NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION NC-7 ANNUAL REPORT

JANUARY 1 - DECEMBER 31, 1994

North Central REGIONAL PLANT Introduction Station
NC-7 ANNUAL REPORT, JANUARY 1 - December 31, 1994

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.X. Bretting, Iowa

C. **State Experiment Stations Representatives**

1. Illinois	*T. Hymowitz, Secy.	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	*S. Berry
5. Michigan	*A. Iezzoni	11. S. Dakota	*A. Boe, Chmn.
6. Minnesorta	*H. Pellett	2. Wisconsin	*W. Tracy

*Voting members

D. U. S. Department of Agriculture

1. ARS~National Program Staff, Plant~Cermplasm	*Vacant (Shands)
2. ARS Plant Introduction Office	*Vacant
3, ARS Area Director, Midwest Area	R. Dunkle
4. Cooperative State.Resarch Service	D. MacKenzie
S. Soil Conservation Service	*E. Jacobson
6. Nation Center for Agric. Util. Research	*R, Kleiman
7. National Seed Storage Laboratory	*s. Eberhart

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

1. USDA-ARS Staff

a. Research Leader/Coordinator	F. Bretting
Program Office Coordinator	L, Wilson-voss
Office Automation Clerk	L. Wells
b. Research Agronomist	W. Roath
Agricultural Research Technician	J. Van Roekel
c. Horticulturist	M. Widrlechner
Agricultural Research Technician	Vacant
Biological Science Technician	J. Edwards
d. Research Entomologist	R. Wilson
Agricultural Research Technician	S, McClurg
Biological Research Technician	C. Abel
Biological Aide	R. Schweppe
e. Agricultural Research Technician	D. Kovach
Biological Research Technician	L. Burke
Biological Science Technician	Vacant
'Germplasm Program Assistant	Vacant
Biological Science Technician	I. Larsen

2. Iowa State University Staff

a. Research Station Superintendent II	L. Lockhart
(I) Field-Lab Technician III	M. Czajkowski
(2) Field-Lab Technician II	J. Scheuermann
'(3) Clerk Typist II	*L. Minor*
b, curator II	M, Millard
(1) Fild-Lab Technician II	T. Ladjahasan --- vacant.
c. System Support Specialist II	C. Block
d. Ass. Scientist 'II (Plant Pthology	R. Luhman
e. Curator I, I (Brassica, Grasses	K. Reitsma
f. Curator II (Vegetables)	M. Brothers
Curator II (Sunflowers)	D. Brenner
G. Curator II (Amaranth)	

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

Personnel changes:

Resisnations: Becky Rasmussen, Office Automation Clerk, accepted a higher paying job at the National Veterinary Services Laboratory. Peter Lundeen, Systems Support Specialist II, resigned to assume a position with the Department of Plant Pathology at Iowa State University. Maurianna Young-Smith, Biological Aide, moved to Tennessee, *where* her husband had accepted a position. Naomi Harrold, Agricultural Research Technician, moved to Illinois where her husband had accepted a position.
New hires: Hiring of Federal employees was halted by a freeze that lasted much of 1994, and then was slowed by various factors at the national level. Consequently, no new full-time employees were hired during 1994.
Promotions: No employees were promoted during 1994.

Construction:

1. Construction of a greenhouse attached to the Entomology Building was completed.
2. Renovation of the seed handling room was begun.
3. A chain-link fence was erected as a trellis for ornamental vines.
4. An automated watering system was installed in one of the farm greenhouses.

(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)

Acquisition:

1. More than 230 germplasm accessions were acquired by the NCRPIS during 1994 (details listed under the curators' reports).
2. Significant acquisitions included sixty-three Helianthus accessions collected by the sunflower curator and Dr. Gerald Seiler in the Canadian provinces of Alberta, Saskatchewan, and Manitoba.
3. The NPGS's active collection of Beta (1350 accessions) was tranferred from the NCRPIS to the Western Regional Plant Introduction Station, as per the recommendations of the 1993 NCRPIS Review Team. The CRIS funds that supported the NCRPIS's Beta curatorial program were transferred to an USDA/ARS unit in Fresno,CA to support development of the new NPGS regeneration site at Parlier, CA.

Maintenance:

1. More than 40,000 accessions representing more than 300 genera and 1500 species are now maintained at the NCRPIS.
2. More than 1700 accessions were "backed-up" in long-term storage at the National Seed Storage Laboratory (NSSL),
3. A five-year backlog of maize seed that required storage was eliminated.
4. Seed collections were re-arranged and re-labelled with "bar-coded" labels.

Regeneration:

1. More than 1600 accessions were cultivated for seed increase at the NCRPIS or at other sites. The success rate for germplasm regeneration was very high in 1994 because of nearly ideal weather.
   a. Nine hundred and seventy accessions *were* regenerated at NCRPIS using insect pollinators in cages.
   b. The NCRPIS's germplasm regeneration program received valuable assistance from seed companies. Limagrain regenerated maize, Asgrow and SunSeeds regenerated carrots and Pioneer Hi-Bred and Cargill regenerated sunflowers.

c. -A group led by Mr. J. Rojima of Sakata Seeds regenerated Spinacia germplasm in positive pressure chambers at the USDA/ARS research site in Salinas, CA.

2. The NCRPIS!s new "bee-overwintering" facility became fully functional during 1994. This facility has decreased the annual cost of the NCRPIS's controlled pollination program,: and protected the NCRPIS's bee colonies from pests and diseases.
3. -- Tests of Bombus Mega hrlg! and Osmia bees as-pollinators of NCRPIS germplasm indicated that Osmia cornifrons is apparently a significantly more efficent pollinator of Brassica than *are* honeybees or Megachile
4. The Amaranthus regeneration program moved to the NCRPIS campus greenhouses, whereas the Cuphea maintenance effort moved to farm greenhouses.

Distriubtion:

1. More than 12,000 seed packets were distributed to researchers in the U. S. (ca. 75% of the total) and abroad (the remaining 25%).
2. Twelve vegetative cuttings were distributed. More than 600 individual, 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 3400 accessions *were* assayed for their germination/viability percentages.
2. Maize, sunflower, cucumber, melon, amaranth, Chenoaodium, brassicas, millets, and ornamental germplasm regeneration plantings were inspected for pathogsns.
3. Accessions of Cucurbita pepo were assayed via ELISA for squash mosaic virus before planting.
4. Alternaria radicina was detected in the NCRPIS carrot collection. A simple hot water treatment was very successful in eliminating this fungus.
5. Further research was conducted to characterize *a* seedborn bacterial disease of melons, and to develop a protocol for disinfecting seeds.
6. Further research was conducted- on the frequency that Stewart's wilt is transmitted through maize kernels.

Information *management:*

1. A slide scanner, document scanner, optical disk drive, and 90 Mhz personal computer were purchased with funds from the NCRPIS-ISU imaging project.
2. A local-area network (LAN) was established at the NCRPIS campus location This network links the administrative support and Research Leader's computers.
3. 'The NCRPIS computer staff continued to cooperate with other sites in the National Plant Germplasm System in the initial development of a revised version (GRIN 3) of the Germplasm Resources Information Network.

Characterization:

1. Morphological characterization data were recorded for maize, bassicas, millets, carrots, amaranths, cucurbits, Cuphea, ornamentals, and other crops.
2. The NCRPIS staff continued a cooperative project with Iowa State University's Seed Science researchers for developing an integrated, computerized image acquisition and management system. Several pieces of computer equipment were acquired for this effort;
3. Isozyme analyses are being conducted on several maize populations that were regenerated according t&several dkfferent pollination protocols. These analyses are testing the efficiency and effeciency of the NCRPIS's maize regeneration effort.
4. *A* descriptor list *for* amaranths was approved by the New Crops CAC and has been implemented.

Evaluation:

1. Accessions of maize, millets, brassicas, Cuphea, and mints were evaluated for general agronomic or horticultural merit.
2. Screening of Peruvian maize accessions for host-plant resistance to European Corn Borer identified 11 accessions with.host-plant resistance which appparently is conferred by a mechanism other than presence of DIMBOA.
3. More than 100 maize accessions were evaluated for host-plant resistance (in silks) to corn earworm feeding. More than seven hundred maize accessions were evaluated for host-plant resistance to 1st generation European Corn Borer, and two hundred accessions were evaluated for host-plant resistance to 2nd generation European Corn Borer.
4. Fourteen amaranth accessions were evaluated for host-plant resistance to lygus bug feeding.
5. Efforts to refine an assay for host-plant resistance to sunflower moth and corn earworm feeding continued.
6. The entomologist and crucifer curator received a grant from the USDA/ARS National Program Staff to evaluate brassicas for host-plant resistance to green peach aphid.
7. The horticulturist and his graduate student received a grant from the Herb Society of America to develop novel methods of evaluating chemotypes in Auastache.
8. Evaluation of the entire NPGS active collection of cultivated sunflower for host-plant resistance to Alternaria helianthi continued.
9. Research continued with seed transmission and disease etiology of Erwinia stewartii, the causal agent for Stewart's wilt.

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. The Cuphea and Coriandrum enhancement projects terminated with the retirement of the Agronomist. The most promising enhanced lines will be incorporated into the NCRPIS's gennplasm collection.
3. Non-seed shattering accessions of Amaranthus were identified, and are being bred. This germplasm may be useful in breeding programs for this crop.

Health safety, and EEO progress:

1. Many of the NCRPIS staff attended seminars regarding Worker Right-to-Know Laws, Hazardous Waste, and Tractor Safety. Several staff members attended seminars regarding supervision, OSHA Laboratory training, Respirator Training, CPR and First Aid Training, and Dust Mask Training.
2. All field workers received training in the proper use of dust masks. All NCRPIS laboratories conducted extensive efforts to compile Material Safety Data Sheets for all chemicals in use, and to assemble detailed protocol for all experimental procedures.
3. A Communications/Teamwork Committee was formed to enhance NCRPIS teamwork. This committee arranged training sessions in assertiveness and Communication presented by ISU's Employee Assistance Program.
4. Several NCRPIS staff arranged a "Hispanic" dinner which featured Hispanic cuisine and a guest speaker from Mexico.

Outreach:

1. An informational brochure describing the NCRPIS and its activities was completed, It is distributed to all visitors, Copies were forwarded to relevant offices at the national, regional, and local levels.
2. More than 250 visitors toured the NCRPIS during 1994.
3. Several staff members visited local elementary schools to teach students about the NCRPIS and its work,
4. The Ornamental Horticulture program distributed various planting and performance reports to trial site cooperators.

5. The NCRPIS hosted, and Pioneer Hi-Bred International sponsored, a conference on the co-evolution of maize and human cultures in the southwestern United States. The conference led to the formulation of an interdisciplinary research program focused on this topic.

V. INDIVIDUAL PROGRESS REPORTS

A. Germplasm maintenance, evaluation, and enhancement of Cuphea and other new crop species (W.W. Roath)

Acquisition:

There was no significant increase in the number of new accessions in 1994.

Maintenance and distribution:

A Cuphea germplsm management plan was completed and submitted to the blew Crops Advisory Committee.

Number and percentage of total Cuphea accessions

1994	# of accessions	% of accessions in collection
Available	281	34
Distributed	209	25
Duplicated at NSSL	355	43
Regenerated	74*	9
Germinated	412	50

* These accessions were grown in 1994; their seed is being processed at the time of this report.

Distribution of C. lanceolata and C. viscosissima

1994	# of accessions	# of packets,
C. aequipetala	0	0
C. cyanea	2	2
C. lanceolata	50	86
C. lutea	8	10
C. viscosissima	6 1	63
C. wrightii	26	60
Other species	52	92
Total	209	330

Significant progress: Fewer accessions were regenerated in 1994 than in recant years, however, a larger *number* of accessions were germinated for increase this year (246 in 1994 compared to 140 in 1993). Seed processing is still going on the time of this writing, but it appears that 1994 was a

good year for seed production and all accessions that were in the field will have enough seed for distribution and backup.

