIN that apply to all accessions which fall into my responsibility. Mark Millard and I, during my training, reviewed and proofed one of these. For every accession that is assigned an Ames number, that same Ames number is also listed as a secondary identifier for tracking purposes through time. Programs were run to identify which accessions did not have their Ames number as a secondary identifier and those were corrected.

The GRIN data are stored within a database; any information that is viewed must be queried by using a computer database language. Therefore, the standardization of GRIN data is important. Fields and definitions in the Source History and Accession Names areas on GRIN were discussed by various curators and me to establish procedures and strive for standardization.

Projects:

A responsibility secondary to logging in new accessions is to research, proof, and update passport information of those accessions that require a PI number. I met with the the curators to discuss the priority of the candidate accessions.

Forty Cichorium accessions comprised the first group addressed. The Cichorium passport data have been edited and await curator approval.

Fifty-five wild Helianthus accessions collected in Canada comprised the second group reviewed. These accessions have received their PI numbers

Twelve hundred accessions of Amaranthus given to NC-7 after the closing of the Rodale Research Center program comprise the group I am currently working on. This effort has transcended the initial goal of updating passport information for accessions that must be assigned a PI number, to now researching a entire block of passport data. The data have been updated and loaded, and now await curator approval and notification about accessions that will receive PI numbers. Over 600 donors and collectors with the corresponding dates and countries were added to the Source History, and the information associated with aobut 3600 secondary identifiers was updated and standardized.

Training received:

During my first month here Mark Millard and I formally met for five hours a week, during which he trained me in the basics of Unix, Oracle, SQL, Kermit, and GRIN. This was in addition to the GRIN log in procedure training that Lisa Burke and Mark Widrlechner provided, which also formally lasted for one month.

I also participated in the Leadership Development Center's "Improving Teamwork Culture" training. Being new to the NCRPIS, the most beneficial aspect of this training for me was getting to know my new fellow employees and employers better. What I learned through this training will help me create and maintain a positive and productive relationship with them.

Conclusions:

I spent my first month on the job involved with formal training. Through the next two months I addressed the backlog, which facilitated informal training and allowed me to become familiar with the NPGS and NCRPIS data management system. Since then, incoming seeds have been promptly logged in and, starting with the Rodale Research Center Project, major improvements in the passport data have occurred.

My future plans include: proofing the passport data which I have loaded since I began this job, taking the graduate level course 'World Food Issues' at ISU, and assisting the curators by proofing and researching the passport data for 200 Cucumis accessions and 900 maize accessions.