Distribution of Cuvhea in 1994 (209 accessions) increased over 1993 (157 accessions).. Foreign requests continue to dominate, with 287 seed packets of 181 accessions sent to foreign requesters as compared to 43 seed packets of 27 accessions sent to U.S. requesters.

Characterization/taxonomy:

Significant progress: The data from accessions increased in 1993 were entered into GRIN and characterization data for the 1994 accessions are being recorded. Photographs *of* 1994 accessions were taken and filed.

Passport data for all accessions were reviewed and appropriate corrections made to GRIN records.

Evaluation/Enhancement:

Significant progress: Ninety-nine C. viscosissima X C. lanceolata hybrid populations which had undergone 3 cycles of selections for seedling emergence were planted at two locations, Ames and Crawfordsville. The intention was to release the best of these populations. Insufficient data were obtained to support a release decision, therefore the best of these lines will be added to the Cuphea germplasm collection as breeding material. Other less advanced selections from hybrids under evaluation at Ames and Crawfordsville for seedling emergence and shatter resistance will also be added to the collection. Remnant F_1 and F_2 seed of various crosses made between Cuohea accessions have been placed into liquid nitrogen storage. These materials, plus the breeding material in the collection, will provide material to initiate an improvement program with the best of the Cuphea improvement lines, should anyone so desire.

The ten high-oil coriander lines that were in trials at Ames and Crawfordsville will also be added to the NCRPIS germplasm collection.

Several years of trials to develop a seeding management system for Cuphea at Ames were completed. Consistent stand establishment continues to be a problem in growing Cuohea at Ames. Small seed size, and shallow planting under rainfed conditions because of light required for germination seem to contribute to the problem. Although the data are not conclusive, it appears that soil packing, at least under some conditions, can help increase the number of emerged seedlings. The only variable that consistently helped increase the absolute number of emerged seedlings was increasing the number of seeds sown. We *were* not successful in obtaining emergence of more than 54 % of the seed planted at the highest seeding rates, and more often 30 to 40 % of the seed planted emerged. Rainfall patterns contributed to emergence problems. Heavy rain prior to seedling emergence can cause severe washing and loss of stand. This is a difficult problem to overcome, as rain amounts are often unpredictable, and shallow planting into packed seed beds are particularly susceptible to washing.

***Meetings** attended:*

NC-7 Regional Technical Advisory Committee, Peoria, Illinois.

American Society of Agronomy and Crop Science Society of America, Seattle, Washington.

Numerous Plant Breeding Seminars, Plant Breeding Panel meetings, Outlying Research Station meetings, and Cereal and Alternative-Crop Advisory Committee meetings, Agronomy Department, ISU.

Location EEO Committee meetings,, NADC.

Presentations or seminars:

Ben-Safbh, H. and W.W. Roath. 1994. Somaclonal-variation- in Cuphea viscosissima Jacq. Industrial Crop8 and Products 2:239-244.

Chen, W. and W.W. Roath. 1995. Karyotype of Cuphea lanceolata 'and C. viscosissima Jacq. Crop Sci. 35:246-250.

Roath, W.W M.P. Widrlechner; and R. Kleiman. 1994. Variability in Cuphea viscosissima Jacq. collected in east-central U.S. Industrial Crops and Products 3:217-223.

Roath, W.W., M.P. Widrlechner, R.L. Wilson, and R.L. Luhman. 1994. Germplasm: The foundation of sustainable agriculture. Agron. Abstr. Append. 5 p. 2.

Thompson, A.E., W.W. Roath, and M.P. Widrlechner 1994. 'Starfire' Cuphea hybrid. Hortscience. 30:166-167.

Widrlechner, M.P., W.W. Roath, R.G. Fuentas-Granados, and A. Campos. 1994. Collecting Cuphea, Sanvitalia, and Zinnia in Mexico. IPBGR Plant Genetic Resources Newsletter 98:10-12.

Publications in review:

Roath, W.W. in review. Seed storage and dormancy in Cuphea viscosissima, Jacq. Crop Sci.

Roath. W.W. in review. Problems managing seedling emergence in Cuphea in Iowa. Journal of Iowa Academy of Science.

Conclusions:

During the past.9 years that the USDA/ARS CuDhea project has resided at Ames, 830 accessions have been added to the collection. Only one accession was in the collection *prior* to 1986. Nearly half of the accessions have been acquired with my'direct participation. Other ARS personnel have contributed considerable effort in this acquisition. Drs. M.P. Widrlechner and J.H. Kirkbride have been involved in collection. Other organizations and their personnel have provided support for collections and or accessions to the collection. Dr. A.E. Thompson at the USDA-ARS Water Conservation Laboratory,' Dr. S.A. Graham, Kent State University, and Dr. S.J. Knapp, Oregon State University have added greatly to the collection, knowledge, and progress of Cuphea domestication. This was an international effort with support *from* EMBRAPA-CENARGEN, the Brazilian counter part to NPGS, and from the National Autonomous University of Mexico at Mexico City.

More than $700,000 was provided from project accounts to Oregon State University for Cuphea domestication. From that *program* came the interspecific hybrid, C. visoosissima X C. lanceolata, which has the genotype most likely to be a productive-domestic crop. Also, the genes for shatter resistance were obtained from this project.

Considerable knowledge about Cuphea germplasm has been accumulated, Variability of the C. viscosissima accessions have been described. Tissue culture techniques and somaclonal variation have been described. This work resulted in the granting of a Ph.D. degree to Dr. Ben-Salah of Tunisia. We reported DNA extraction techniques and published the karyotypes of C. lanceolata and C. viscosissima. We described a method to germinate dormant seed, and reported that C. viscosissima can be stored effectively for at

least 5 years in liquid nitrogen or in above-zero storage. Improved populations of CuDhea have been selected under Iowa conditions. These populations have improved seedling emergence, are nondormant, and are self-pollinating. Shatter resistant lines have also been identified in Ames-selected material. Although, commercial production of lauric acid from improved Cuphea has not been accomplished, the materials to make that possible have been assembled and considerable progress has been made toward that goal. Should commercial interest in CuDhea be re-established, it should be possible to produce a commercial crop for the production of capric acid in a relatively short time. Maybe by that time the knowledge necessary to develop transgenic lauric acid-producing Cuphea will be available.

Strengths and weaknesses:

Strenuths

The program's primary strength has been high-quality technical assistance. The program's technician has provided invaluable assistance. Additional strengths have included other NCRPIS staff and their contributions to field work, database processing, and computing. The NCRPIS's field and laboratory facilities are excellent, and provide an environment where work has been accomplished efficiently and without outside interference.

Weaknesses

The inability of ARS to sustain interest and support for the development of alternative crops has been a weakness. At about the time promising developments in CuDhea had been identified, interest and support for the project declined. The project, I feel, deserves additional effort in two areas. First, transgenic CuDhea hybrids that yield high quanitities of lauric acid should be produced. Improved lines should be selected for seedling emergence, shatter resistance, and high yield under rainfed conditions.

Plans:

Acquisition is complete for the present level of interest in the crop.

Maintenance and distribution will be turned over to the present project technician, who will also help with the maintenance and distribution of oilseeds other than those in Asteracsae.

The evaluation and enhancement portions of the project have terminated. However, accessions of C. carthacenensis, C. calophylla, and C. micrantha should be evaluated for medicinal properties.

B. Entomology (R. Wilson)

Progress:

Field

Corn - *Corn* earworm evaluation: One hundred maize accessions from Colombia 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. Available accessions from two maize races, 'Dulcillo del Noroeste' and 'Confite Puntiagudo' were planted in the field for silk collection. Silks were collected and frozen but diets have not been prepared to date.

European corn borer evaluation: Seven hundred forty-four maize accessions *were* evaluated for leaf feeding resistance to first generation European corn borer. Ninety rated resistant. Two hundred maize accessions were evaluated in the field *for* second generation European corn borer resistance . Date from this experiment have not been analyzed.

In cooperation with Linda Pollak (USDA-ARS, Ames), 200 LAMP maize accessions were evaluated for first generation resistance to European corn borer. Fifty-two rated resistant. Twenty LAMP accessions were rated for resistance to second generation borer. Data from this experiment have not been analyzed.

A pest management test was performed in cooperation with Les Lewis (USDA-Ames), to test the effectiveness of Beauveria (a fungus) in conjunction with plants that are resistant to Europe/in corn borer leaf feeding. Data have been collected but not completely analyzed.

Sunflower -Work continued on refining the sunflower moth evaluation technique for both cultivated and wild sunflowers. Fifty domesticated sunflowers were planted in the field and infested with sunflower moth. Ten wild sunflowers *were* planted in the field in cages and infested with sunflower moth. All sunflower heads have been harvested but processing is not finished to date.

Amaranth - Fourteen amaranth accessions were planted in the field to be evaluated for lygus bug resistance. Plants of all the accessions supported significantly fewer nymphs/female and total nymphs that did the susceptible check.

Brassica - A replicated field cage teat was conducted-to compare Osmia bees, honey bees, and alfalfa leafcutting bees for pollination efficiency of two Brassica accessions. The Osmia bees were significantly better pollinators than were honey bees or alfalfa leafcutting bees for producing the most seed/plant. Honey bees and alfalfa leafcutting bees were equal in their pollinating efficiency.

Cucumis In a replicated field cage study with C. melo and C. sativus, there were no statistical differences for seed produced per cage when using Osmiq bees, honey bees, alfalfa leafcutting bees, and bumble bees.

Laboratory

Diets A test was run to compare corn earworm larval weights when reared on three artificial diets: standard Ames, standard Tifton, and Georgia State. Ames-reared corn earworm larvae were smaller when fed with each of the respective diets. Genetic inbreeding is suspected as the cause for the smaller weight.

Rearing - A colony of sunflower moths is maintained so there will be sufficient numbers of insects for our field evaluation program.

A colony of corn earworms is maintained so there will be sufficient numbers *of* insects for our laboratory evaluation program. The standard procedure of pre-sexing pupae before they are placed into an oviposition chamber is *very* time consuming, A test was run to determine if this step was necessary. Results indicated this was not necessary and thus omitting this step will save some time in the rearing procedure.

A colony of green peach aphids is being maintained in the greenhouse and growth chamber so there will be sufficient numbers of insects for use in our greenhouse evaluation of Brassica.

Greenhouse

The greenhouse attached to the Entomology Building is finished and in operation.

A test was run in the greenhouse to compare five methods for placing corn earworms on silks: hand infesting, infesting with larvae in corn meal using a bazooka,- infesting with eggs mixed with *corn* starch in a shaker, infesting with eggs in agar and applied with a syringe, and infesting with larvae in corn cob grits applied with a bazooka. Results indicated that larvae in corn cob grits applied with a bazooka was the least effective method. The other methods were statistically equal to each other.

Miscellaneous

I serve on graduate committees for one Ph.D and two MS candidates in Entomology.

Manuscript review:

During 1994, I peer-reviewed several manuscripts for colleagues.

I reviewed manuscripts for the editors of the Journal of Economic Entomoloav, Crop Protection, Entomonhaaa, and the Journal of the Kansas Entomological Society.

Cooperative research:

I cooperated with Linda Pollak (ARS, Ames, IA) to evaluate 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 to evaluate maize for corn earworm resistance.

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

I am cooperating with Brad Binder (ARS, Ames, IA) on chemical analysis of corn leaves possessing resistance to European corn borer.

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

The entomology program provided ladybug beetles for biocontrol of aphids in field cages for several germplasm curatorial programs.

EEO activities:

Attended "Communication Workshop" at ISU on June 14, 1994.

Attended "Hispanic Meal Celebration" at NCRPIS Farm on Sep. 21, 1994.

Attended "Assertive Training" at ISU on Oct. 18, 1994.

Attended "Self-Esteem" seminar at NADC on Nov. 17, 1994.

At present, three women (one a minority) are working part-time for the entomology project.

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.

Meetings attended:

Southern Corn Improvement Conference, Savannah, GA, Feb. 15 -17, 1994.

Plant Resistance to Insects Workshop, Stillwater, OK, Feb. 27-Mar. 2, 1994.

North Central Branch meeting of Entomological Society of America, Springfield, IL, Mar. 20-24, 1994.

Eighth Great Plains Sunflower Insect Workshop, Fargo, ND, Apr. 13-14, 1994.

IPM Symposium,. Las Vegas, WV, Apr. 19-22, 1994.

International Insect-Resistant Maize Workshop, CIMMYT, Mexico, Nov. 26 - Dec.3, 1994.

Entomological Society of America Annual Meeting, Dallas, TX, Dec. 13-17, 1994.

Short courses/training:

Attended "Hazardous Waste Training" at ISU on Jan. 24, 1994.

Attended "Dust Mask Training" at NCRPIS Farm on Mar. 3, 1994.

Attended "Worker Protection Standards" training at ISU on Mar. 9, 1994.

Viewed "Lab Safety" video at NCRPIS Farm on Apr. 28, 1994.

Attended "Hazardous Chemical Training" at NADC on May 9, 1994.

Attended "Tractor Safety" video and discussion at PI Farm on May 20, 1994.

Attended "Electrical Safety" meeting at ISU on Sep. 7, 1994.

Attended *Defensive Driving" short course'at ISU on Nov. 22, 1994.

Participated in ISU Department of Entomology, CSRS Review, May 9-12, 1994.

Papers presented at meetings:

"Evaluation of Peruvian maize for resistance to European corn borer leaf feeding and ovipositional preference", Coauthor with Craig Abel, Plant Resistance to Insects Workshop, Stillwater, *OK.* Feb. 27-Mar. 2, 1994. (Poster)

"Evaluation of red kernel maize for resistance to corn earworm silk feeding", North Central Branch, Entomological Society of America, Springfield, IL, Mar. 20-24, 1994.

"Maintenance of, and requests for, maize germplasm having resistance to insect pests", International Insect Resistant Maize Workshop, CIMMYT, *Mexico,* Nov. 26 - Dec.3, 1994. (Invited talk)

"Evaluation of NPGS cultivated and wild-type sunflower for resistance to sunflower moth", Eighth Great Plains Sunflower Insect Workshop, *Fargo,* ND; Apr. 13-14, 1994.

"European corn borer leaf feeding resistance in Peruvian maize". Coauthored with Craig Abel, Entomological Society of America annual meeting; Dallas, TX, Dec.13-17, 1994.

"Status of entomology program at the North Central Regional Plant Introduction Station", ISU Entomology Department CSRS Review, May 10, 1994.

Other:

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

Visited a 7th grade class in Boone, IA and discussed entomology.

Attended Popcorn Field Day at McHone Seeds, Ames, IA, Sept. 8, 1994.

Currently serving on the Board of Directors of the Amaranth Institute for a three year term.'-

Helped 7th grader from Marshalltown with a science fair project. Met with him and his advisor on June 16, 1994. Visited his field plots in August.

Attended Mycogen field day at Slater, IA on Sep. 19, 1994.

Attended GEM field day at ISU Agronomy Farm on Sep. 22, 1994.

Currently serving on the following NCRPIS committees: Extension Committee, Communication and Team Building Committee, Office Clerk Selection Committee. I am the Transportation Officer.

Plans:

Field

Evaluate 275 maize RI accessions for corn earworm silk feeding resistance.

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

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

Evaluate 10 amaranth RI accessions *for* resistance to tarnished plant bug and *work* on a better technique far evaluation.

Cooperate with Rick Luhman 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 to analyze corn silks *for* chemicals causing resistance *(Maurice* Snook).

Evaluate 50 sunflower (cultivated type) and 10 (wild type) PI accessions forresistance to sunflower moth.

Cooperate with Kathy Reitsma on using Osmia. bees to pollinate Cucumis in cages.

Improve evaluation technique for amaranth/lygus by resistance.

Cooperate with Linda Pollak by evaluating 200 LAMP accessions for first generation, and 20 accessions for second generation, European corn borer resistance.

Laboratory

Prepare corn earworm evaluation diets from field-collected silks.

Examine fecundity of 'corn rootworm after feeding on maize silks resistant to corn earworm.

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 see if resistant pollen could be used as a first line of defense against this insect.

Cooperate with Brad Binder (ARS , Ames) to identify chemicals causing' resistance to European corn borer and corn earworm in maize.

Greenhouse

Evaluate Brassica for resistance to green peach aphid.

Miscellaneous:

Continue active participation in the Departments of Agronomy'and Entomology.

Continue to attend professional meetings and present research results.

Continue Working with graduate students.

Continue to develop cooperative research projects.

Publications:

Abel, C.A. and R.L. Wilson. 1994. Evaluation of Peruvian maize for resistance to European corn borer (Lepidoptera: Pyralidae) leaf-feeding and ovipositional preference. Abs. Submitted Papers, Posters, Symposia . , Presentations, N. Cent. Bran., Entomol. Soc. Am. 49: 3.

Wilson, R.L., B.R. Wiseman, and M.E. Snook. 1994. Evaluation of red kernel maize for resistance to corn earworm silk feeding, Abs. Submitted Papers, Posters, Symposia Presentations, N. Cent. Bran., Entomol. Sow. Am. 49: 23.

Abel, C.A. and R.L. Wilson. 1994. Evaluation of Peruvian maize for resistance to European corn *borer* leaf feeding and ovipositional preference. Internat. Plant Resist. Ins., 11th Biennial Wrkshp 11: 21.

Wilson, R.L. 1994, Evaluation of the National Plant Germplaem System cultivated and wild-type sunflower germplasm for resistance to sunflower moth. Prwc. 8th Great Plains sunflower Ins. Wrkshop : 40.

Snook, M.E., N.W. Widstrom, B.R. Wiseman, R.C. Gueldner, R.L. Wilson, D.S. Himmelsbach, J.S. Harwood, and C.E. Costello. 1994. New flavwne C-glycosides from *corn* (Zea mays L.) for the control of the corn earworm

(Helicoverpa zea). In Hedin, P.A., Bioregulators for crop protection and pest control. American Chemical Society. Washington, D.C. pp. 122-135.

Roath, W.W.; M.P. Widrlechner, R.L. Wilson, and R.L. Luhman. 1994. Germplasm: The foundation of sustainable agriculture. Agron. Abstr. Append. 5, p. 2.

Pollak, L.M.; K.E. Ziegler, and R.L. Wilson. 1994. Evaluation of the U.S. national germplasm system popcorn collection for popping and agronomic traits. Agron. Abstr. p. 218.

C. Horticulture (M.P. Widrlechner)

Germplasm Collections

Acquisition:

I received 61 new accessions of ornamentals and 4 accessions of mint-family plants during 1994. Most of these accessions came from exchanges initiated through Indices Seminum. The most extensive exchange resulted from a group of 14 accessions which was collected from wild populations in China and the United States received from the Morton Arboretum. I also reported on the 1993 exploration to acquire Cuphea, Sanvitalia, and Zinnia in Mexico, which was published in Plant Genetic Resources Newsletter late in 1994.

Maintenance:

Available for distribution:

Ornamentals t-NC-7 priority site) 518/1565 (33%) (122 genera)
Ornamentals (For trials or transfers) 55/203 (27%) (74 genera)
Hint-family Plants 34/142 (24%) (35 genera)*

* This includes four genera assigned after the re-allocation of "minor" site-crops.

Distribution:

I distributed 12 plants and 186 seed packets of ornamentals to meet germplasm requests, and 777 plants as part of the NC-7 Trials. Requests for seed of ornamental germplasm were higher than the previous record levels of 1991-92. I attribute this to the wide distribution of seed lists in 1994, following a year's delay until passport data on GRIN could be made as complete as possible. There were 11 seed packets of mint-family plants distributed in 1994.

Duplicated at NSSL

Ornamentals (NC-7 Priority Site) 131/1565 (8%)*
Mint-family Plants 3/142 (2%)**

* This does not include 60 accessions prepared for back-up at NSSL. These will be shipped as soon as 50 new PI numbers can be obtained. An additional 175 accessions have been identified for hick-up of distribution lots early in 1995, and other accessions have been noted with sufficient original seed to allow samples to be subdivided and placed in "black box" storage at NSSL.

** This doers not include 11 accessions of Pvcnanthemum for which we serve as back-up for Corvallis.

Resenerated

Ornamentals (NC-7 Priority Site) 79/1565 (5%)*
Ornamentals (For trials or transfers) 8/203 (4%)
Mint-family Plants 0/142 (0%)**

* This includes 54 successful cage increases, 16 woody ornamental seed increases, and 9 woody plant grow-outs.

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

Tested for Germinability/Viability

Ornamentals (all accessions held as seed) 261/1514 (17%)*
Mint-family Plants 22/142 (15%)

* These data are cumulative. Forty-two accessions will be tested early in 1995.

Significant Prosress

We had an especially successful year for caged seed increase from herbaceous ornamentals, which can be attributed to the warm, dry spring, moderate summer with evenly spaced rains, and late killing frost in October. We made additional progress with germination testing of herbaceous and some woody ornamentals, i.e. Soiraea and Sorbaria. Updated seed lists will be completed and distributed to cooperators and to institutions providing Indices Seminum early in 1995, after all inventory data have been proofed on GRIN and PI numbers are assigned to all available accessions.

Characterization/taxonomy:

During 1994, there were no large-scale characterization/taxonomy projects on the crops that I curate. However, all herbaceous ornamentals in the cage-increase field were checked to verify identifications, including 16 accessions of Chrvsanthemum. In all, 7 accessions were reidentified.

Evaluation:

Roger Fuentes-Granados, a Ph.D. candidate under my joint direction (along with Lester Wilson of the ISU Food Science Dept.), submitted his research proposal and Program of Study to his POS Committee. For the genus Acastache, he proposed to evaluate the inheritance of isozymes revealed in his M.S. research, of essential oils, and of new genetic markers, such as DNA markers, that could be linked to genes controlling essential oil production. During 1994, his research was supported by a grant entitled, *'Identifying Genetic Markers and Their Role in Selecting Chemotypes in Perennial Lamiaceae," in the amount of $2500, received from the Herb Society of America.

A population of Salvia azurea selected for adaptation to early flowering and seed production under local conditions is its second year of evaluation against two other populations at four midwestern test sites.

Enhancement:

During 1994, Roger Fuentes-Granados and I were successful in producing hand-pollinated *crosses* in Asastache, with parents chosen to elucidate the genetic control of isozyme banding patterns and of essential oil production. These techniques can also be used to enhance Asastache

populations for horticultural characteristics, nectar production, and essential oil composition. The project to select Salvia azurea populations for adaptation to heavier soils and a shorter growing season is apparently successful *in* selection for earlier flowering, but more evaluation data are needed (see above).

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - 617 plants of 9 accessions were sent on request to regional cooperators for planting at 28 sites (an additional 148 plants of these accessions were sent to arboreta). Twelve replacement plants were also sent to cooperators.

Computer-generated "Report of Planting," "Plot Information," "First-year Performance Report," and "Five-year Performance Report" forms were distributed to trial site cooperators this spring. Development of user-friendly, free-standing data collection and summarization programs through the use of ObjectVision was suspended this spring due to the resignations of Naomi Harrold and Peter Lundeen.

Three newsletter updates and a special letter were sent to trial site cooperators in 1994, to keep them informed about current developments at Ames and throughout the program.

I have continued the research presented in 1992 to the IPPS (published early in 1994) by obtaining additional information on the floristics, soils, plant communities, and climates of Eastern Europe (especially of Romania and Ukraine), facilitated in part through a trip to the University of Illinois libraries in February, 1994. Late in 1994, I established contact with Dr. Sergei Mosyakin, at the National Botanical Institute in Kiev and we are now exploring possibilities for cooperative research.

I delivered plants to trial sites in Wisconsin, Illinois, and Michigan. I worked with Michael Dana, the NC-7 Ornamental Subcommittee member from Indiana to move the Purdue trial site from Kokomo to a site near West Lafayette. The trial site in Bottineau, North Dakota terminated its ornamental evaluation program in 1994 with the transfer of the cooperator to another position with the North Dakota Forest Service.

Germplasm activities in crops other than those I curate:

Seven requests for accessions with special horticultural characteristics were handled, resulting in the distribution of 115 packets of seed and 8 plants.

In the first quarter of 1994, I coordinated a project to re-examine curatorial activities and assignments for "minor" site crops, those that were not addressed in the 1993 ARS/CSRS Review of the Station. On the basis of this project, we gained a better understanding of the curatorial needs of these crops and reassignments of genera were made among curators to manage these collections more effectively.

I assisted in the drafting of management plans for Cuphea and miscellaneous oilseeds and for Amaranthus.

In 1994, I completed a project to re-analyze the holdings of prairie plant germplasm *in* the NPGS and to analyze usage patterns. This work was presented at the 14th North American Prairie Conference in July and the manuscript resulting from the talk was recently revised and soon should be accepted for publication.

I helped Bill Roath finalize two manuscripts reporting 1) the release of a new ornamental hybrid Cuphea 'Starfire' (accepted by HortScience) and 2) patterns of agronomic variability in collections of Cunhea viscosissima from the eastern U.S (published in Industrial Crops & Products at the end of 1994).

In June, I visited the Kearney Agricultural Center and nearby areas in Parlier, California to check growing conditions at a potential NPGS regeneration site. I also examined a summer test planting of germplasm from Ames and other NPGS sites and consulted with site personnel.

Other research and training activities:

I assisted Peter Bretting in preparing a manuscript and a presentation on the uses of genetic markers in plant genetic resource management,. The manuscript has been accepted by Plant Breedina Reviews and the shorter version is being revised for publication in HortScience. I also assisted Peter Bretting in preparing a presentation on the uses of core collections and other tools to manage risk and change in the preservation of plant genetic resources. I presented this talk at a symposium on core collections held at the Annual Meeting of the Crop Science Society of America in Seattle, in November.

Research continued on the taxonomy of Rubus in Iowa. I have identified blackberries from Iowa collections, representing five sections of the subgenus Eubatus, and am collecting morphological data to prepare keys for field identifications and to develop hypotheses that can be tested via cytogenetic and molecular approaches. Data collection is essentially complete for all five sections of the subgenus. Only limited field work remains to be completed in the 1995 field season.

I assisted in the instruction of AGRON 523, Plant Genetic Resource Management. This included the presentation of lectures and revision of lecture notes, especially for topics directly related to the ex situ preservation of germplasm. This year's course involved a diverse group of graduate students, visiting scientists, and NCRPIS staff.

***Meetings** attended:*

January - Management Problems of the Technical Person in a Leadership Role (Pryor Course) (West Des Moines, IA)

March - Shade Tree Short Course (Ames, IA)

May - American Rhododendron Society annual meeting (Asheville, NC)

June - AABGA annual meeting (Pasadena, CA)

June - NC-7 Regional Technical Committee (Peoria, IL)

July - 14th North American Prairie Conference (Manhattan, KS)

August - ASHS annual meeting, including Leafy Vegetable CAC, Root & Bulb Vegetable CAC, Crucifer CAC, Herbaceous Ornamental CAC, and Woody Landscape Plant CAC, and the annual meeting of the Landscape Plant Development Center (Corvallis, OR)

August - North Central Regional Meeting of the ASA/CSSA (Des Moines, IA)

November - ASA/CSSA annual meeting, including Forage & Turf Grass, Special Purpose Legume, and New Crop CACs (Seattle, WA)

December - Eastern Region annual meeting of the International Plant Propagators' Society (Philadelphia, PA)

Presentations and seminars:

Bretting, P.R. and M.P. Widrlechner. 1994. Managing risk and change for plant germplasm management. Presented at the 86th Annual ASA-CSSA-SSSA meeting, Seattle, WA, 13-18 Nov. (presented by junior author)

Widrlechner, M.P. 1994. Collecting composites and Cuohea in Mexico. Presented to the Horticulture Departmental Seminar, Iowa State University.

Widrlechner, M.P. 1994. Prairie plant germplasm revisited. Presented to the 14th North American Prairie Conference, 12-16 July, Manhattan, KS.

Publications which appeared in print in 1994:

Ayers, G.S. and M.P. Widrlechner. 1994. The genus Aoastache as bee forage: a historical perspective. American Bee Journal 134: 341-348.

Ayers, G.S. and M.P. Widrlechner. 1994. The genus Auastache as bee forage: an analysis of reader returns. American Bee Journal 134: 477-483.

Ayers, G.S. and M.P. Widrlechner. 1994. The genus Aastache as bee forage: an analysis of reader returns (Published with this title in error). Original title: Making a planting of Agastache for your bees. American Bee Journal 134: 621-627.

Bretting, P.K. and M.P. Widrlechner. 1994. Managing risk and change for plant germplasm management. Presented at the 86th Annual ASA-CSSA-SSSA meeting, Seattle, Washington, 13-18 Nov. Agronomy Abstracts, p. 220.

Pair, J.C. and M.P. Widrlechner. 1994. Evaluation of flowering ash in Wichita, Kansas. Landscape Plant News S(4): l-3.

Roath, W.W., M.P. Widrlechner, and R. Rleiman. 1994. Variability in Cuphea viscosissima Jacq. collected in east-central United States. Industrial Crops & Products 3:217-223.

Roath, W.W., M.P. Widrlechner, R.L. Wilson, and R.L. Luhman. 1994. Germplasm: The foundation of sustainable agriculture. Poster for the North Central Regional Meeting of the ASA/CSSA, Des Moines, Iowa, l-3 August.

Widrlechner, M.P. 1994. Is Eastern Europe a useful source of new landscape plants for the midwest? Presented to the 1992 Annual Meeting of the Eastern Region of the International Plant Propagators' Society. Combined Proc. of the IPPS 42: 451-455.

Widrlechner, M.P. 1994. Environmental analogs in the search for stress-tolerant landscape plants. J. Arboric. 20: 114-119.

Widrlechner, M.P. 1994. Prairie plant germplasm revisited. Presented to the 14th North American Prairie Conference, 12-16 July, Manhattan, KS. Abstracts, p. 16.

Widrlechner, M.P., W.W. Roath, R.G. Fuentes-Granados, and A. Campos. 1994. Collecting Cuphea, Sanvitalia, and Zinnia in Mexico. Plant Genetic Resources Newsletter 98: 10-12.

Other items:

I have been appointed to chair the Publications Committee of the American Chestnut Foundation. This entails working with the managing editor of the Journal of the ACF to ensure adequate review and technical accuracy of all articles published.

Following up on my 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), I have helped Arthur Tucker update his project and submit this new Proposal in January, 1995.

Conclusions:

Curation

1993 was an exceptionally productive year for germplasm increase, with seed quantities and quality higher than typical, due to a warm, dry spring, moderate *summer* with evenly spaced rains, and late killing frost. Progress renovating long-term field plantings continued to be uneven, hindered by the departure of Naomi Harrold and the lack of a replacement for the entire field season.

One of the main areas of curatorial progress was the improvement of passport data on GRIN. The printing and distribution of ornamental seed and plant lists resumed in 1994 after all passport data were made as complete and accurate as possible given the information in our files. The development of GRIN3 *in* the final quarter of 1994 once again created difficulties with passport data, as I have not yet completely verified that all records have been accurately and fully transferred to GRIN3.

A major curatorial effort resulting from storage and updating of inventory records is planned for early in 1995, which will result in a large expansion of accessions backed up at NSSL. After a short hiatus, regeneration work will resume on mint-family plants in 1995. In other respects, no major changes in curation are planned and are unlikely until the Technician vacancy is filled.

Research

In contrast to the "lull" in publications in 1993, eight papers and two abstracts appeared in print in 1994, along with one poster presentation. Much of my time devoted to research in 1994 centered on three areas: assisting George Ayers with the assembly of information used in a comprehensive review of Acastache for beekeepers; advising Roger Fuentes-Granados on the development and conduct of his Ph.D. program; further analyses of Eastern European floristics, climates, and soils and the establishment of appropriate contacts.in Ukraine to begin cooperative work.

There are also seven publications in various stages of preparation. Two from Roger Fuentes-Granados's M.S. thesis will appear in print in 1995. Others to be published shortly result from an analysis of prairie plant germplasm in NPGS and its usage and from cooperative work with Purdue University on Anethum, with Bill Roath on Cuphea, and with Peter Bretting on genetic markers and plant genetic resource management.

D. **Plant Pathology** (C. Block)

Disease notes on seed increase plantings:

Regular inspections of field and greenhouse plantings continued to be an important component of the pathology program. Inspections are of particular importance for diseases which could pose a risk of seed transmission. Inspections have been instituted for Zea (1990), Helianthus (1991), Cucumis satfvus and C. melo, (1992), Cucurbita pepo (1993), Amaranthus and Chenopodium (1994), Brassica and related species (1994), Setaria and Panicum (1994), and ornamentals (1994).

Sunflower: The sunflower increase plots (101 cultivated and 38 wild) were inspected twice during the growing season, primarily for downy mildew, caused by Plasmooara halstedii (Farl.) Berl. and deToni. No downy mildew infected plants were detected. No significant disease problems were noted.

Maize: The seed increase plots (60 accessions) were inspected for incidence of Stewart's bacterial wilt and common smut. No Stewart's wilt was detected. There was little disease in any of the plots.

Amaranthus and Chenopodium

Forty-four accessions of Amaranthus and 18 accessions of Chenopodium were examined in the greenhouse. No disease problems *were* observed.

Brassica and Related Genera

One hundred and seventy accessions were inspected twice during the summer for disease problems. Several diseases are important from a seed transmission viewpoint, downy mildew caused by Peronosnora oarasitica (Pars.) Fr., black rot caused by Xanthomonas camnestris pv. camuestris (Pammel) Dowson, blackleg caused by Leptosphaeria maculans (Desm.) Ces & de N., and Alternaria diseases caused by A. brassicaq (Berk.) Sacc. and A. brassicicola (Schw.) Wilt, Overall disease problems were minimal.

All accessions were free of Alternaria diseases, downy mildew and blackleg. Black rot leaf infection (X. campestris pv. camnestris) was found in 2 accessions of Sinapis alba, 2 accessions of Brassica juncea, 2 accessions of B. rapa, 1 accession of B. tournefortii and 4 accessions of B. niara.

No disease problems were noted on the following species: Alvssum alvssoides, A. atlanticum, A. dasycarpum, A. desertorum, A. aranatense, A. linifolium, A. minutum, A. montanum, A. murale, A. nebrodense, A. serpyllifolium, Aurinia corvmbosa, A. saxatilis, Berteroa incana, Brassica carinata, B. eloncrata, B. fruticulosa, B. aravinae, B. napus, B. souliei, Camelina sativa, Ervsimum cheiranthoides, E. creticum, E. cuspidatum, E. graecum, E. linifolium, E. myriophyllum, E. diffusum, E. incanum, E. olympicum, E. repandum, E. raulinii, E. smyrnaeum, Eruca sativa, Brucastrum nasturtiifolium, Erucastrum viruatum, Hesperis laciniata, Isatis canescens, I. tinctoria, Lepedium bonariense, L. camueatre, L. cardamines, L. densif lorum, L. graminifolium, L. heterophyllum, L. hirtum, L. latifolium, L. perfoliatum, L. ruderale, L. sativum, L. sninosum, L. villarsii, L. virginicum, Matthiola fruticulosa, M. sinuata, Sinaois arvensis, Thlaspi arvense, T. perfoliatum, T. nevadense.

Cucumis sativus and C. melo

Five hundred and fifty cages were inspected in late August. Anthracnose, caused by Colletotrichum orbiculare (Pass.) Ell. and Halst., was a serious problem, resulting in early death of many accessions. Some accessions

appear to be highly resistant, but many are extremely susceptible and require regular fungicide sprays to be productive.

Powdery mildew (Swhaerotheca fuliainea) was present, but generally not a problem.

Cucurbita pepo:

In 1991 and 1992, squash mosaic virus was a problem on the seed increase plants. Potential sources of the disease are seed-borne transmission and introduction via cucumber beetles. The virus spreads readily through the movement of cucumber beetles or by handling during pollination. To ensure that only "clean" plants were transplanted, a program was initiated in 1993, and continued this year, to test all greenhouse seedlings before transplanting. Seedlings were tested at the first true leaf stage. Ninety-seven accessions were tested, comprising approximately 1000 plants. Results: Eleven infected accessions, with one or more infected seedlings, were identified.

Assay costs are shown in the following table:

MATERIALS	COST PER SAMPLE	
Antibodies	$0.24	
Sample bag	$0.17	
ELISA plate	$0.02	
Buffers	$0.01	
Labor (6.00/hr)	$0.18	
Cost per sample	$0.62	Typical cost per accession (8 samples) = $5.00

Unfortunately, several SqMV infected accessions were identified in the field during August. ELISA tests confirmed that SqMV was present. The lack of SqMV control resulted from either a failure to detect infected greenhouse plants or introduction of the virus to the field by infected cucumber beetles. Additional strategies focusing on better insect control are planned.

Grasses - Panicum and Setaria

Seventy caged increase plots were inspected twice, in mid-August and mid-September. Panicum sumatrense and P. miliaceum were disease-free. Some accessions of Panicum miliaceum were infested by corn borers. Most of the Setaria italica plots were disease-free, except for four accessions which had 2-10% necrotic leaf tissue, caused by bacterial leaf stripe (Pseudomonas andropoaonis).

Ornamentals

Eighty caged seed-increase accessions were inspected in 1994. Genera included Alcea, Althaea, Antirrhinum, Aronia, Campanula, Chrysanthemum, Dianthus, Gypsophila, Hesperis, Lavatera, Leucanthemum, Liuustrum, Malva, Potentilla, Sanvitalia, Sorbaria, Swiraea and Zinnia.

Overall disease problems were minimal.

Aster yellows (leafhopper transmitted) was detected on 2 plants (Campanula), but the horticultural crew regularly rogues any infected plants.

Verticillium dahliae was isolated from 2 wilting Zinnia plants.

The most conspicuous problem was an apparent potassium deficiency on Alcea, Althaea and Lavatera accessions growing in sandy soil. All three genera are members of the Malvaceae, as is cotton. Cotton has a deep taproot with a very low root density near the surface, making it prone to K deficiency where subsoils are low in potassium. Heavy rains of the previous *summer* may have leached available K from the soil.

RESEARCH NOTES:

Sunflower Accession Evaluation:

One hundred and forty accessions of cultivated Helianthus annuus were planted for Alternaria leaf blight (Alternaria helianthi (Hansf.) Tubaki and Nishishara) evaluation, bringing the total *number* of accessions evaluated to 1020 (845 cultivated and 175 wild), Four-row plots were planted in a randomized complete block design with four replications. The two center rows of each plot contained the test accession. The two outside rows contained the check variety, hybrid 894. Hybrid 894 is moderately resistant under Iowa growing conditions. No accessions *were* highly resistant, but several had partial *or* "field" resistance comparable to hybrid 894. These results followed the consistent trend of no highly resistant accessions in cultivated sunflower collection.

Seed Transmission Research

Seed transmission of Erwinia stewartii in maize:

ELISA assays of bulk corn seed samples were used to detect Erwinia stewartii bacterial infection. Bulk seed assays were found to be more efficient than single seed tests for estimating percentage of infected kernels. Whole samples (about 250 seed) were subdivided into 10 to SO seed sub-samples and comminuted in a Waring blender. Seed extracts were pipetted into 96-well microplates coated with a polyclonal "capture' antibody. The second antibody was a horseradish peroxidase enzyme-conjugated monoclonal antibody (Agdia, Inc., Elkhart, IN). A statistical estimate of the percent seed infection was calculated by using maximum likelihood equations. Only one seed in a sub-sample needs to be infected to give a positive test, however, at least one negative sample is required in order to estimate percent seed infection. For example, if a 250 seed sample is subdivided into 25-seed units, an estimate of true seed infection can be obtained if 1-9 units are positive, but not if all ten are positive.

Results:

In one test, seed was harvested from naturally infected plants of hybrid B73 X KS4 in 6 severity classes: 0, 5, 10, 25, 35 and 50% leaf area killed. No seed infection was detected in the 0, 5, and 10% severity classes. Incidence of infected seed was low in the higher classes with 0.2%, 1.2%, and 1.8% in the 25, 35, and 50% classes, respectively.

Examination of more than 40 NCRPIS maize accessions, ranging from 5% to 75% leaf area killed, gave similar results. Kernel infection was detected only when leaf infection was 25% *or* higher. Thirty seed lots had 0% infected seed. In most of the *very* susceptible genotypes, where leaf infection was 50-75%, estimated kernel infection was still under 5%.

Risk of introduction of Erwinia stewartii into new locations by U.S. seed

The level of plant infection required to generate E. stewartii-infected corn seeds will occur only under very unusual circumstances in the U.S. The minimum accepted quality standards for germination alone ensure that these fields would be not used for seed production. Even if they were, the chance of transmission through seed is extremely low.

Survey of Alternaria radicina in the carrot germplasm collection.

One hundred and two accessions, from 25 seed production years, were assayed to determine the extent of Alternaria radicina (black rot) infection among carrot accessions in the NCRPIS collection. Seed production year ranged from 1955 through 1991. One hundred to 150 seeds were tested per, accession. seeds were plated on Alternaria radicina Selective Agar (ARSA) as outlined by Pryor et al., 1994 (Plant Dis. 78:452-466). Only 18 of 102 accessions were free of A. radicina. The fungus was isolated from one lot of 1955 seed and 3 lots of 1961 seed. On the majority of infected seeds, the infection was superficial, with only a few strands of mycelium growing from the seed surface onto the agar.

Ten accessions with high levels of infection, 25-70%, were selected for hot water seed treatment. Soaking seeds for 25 minutes in 50° C hot water successfully eradicated the fungus with minimal or no loss in germination.

A second carrot pathogen, Alternaria dauci (Alternaria leaf blight) was not detected, but ARSA medium may not be conducive to growth of A. dauci.

Cucumis melo bacterial disease

An aggressive seed-borne and seed-transmitted, bacterial pathogen was isolated from several muskmelon PI's. Initial symptoms on greenhouse seedlings included water-soaked and necrotic lesions on cotyledons and angular, water-soaked necrotic spots on the leaves. Two isolates were sent to Dr. Robert Stall at the University of Florida for fatty acid analysis. They had high similarity indices (>0.80) to the watermelon fruit blotch pathogen, Acidovorax avenae ssp. citrulli, previously known as Pseudomonas pseudoalcalioenes pv. citrulli. BIOLOG 96- well carbon source plates also showed a high degree of similarity. These tests indicate the muskmelon and watermelon pathogens are certainly related,though not necessarily identical.

The source of the bacterium at NCRPIS appears to be from seed transferred to Ames from the Southern Regional PI Station in.Georgia (1987 seed crop). Seed transmission was demonstrated from seed harvested from severely infected plants and also from seed soaked for five minutes in a suspension of the bacterium. All 1994 seed lots were subjected to 24 hour fermentation followed by soaking in dilute hydrochloric acid, following the recommendations of Dr. Donald Hopkins, Univ. of Florida.

Meetings/presentations:

January:	Sunflower Research Forum (Fargo, ND).
February:	16th Annual Seed Technology Conference at ISU.
March:	Regional Seed Quality Workshop (Urbana-Champaign, IL).
August:	American Phytopathological Society Meeting (Albuquerque, NM.) 'Seed Pathology' and 'Collections and Germplasm' committee meetings were also held.
November :	Cucurbitaceae -1994: Evaluation and Enhancement of Cucurbit Germplasm (South Padre, TX), Cucurbit CAC, Melon and Squash Breeders Round Table.

December: Two day workshop on Statistical Analysis - SAS for linear models.

Served on the Agronomy department's Greenhouse and Growth Chamber committee.

Attended weekly plant pathology seminars and weekly staff meetings.

Presentations:

February: Poster on "Assessing risk of seed transmission of Erwinia stewartii from naturally infected seed lots in maize" at the Seed Technology Conference at ISU.

March: ISU Plant Pathology Department's Practical Plant Pathology Workshop. Taught three classes on ELISA techniques for identifying plant pathogens.

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

August: Presented poster on 'Assessing risk of seed transmission of Erwinia stewartii in maize' at Albuquerque APS meetings.

Training Sessions:

January 24: ISU Hazardous Waste Generators Safety Training
April: Time Management Seminars
April 28: Lab Safety Training - ISU Environmental Health and Safety
May 20: Tractor Safety Training
May: Dust Mask Safety Training
August 29: Pesticide Applicator Continuing Education, Categories 1A,1B,1C, 10.
October 25: Pesticide Applicator Continuing Education, Categories 3G, 10.
October 26: Pesticide Applicator Continuing Education, Category 1D.
November 29: Pesticide Applicator Continuing Education, Category 4.
October 18: Assertiveness Training Workshop.
November 22: Defensive Driving Training.

Research plans:

Phytosanitary inspections of seed increase plots will continue for the crops mentioned in this report. 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 popular accessions that were not increased (and therefore not examined in the field) at NCRPIS.

A bulk planting of wild sunflower is planned with the intent of selecting and bulking seed from plants showing resistance to both Alternaria leaf blight and Septoria leaf spot. The wild sunflower accessions, previously tested for Alternaria resistance, showed as much within accession variation for resistance as between accession variation.

The extent of infestation of the Daucus seed collection by Alternaria radicina will be further investigated.

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.

Planned meetings/presentations:

Sunflower Research Forum at Fargo, ND on Jan. 12-13, 1995.
Annual Seed Technology Conference at ISU, Feb. 22-23, 1995.
Attend Sunflower CAC meeting in Ames, July, 1995.
Attend the APS national meeting in Pittsburgh, PA, August 16-21, 1995.
Attend Cucurbit meetings and Cucurbit CAC meeting (not yet scheduled).

E. Farm Superintendent (L. Lockhart\

General:

Supervised and coordinated daily operations at the NCRPIS farm. This includes management of all facilities, fields, and greenhouse space. Supervised or conducted 69 pesticide applications in the field and/or greenhouses. Coordinated and scheduled the student labor force of 22 FTE's.

Labor:

During the calendar year 1994, 201 applications for hourly employment were received and reviewed. There were 55 interviews resulting in 44 hourly employees hired. Two employees were dismissed for poor work performance and four for habitual tardiness. Currently there are 48 (18.2 FTE) part-time hourly employees working at the NCRPIS. I also coordinated and supervised two student internships during 1994. One of the students was an international intern from Germany, the other was an ISU student majoring in Ag Business who developed a computerized inventory tracking system to track supplies used in the day-to-day operations.

Maintenance projects completed:

Served as a liaison between contractors, IA Agriculture Experiment Station, and utility providers to construct entomology greenhouse.

Re-constructed the former bio-tech fence to provide a trellis system for several species of climbing ornamentals.

Designed and installed an automated watering system for the large greenhouse at the farm.

Tours:

This past year I organized and conducted 15 tours. There were approximately 275 visitors to the NCRPIS during 1994.

Conferences, training, *etc. attended:*

Numerous departmental seminars

Worker Right-to-Know Update, ISU

Respirator Training Certification EH&S

CPR and First Aid Training, ISU

ASTA, Chicago

ASA-CSSA-SSA Annual Meeting

Staff Training:

Conducted five disposable dust mask training sessions.

Conducted three Tractor Safety Training sessions.

Devised a documentation system to assure all safety training for station personnel is documented according to OSHA guidelines.

Committees:

NCRPIS Extension: Served as Chairman and completed a station brochure detailing the mission and efforts of the NCBPIS.

Served on a selection committee to hire an additional agricultural engineer for the IA Agriculture Experiment Station.

Purchasing:

I 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 1995:

Construction:

Remodel seed storage work room.

Coordinate installation of -20°C Cold Room

Construct compost bin for greenhouse organic material.

Other:

Implement Lockout/Tagout Program

F. Controlled insect pollination program (C. Abel)

Progress:

Caae pollinations: Nine hundred and sixty-nine insect cages were supplied with pollinators for controlled pollination of 1042 plant germplasm accessions. Honey bees and honey bees with house flies were used in all cages-with the exception of 31 cages in which Alfalfa leaf cutting bees (Megachile rotundata) were used for pollinating some Brassica spp. accessions.

Beekeeoinq: Three hundred and forty-two.2 lb. packages of buckfast honeybees were purchased this year. Two hundred of these were placed directly into nucleus hives (nucs) for Brassica spp. pollinating and the *remaining* packages supplied nucs for our summer pollinating season.

It was found that allowing honey bees to forage outside of the pollinating cages on alternate days no longer benefits the nuc hives. High honey bee densities at NCRPIS have reduced the amount of food that may be obtained from surrounding floral sources.

Five hundred and twenty-nine nucs were wintered in the indoor facility (Winter '93'-'94'). Nuc survival was 75.4%, a four-fold increase from the previous year. The increase in nuc survival may be attributed to: 1)

Improved management practices which insured a younger and larger population of bees going into the wintering facility than the previous year; and, 2) Warmer environmental conditions (47°F) within the wintering facility than the standard used the previous year (43°F). The warmer temperature appears to improve survival of the smaller colonies in the wintering facility (P. Kelly, U. Wealth, personal comm.).

six hundred and nine nucs were wintered in the indoor facility this fall. Four *wintering* studies will be performed with data from these studies to be published in the American Bee Journal.

Forty large hives were wintered in the indoor facility (Winter '93'-'94'). Thirty-seven hives (92.5%) survived. This fall, 114 large hives are being *wintered* indoors with the remaining 48 large hives wintered outdoors.

Twenty honey bee nucs were supplied to Kim Lewers (ISU Agronomy Dept.) for her dissertation work on soybeans.

Bombus: Ninety Bombus bimaculatus queens were captured between 4/19/94 and 5/03/94. Continuous rearing of this species was found to be infeasible, but procedures are now in place to rear colonies from spring-captured queens for mid-summer control pollinations.

A former Bombus-rearing company owner indicated that Bombus bimaculatus is a very difficult species to rear and was abandoned by the industry. Attempts to continously rear this species at NCRPIS will be discontinued. Further rearing research will be done with B. impatiens and B. sriseocolus.

Meaachile rotundata: Alfalfa leafcutting bees were used in 31 cages for regenerating Brassica spp. accessions.

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

Pollinator Studies: Honey bees, alfalfa leafcutting bees, 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 in each study.

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

Personnel :

Ron Schweppe (Biological Aide) was added to the insect management team in January. Ron joins two hourly employees (Nathan Bye and Brett Roberts) that have been with me for almost two years. These employees provide excellent work and are primarily responsible for the accomplishments we have achieved within the past year.

Future plans:

Capture queens and rear colonies of Bombus bimaculatus to be used in pollinator studies.

Perform lab rearing studies on B. impatiens and B. utiseocolus.

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

Acquire, manage, and evaluate Peponapis pruinosa, Xenoglossa strenua, 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. The biology of N. triangulifera indicates a close association between this insect and sunflower, which is its primary food source.

Work cooperatively with Suzanne Batra (Bee Research Laboratory, USDA-ARS) and Bob Cox (State Apiarist, Iowa Dept. of Ag.) on importing and establishing a Janpaneae Anthophorid species, Anthophora Pilipes villosula (reportedly an efficient buzz pollinator of early season crops), into Central Iowa.

Continue literature research on bee pasture plantings to be used in honey bee and non-honey bee pollinator rearing.

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 studying the biology of Osmia cornifrons.

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

Assist Richard Wilson and Rick Luhman with evaluating honey bees, alfalfa leaf cutting bees, Osmia cornifrons, and Bombus bimaculatus as pollinators of Sinapis alba, and Brassica napus.

Assist Richard Wilson and Kathy Reitsma evaluating honey bees, alfalfa leaf cutting bees, and Osmia cornifrons as pollinators of Cucumis melo, Cucumis sativus, and Coriander sativum.

Assist Richard Wilson and Mary Brothers evaluating honey bees and Osmia cornifrons as pollinators of Helianthus petiolaris.

Miscellaneous:

Hosted Dave Charmin from Northeast Regional Plant Introduction Station.

Hosted Jorge Gonzáloz Acerato, Universidad Autónoma de Yucatán.

Gave 12 presentations to visiting individuals, groups, and classes.

Assisted Mark Gleason (ISU Plant Pathology Dept.) and John Obrycki (ISU Entomology Dept.) in using honey bees as a carrier agent for spreading Gliocladium roseum, a fungal biological control agent, for the control of gray mold (Botrvtis cinerea) in strawberries.

Completed course work in Plant Breeding, Field Plot Techniques in Plant Breeding, and Insecticide Toxicology.

State of the operation:

Insect management had *an* encouraging year. The early success of the indoor wintering facility looks promising. The weather was favorable for both the pollinator5 and the plants with very good seed increases occurring for most crop species. The pollinator studies have already yielded some benefits

with the discovery of Csmia cornifrons as an excellent pollinator of Brassica rapa. Plans have been laid for new pollinator studies for the coming year. Information on promising new pollinators is being acquired on a month-to-month basis. Some of these new pollinators may be added to our pollinator studies of various crops. These studies have the potential to greatly improve our plant germplasm regenerating efforts-at NCRPIS as Well as supply general information to the public about non-honey bee crop pollinators and their management. Continued research in these areas should increase the efficiency of regenerating plant germplasm accessions in the field.

G. Zea Curator (Mark Millard)

Activities

Curatorial Information

Significant events

The Systems Support Specialist II resigned in June of 1994. Many computer duties reverted back to the curator. Assistance with computers was given by the Brassica curator and the seed storage technician and several others.

GRIN3 became operational in August 1994. The maize curator is a member of the GRIN advisory committee and has spent many hours trouble-shooting GRIN3 and massaging data before during and after the transition.

Acquisition:

New accessions received

During 1994, 328 Zea accessions were acquired: 217 of these accessions (21 with PI numbers) were received from NSSL for the first time. These accessions were set aside and held until NSSL had enough money for shipment, Most accessions only have NSL numbers. There is a large portion of them which appear to be racial collections from the Rockefeller Foundation-sponsored collections of the 50s which were deposited in regional banks in Mexico, Colombia, and Brazil. To date however, the passport and exact origin of many of the accessions is unclear. They were deposited in the very early days of NSSL and the little information that apparently was required for deposition.

Maintenance and distribution:

#/% available for distribution--Seventy percent (9726) of the 13940 accessions held in December 1994 were available for distribution (The figures for 1994 as a whole are 68% (8684) of the 12,805). The largest portion of unavailable accessions is still the 1600 accessions in the Galinat-Mangelsdorf collection. Evidently, less than 50% of these accessions are viable.

An accounting change greatly affects the numbers of accessions of Zea at NCRPIS for 1994 compared to 1993. It has been agreed by the active sites and NSSL that, if a site has any seed at all of an accession, then the primary supply *site* becomes the distribution site in the GRIN database. We had previously requested from NSSL in the late 1980s,10-20 seeds of an entire group of 2000 accessions backed up by Colombia for comparison with accessions we were receiving directly from Colombia. We have to date not received distributable amounts of hundreds of these accessions. Also contributing to the difference of some 800 accessions from the expected Zea

total for 1994 are NSL accessions regenerated previously by NCRPIS;' These accessions were kept as NSSL accessions until PI numbers could be obtained.

#/% distributed--We distributed 3750 packets of Zea seed in 1994. This represents 16% '(2223) of all Zea accessions. Packet distribution was up 24% over 1993.

#/% duplicated at NSSL--NSSL has seed of 67% (9371) of the Zea accessions held at NCRPIS. 1251 accessions were sent in 1994. 9033 of the 9912 (91%) of the PI'd accessions are backed up at NSSL!

#/% accessions regenerated--In 1993, 152 accessions were regenerated, just over 1% of the total Zea collection. This figure includes 10 accessions regenerated by LimaGrain in Iowa, and 81 accessions regenerated in Puerto Rico.

One-hundred and twenty-three accessions of the Mangelsdorf-Galinat collection have been put through a rescue attempt in 1994. Thirty-six of the accessions germinated, and are currently growing in the greenhouse.

A more productive way to increase the earliest maize accessions was tried successfully in 1994. Seed is planted in April in growth chambers and then transplanted to 5 gallon, short pots. These accessions are then dispersed to distant locations for isolation increases. When pollen shed stops they are brought together and monitored until maturity.

#/% tested for viabilitv--We tested 12% (1687) of the Zea accessions for viability in 1994. This percentage is lower than the 20% for 1993 mainly because of the GRIN2-GRIN3 transition. File formats must be changed to accept germination data. NSSL promises a new dBASE program for inactive data germ on a Novell network in early 1995. We are slowing germination testing until this program is in place.

#/% of collection with permanent PI accession numbers is 71% (9912) of the total Zea accessions. Fifty-three NCRPIS accessions were given PI numbers in 1993. An additional 36 NSSL accessions were given PI numbers with the maize curator's help.

Significant Drouress--Backups at NSSL held at 1993 levels. Many more Galinat-Mangelsdorf collection accessions were tested for viability.

We had a successful increase of most PVP accessions because of superior maize growing conditions. Those accessions remaining started from very small quantities of original seed (e.g., the non Ht version of W117) and will need another increase to provide the 5,000 kernels necessary for release. An increase designed to allow widespread distribution of these accessions is being attempted in the greenhouse this winter. Ten accessions were sent to Dr. Stuber for isozyme analysis in December. I expect that 40 of 44 total PVP accessions will be available after Dr. Stuber's analysis. The other four may have enough kernels for analysis in late May.

LimaGrain provided a very good increase of 9 of 10 inbred lines.

A new manager was hired for the St. Croix nursery work. Rainfall was half of normal during the last year. 50 accessions were planted in December. Two to four nurseries of 50-100 accessions are planned in 1995.

#/% of collection tested for seed-born pathogens. I am adding this category since the NCRPIS pathologist is beginning to screen accessions for Stewart's wilt using an ELISA test. This test enables us to send seed to countries requiring some kind of Stewart's wilt declaration. The results

for this and all such screenings can now be entered into GRIN. Fifty-eight accessions were screened in 1994.

Characterization/taxonomy:

#/% characterized/classified--only the few accessions grown were characterized in 1994. No significant progress was made in computerizing old data because of the GRIN2-GRIN3 transition. Conversion of double record, maximum/minimum-type observations to the GRIN3 single record type was begun to test GRIN3 data loading procedures. The GRIN3 observation record allows for minimum, maximum, mean, and population size information to be contained within the record. Previously, much Zea data were entered as two records, one for the maximum observation for that trait, and one for the minimum observation for that trait. The remainder of these double entries will be combined in 1995. Old data can now be loaded en masse. Programs for direct entry of ear observation will be written in 1995.

The National Program Staff provided money to purchase a Pentium 90 MHZ computer with a *one* gigabyte hard drive and a 17 inch monitor to begin a picture database of maize ears. A slide scanner and a megabyte optical drive was also purchased with these funds. During the year, two Kodak picture CDs were made during slide development. These pictures were compared with images digitized from slides with the scanner. The quality was difficult to distinguish with the naked eye.

Significant nroaress--Imaging equipment is now on site. Lack of trained personnel to operate the equipment hinders progress with this project.

Due to the weather and resource shortages, the morphological evaluations of U.S. material was delayed in 1994 as it was in 1993.

William González, a graduate student working with Dr. Bretting, is analyzing isozyme data *on* three maize accessions planted to evaluate the efficiency of our pollination procedure. He is also obtaining additional marker data on other accessions planted in the pollination procedure experiment.

Evaluation:

#/% evaluated--Seven hundred and forty-seven accessions were evaluated for resistance to first generation European corn borer feeding by the NCRPIS entomology group. sixty three percent (8449) of the accessions have been evaluated for host-plant resistance. This is an excellent example of a characteristic which lends itself to a very low cost assay of thousands of accessions.

Late generation European corn borer feeding resistance screening was performed for a second year on.200 accessions. This data will be loaded into GRIN in 1995.

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

During the last four years, the Plant Pathologist has screened *our* increase plots for diseases which are important for seed export into some countries. To date, *no* sorghum downy mildew has been observed. Common corn smut, common rust, and leaf blights always occur and we cannot certify that our increases are free of these diseases. Stewart's wilt was highly abundant this year. The Pathologist is researching the importance of this disease to distribution of maize kernels.

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

Peter Bretting prepared for the maize curator a preliminary test array-for maize. He focused on New World accessions. This array will be refined in 1995 because there has developed a stronger need for such an array. At the CAC in December, 1994 David Smith presented a proposal he is developing with the maize disease research community for the evaluation of many accessions for disease resistance to several diseases. Then entomologists are expected to follow suite in 1995.

Enhancement and/or *utilization:*

#/% enhanced--No enhancement program has been undertaken with Zea at the NCRPIS. However, the NCRPIS provided much larger than standard amounts of seed of most of the 50 accessions used in the first stages of the GEM project headed by Linda Pollak

Significant nrooress--Congress funded the germplasm enhancement program (GEM) headed by Linda Pollak. We have provided seed for the initial stages. We expect that little more NCRPIS resources will be needed until finished populations are released to the public. GEM has sparked renew interest in evaluation of those and other accessions for future enhancement.

Support/administrative personnel:

Significant accomplishments--The Zea technician is beginning to become proficient with computers. This can only help the maize project move forward.

Travel and Meetings attended:

The 1994 Maize CAC meeting at the American Seed Trade Association meetings in December in Chicago. A significant number of members were rotated off the committee. Ben Burr was replace by Linda Pollak, Bruce Hunter was replaced by Randy Holley, and William Kuhn was replace by Wilfredo Salhuana. Dr. James Bing from Mycogen was added as an entomologist. John Dudley replaced Arnel R. Hallauer as CAC chairman.

The National Sweet Corn Breeders Association also met at the American Seed Trade Association Meetings.

Presentations or seminars:

A well received demonstration plot was planted in 1994 to display the morphology of U.S. landraces and related Mexican landraces. The purpose was to show the material "in-the-flesh" to a group of maize experts and archeologist-anthropologists attending a workshop sponsored by Pioneer Hi-Bred. This demonstration involved a field tour and a hands-on ear display. The demonstration was viewed several times after the workshop by other individuals and groups. It will probably become a permanent part of NCRPIS outreach programs.

Numerous visitors and groups toured NCRPIS and learned procedures for maize curation.

I led a classroom discussion of germplasm databases using GRIN and an on-line demonstration for Agronomy 523, Plant Genetic Resources.

Canclusionst

State of the program

In summary, we are keeping up with accession maintenance tasks, but just so. Our regeneration effort must be increased, and the data we have on our accessions in GRIN3 must be improved. 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.

Strenoths and weaknesses: what facilitated or hindered proaress

GRIN3 implementation is not an overnight affair. Significant time has been spent by this curator and other curators at the NCRPIS in learning the new system. A very bright light at the end of the tunnel exists. Capabilities such as the ability to have much more complete data and the ease in adding new information as compared to the GRIN2 system are apparent.

Review of a maize descriptor list was delayed due to the GRIN3 implementation timing. The maize curator decided not to add confusion to an already confusing switch to GRIN3. Hopefully, 1995 will see progress in this area.

Obtaining new accessions of important collections was also postponed. Besides the switch to GRIN3, personnel vacancies have caused a shortage of individuals to handle the work load.

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.

Policy and procedures for the maize collection are being refined. Currently, the only criterion for eliminating duplicates is whether an accession with the same identifier can be traced to the same collection site or developer. Molecular marker techniques might assist in this effort. A more precise acquisition policy, tailored to maize, but using NPGS guidelines, is under development, but further work is needed.

Future plans:

Acquisition plans

No accessions have been acquired to satisfy previous CAC approval that all Caribbean accessions held by CIMMYT should also be available at the NCRPIS. We will try to procure this material in 1995, as budget allows.

Maize from Guatemala, Bolivia, Ecuador, Paraguay, and Brazil is not well-represented in the NCRPIS collections. We did receive some accessions from NSSL which may improve this situation in 1994, but passport information must be reviewed to determine this. I will try to obtain at least the racial type collections from these countries.

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 CAC recommended obtaining commercial tropical hybrids for the collection.

Many public maize breeding programs in the southern U.S. are disappearing.. Further effort will be devoted to obtaining the important inbred lines and

old open pollinated varieties from this region. Maize from Texas, Louisiana, Mississippi, Alabama, and Florida are especially under-represented in the NCRPIS collection.. The maize curator has made arrangements with the maize genome database to work together to document the locations of all important U.S. germplasm.

Maintenance:

A top priority in 1995 will be to regenerate a number-of maize accessions similar to that achieved in the late 1980's and early 90's.

Dr. Bill Tracy spent considerable time in years prior to 1994 selecting the most important materials to be conserved of the Crookham collection in NSSL. In 1995, we will begin regenerating 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 winter increase. These will be mainly important LAMP accessions not yet distributable from NCRPIS.

Characterization and evaluation work

Approximately 750 accessions will be initially screened for first generation corn borer resistance/tolerance by the entomology program.

Approximately 500 accessions will be screened for corn earworm resistance by the entomology program.

I will continue entering field book data into GRIN. Additional cooperator data may be arriving in 1995 in a big way. Data are expected *from* pathologists and entomologists.

Experimental work reouirinu the maize program's resources

The cooperative research with Iowa State and their imaging team will need further attention as equipment and software purchases are completed. Testing of the database and its efficiency will begin. Standardized procedures *for* slide digitizing and direct video imaging must be developed.

Travel

The Puerto Rico winter nursery will again require 2-3 weeks of my time in the spring of 1995. One or two other staff will also be needed.

I will attend the American Seed Trade Association and the Maize Crop Advisory Committee meetings in December.

The GRIN site meeting will be held in conjunction with the PGOC meeting and will be held in Ames in 1995. No travel will be required, but extra time for planning and coordination of the GRIN meeting will be required.

H. Vesetables (K. Reitsma)

Activities--General Summary

Acquisition:

New accessions: Uncertain. Because of the vacancy in the Gerplasm Program

Assistant position, not all incoming germplasm has been inventoried and logged in at the NCRPIS.

Status: 5620 with PI-numbers, 1911 with Ames-numbers, 7495 in total.

Maintenance and distribution:

There are currently 3747 accessions (50%) available for distribution; 2160 packets (1482 accessions, 20% of collection) were distributed; 2767 accessions (37%) duplicated at NSSL; 948 accessions attempted regenerations; 0 accessions tested for germinability/viability.

Activities--Specific Crop Summaries

ASPARAGUS

Acquisition:

New accessions received: None.

Status: 146 PI-numbers, 12 Ames-numbers, 158 total.

Maintenance and distribution:

#/% available for Distribution--As of January 1995, 32 (20%) of 158 accessions are available for distribution.

#/% distributed--Seventy-two packets (40 accessions, 25% of collection) were distributed in 1994 as foreign requests.

#/% 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, but the germination percentage on all of the accessions is considered too low by NSSL's standards. This material may be sent for backup in the NSSL "surplus storage" area after the next collection inventory and storage.

#/% 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. These accessions will be tested again in five years (1996).

Significant progress--None. 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 male sterile). Greenhouse space at the NCRPIS is limited and therefore the NCRPIS is not a viable alternative 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 can not be entered on GRIN until descriptors are specified.

Significant progress: None.

Evaluation:

#/% evaluated and significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CICHORIUM

Acquisition:

New accessions received: None.

Status: 62 PI-numbers, 138 Ames-numbers, 200 total.

Maintenance and distribution:

#/% available for distribution--Forty-five PI numbered accessions (23%) of 200 accessions of chicory were available as of January 1994. An additional 40 Ames numbered accessions have been made available upon request.

#/% distributed--In 1994, 101 packets (54 accessions, 27% of collection) were distributed as foreign requests.

#/% duplicated at NSSL--Nineteen chicory accessions (10% of collection) are duplicated at NSSL. Additional Ames numbered accessions can be backed-up when PIs are assigned.

#/% regenerated--No Cichorium accessions were regenerated in 1994. Fifty-four accessions have been started in the greenhouse for regeneration in 1995 biennial cages.

#/% tested for germinability/viability--Germinations will be performed on the 1992 and 1993 increases in 1995.

Significant progress--None.

Characterization/taxonomy:

#/% characterized/classified--Only 33% of the chicory collection has the country of origin specified on GRIN. As time permits, I will enter the additional passport data I recently received from Dr. E. Ryder, USDA-ARS, California, for Ames numbered accessions he donated in 1986.

Significant progress--There is no approved descriptor list for characterizing the Cichorium collection. A copy of chicory descriptors received from a vegetable breeder in Holland will be used as a model for the PI Cichorium collection. With the help of the Horticulturist I will attempt to develop a descriptor list to present to the CAC at the 1995 meeting.

Evaluation:

#/% evaluated and significant progress: Dr. W. Waycott, PetoSeed, California, sent photographs of 199 Cichorium cultivars he had growing in an evaluation planting. A number of these cultivars are part of the NCRPIS collection. I will be requesting several of the photographed cultivars that are not in the NCRPIS collection from Dr. E. Ryder who furnished the seed for Dr. Waycott's planting.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS MELO

Acquisition:

New accessions received: Uncertain.

Status: 2415 PI-numbers, 723 Ames-numbers, 3138 total.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 1498 (47%) of 3138 accessions are available for distribution.

#/% distributed--In 1994, 725 packets (605 accessions, 23% of the collection) were distributed. Twenty-six packets were shipped as foreign requests and 699 packets were shipped as domestic requests.

#/% duplicated at NSSL--The total number of melon accessions duplicated at NSSL is 1222 (39% of the collection).

#/% regenerated--The 1994 melon regenerations again focused on the new germplasm collected in India in 1993. The majority of the 426 melon accessions selected for the 1994 regenerations were second or third attempts at increasing the germplasm. Many accessions failed due to the adverse environmental conditions during the growing seasons of 1992 and 1993. Actual results of this year's increases will not be known until the crop is stored. Preliminary results indicate that regeneration of the material from India was very successful in 1994.

#/% tested for germinability/viability--None.

Significant progress--We continue to have difficulties in regenerating many of the older open pollinated accessions received with the collection transfer in 1987. Many of the accessions must be grown two or three years in a row to produce enough seed to make the accession available for distribution. We have not been able to determine the problem(s) involved. I have solicited the help of a few CAC members to try to regenerate some of the "problem" accessions in California and New York to see if location may be a factor.

Characterization/taxonomy:

#/% characterized/classified--Along with photographing the fruit, an intensive effort was made to record notes on 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.

The SRPIS notes Cucumis melo on GRIN are incomplete and, because the material is open-pollinated, they may no longer characterize the accessions accurately. Complete notes will be recorded using the CAC-approved descriptor list when the accessions are regenerated by controlled pollination.

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. Dr. M. Kyle, Cornell University, Ithaca, NY, continues to evaluate the collection for gummy stem blight resistance (additional data 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: Uncertain.

Status: 962 PI-numbers, 346 Ames-numbers, 1308 total.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 816 (62%) of 1308 accessions are available for distribution.

#/% distributed--In 1994, 118 packets or 99 accessions (9%) were distributed. Twenty-seven packets were sent as domestic requests, and 91 as foreign requests.

#/% duplicated at NSSL--There are 718 (55%) accessions duplicated at NSSL.
#/% regenerated--Due to the adverse environmental conditions during the 1993 growing season, approximately 80% of the accessions had to be regenerated again in 1994. The majority of the 192 accessions of cucumber regenerated in 1994 were Ames numbered accessions from the India collection. Actual results of this year's increases will not be known until the crop is stored. Preliminary results indicate that regenerations were very successful in 1994.

#/% tested for germinability/viability: None.

Significant progress--None. Many of the unavailable accessions are labeled "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. No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some field book notes have been put in Key Entry files, but we must determine what information should be entered on GRIN and in what format).

Significant progress--Along with photographing the fruit, an intensive effort was made to record notes on 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. Ninety-eight percent of the cucumber collection has country of origin specified on GRIN, and 73% of these accessions have an alternate id on

GRIN. Secondary identifier information still needs to be loaded into GRIN for all of the NCRPIS cucurbits.

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS species (wild Cucumis)

Acquisition:

New accessions received: Uncertain.

Status: 276 PI-numbers, 13 Ames-numbers, 289 total.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 106 (37%) of 289 accessions are available for distribution.

#/% distributed--In 1994, 191 packets (101 accessions, 35% of collection) were distributed. Nine packets were sent as domestic orders and 182 packets were sent as foreign requests.

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

#/% regenerated--Regeneration was attempted on one accession of Cucumis figarei at Ames and at Madison, WI by Dr. J. Staub. The regeneration attempt was unsuccessful due to the poor quality of the seed.

#/% tested for germinability/viability--None.

Significant progress--None. 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 maintenance 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.

The SRPIS notes on GRIN are incomplete and, because the material was open-pollinated originally, the notes may no longer characterize the accessions accurately. Complete notes will be recorded using the CAC approved descriptor list when the accessions are regenerated by controlled pollination. This collection is also a taxonomic nightmare. I have found publications wherein researchers have reidentified the NPGS accessions used in their work. Other researchers who concur continue to use the re-identified species name in their publications, citing each other's work. Meanwhile, NPGS

still maintains the accession under the epithet assigned when the seed was received. Since confirmation of reidentifications are rarely received from the taxonomists in Beltsville, MD, we are updating the species name on GRIN and citing the published references as the authorities.

Significant progress--None.

Evaluation:

#/% evaluated and significant progress: Several accessions are included in Dr. M. Kyle's gummy stem blight evaluation work at Cornell University, New York. Additional GSB data must be loaded to GRIN.

Enhancement:

#/% enhanced and significant progress: None.

CUCURBITA

Acquisition:

New accessions received--Uncertain.

Status: 782 PI-numbers, 179 Ames-numbers, 961 total.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 569 (59%) of 961 accessions are available for distribution.

#/% distributed--A total of 130 packets (101 accessions, 11% of the collection) were distributed. Thirty-six packets were sent as domestic requests and 94 packets were distributed as foreign requests.

#/% duplicated at NSSL--There are 408 accessions (42% of the collection) duplicated at NSSL.

#/% regenerated--Regeneration was attempted on 107 (11%) accessions, many of which failed last year. All seedlings were screened for virus before transplanting from the greenhouse to the field.

#/% tested for germinability/viability--None.

Significant progress--The Plant Pathologist screened all accessions for squash mosaic virus before plants were transplanted to the field. We suspect the majority of the infected plants resulted from the virus-infected seed from the 1992 regenerations. Squash mosaic virus dies while the seed is in storage. We will delay the use of newly regenerated seed for at least one year for future regenerations. We do not know what effect this seed borne virus may have on our seed distributions. We have not received any reports from our users that seed has been infected.

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.

No characterization data for the vegetables have been entered on GRIN since the late 1970s. (Some field book notes have been put in Key

Entry files, but we have to determine what information needs to be put on GRIN and in what format.) More funding and a time extension was provided to Laura Merrick to enable her to complete her review of the taxonomy/identification of the NPGS Cucurbita collections. Laura will hopefully provide the Cucurbit CAC and each curator with a report concerning her findings before the November 1995 CAC meeting.

Significant progress--None.

Evaluation:

#/% evaluated and significant progress: M. Kyle at Cornell University continues to evaluate C. pepo and C. moschata for resistance to gummy stem blight.

Enhancement:

#/% enhanced and significant progress: None.

DAUCUS

Acquisition:

New accessions received: 3

Status: 570 PI-numbers, 204 Ames-numbers, 774 total.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 457 (59%) of 774 accessions are available for distribution.

#/% distributed--In 1994, 404 packets (327 accessions, 42% of the collection) were distributed. One hundred two packets were sent as domestic requests and 302 packets were distributed as foreign requests.

#/% duplicated at NSSL--Only 283 accessions (36%) are duplicated at NSSL. Additional accessions could be duplicated, but the percent germination of these accessions is considered too low by NSSL's standards. These accessions may be backed up in the NSSL's "surplus storage" after the collection is inventoried and stored in 1995.

#/% regenerated--Forty-four accessions were planted in November 1993 for regeneration in 1994 summer cages. 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--None.

Significant progress--None.

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.

No characterization data for the vegetables have been entered on GRIN since the late 1970s. (Some field book notes have been put in Key Entry files, but we must determine the information to be entered into GRIN and its format.) The Horticulturist and I want to start a

perennial observation field for the miscellaneous umbels to record complete notes for all of the accessions received since 1984 (the last time when many accessions were planted).

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 1994, 36 packets (35 accessions, 47% of the collection) were distributed. One packet was distributed as a domestic request, and 35 packets were sent as foreign requests.

#/% duplicated at NSSL--Thirty-nine accessions (52%) are duplicated at NSSL

#/% regenerated: None.

#/% tested for germinability/viability: None.

Significant progress None.

Characterization/taxonomy:

#/% characterized/classified: None, but 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, and no characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some field book notes have been put in Key Entry files, but we have to 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--Uncertain.

Status:

The NC7-umbels sitecrop has 337 PI-numbers, 255 Ames-numbers, for a total of 592 accessions including: 6 Ammi, 81 Anethum, 13 Angelica, 3 Astrodaucus, 20 Bifora, 1 Bunium, 13 Carum, 1 Caucalis, 9 Chaerophyllum, 128 Coriandrum, 21 Cuminum, 1 Ducrosia, 8 Eryngium, 4 Ferula, 43 Foeniculum, 1 Levisticum, 1 Muretia, 41 Pastinaca, 148 Petroselinum, 30 Pimpinella, 1 Schumannia, 2 Sium, 6 Torilis, 1 Trachyspermum, and 9 unidentified Apiaceae.

Maintenance and distribution:

#/% available for distribution--As of January 1995, 57 (10%) of 592 accessions are available for distribution.

#/% distributed--Of 383 packets distributed (111 accessions, 19% of the collection), 145 packets were shipped for domestic requests, and 238 packets for foreign requests.

#/% duplicated at NSSL--Only 57 accessions (10%) are duplicated at NSSL. Due to low germinations, few accessions of these genera are duplicated at NSSL.

#/% regenerated--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.

#/% 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 this year's regenerations.

Significant progress--There has been an increased interest in the miscellaneous umbels included in this sitecrop. By direct seeding one row each of two genera in one cage with the two-row planter, I hope to make more of these umbels available in the next two to three years.

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 group of crops. 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:

In general, 1994 regenerations were very successful. We attempted to regenerate 619 Cucumis, 107 Cucurbita, 49 Daucus, and 137 miscellaneous umbels. Actual results of the regenerations will not be known until the seed increases are inventoried and stored.

Many participants in the CUCURBITACEAE 94 meetings in Texas expressed a great interest in the new Cucumis germplasm from India, and I anticipate a significant increase in the number of seed requests for this genus. As soon as this germplasm is regenerated, we should petition for PI number assignment as soon as possible.

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.

Meetings attended:

I attended the following meetings held in conjunction with the American Society for Horticultural Science (ASHS), Corvalis, Oregon, 7-10, 1994:

-Root and Bulb Vegetable Crop Advisory Committee
-Leafy Vegetable Crop Advisory Committee
-Cucurbit Genetics Cooperative
-Genetics and Germplasm Working Group
-Plant Breeding Symposium: Analysis of Molecular Marker Data

November 1-4, 1994 I attended CUCURBITACEAE 94 in South Padre Island, Texas. I attended the Cucurbit CAC meeting and the meetings for the individual Cucurbita commodity groups.

I. Crucifers and Grasses (R. Luhman)

Acquisition:

In 1994 the NCRPIS logged into the GRIN database 34 new Brassicaceae accessions and seven new Poaceae (excluding Zea) accessions. These accessions were given local Ames numbers, and were new to the NCRPIS as Plant Introduction numbers or were sent to the NCRPIS as NSL numbers (Table 1). The NSL numbers and locally numbered accessions will be considered for formal entry into the National Plant Germplasm System. I have also requested accessions from Poland but they have not yet arrived.

Table 1: Number of Brassicaceae and Poaceae (excluding Zea) Accessions Received at NCRPIS during calander year 1994.

Genus	Number of Accessions	Country of Origin	Comment
Alliaria	2	Germany	Locally Numbered
Alyssum	2	Hungary	Locally Numbered
Alyssum	1	Portugal	Locally Numbered
Alyssum	1	Russian Federation	Locally Numbered
Berteroa	3	Germany	Locally Numbered
Brassica	1	Sweden	PI # from NSSL
Brassica	2	United States	NSL # from NSSL
Crambe	19	United States	NSL # from NSSL
Echinochloa	1	Italy	NSL # from NSSL
Erysimum	1	Portugal	Locally Numbered
Lepidium	1	Hungary	Locally Numbered
Panicum	4	United States	PI # from NSSL
Setaria	1	Sudan or Italy	NSL # from NSSL
Setaria	1	United States	PI # from NSSL
Sinapis	1	France	Locally Numbered
TOTAL	41		

Maintenance and distribution:

About 50% of the accessions that I maintain have Plant Introduction numbers and about 80% of those are available for distribution. Most of the ca. 1300 Brassica accessions received from the National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois in 1988 and about half of the 5700+ Echinochloa, Panicum, and Setaria packets forwarded to us in 1987 from the Plant Introduction Office lack Plant Introduction numbers. Oil analyses information has been requested from the NCAUR for the 1987 Brassica shipment. When this information arrives decisions will be made about formal entry of the Brassica into the NPGS.

The 1988 millet shipment included ca. 2800 packets of seed that had Indian identifiers that matched with Plant Introductions. In many cases the seed from the original introductions and the seed from the 1988 shipment do not match. Therefore, there is strong consideration being given to inactivation of all of the non-PI'd millets received in 1988 (2885 packets, 1794 accessions)

In 1994 we distributed seed from 14 of the 36 genera that I curate. Twenty-six U.S. and 23 foreign scientists received 2286 and 435 packets of seed, respectively (Table 2).

At present, 36% of the total accessions and 74% of the PI'd accessions that I manage are duplicated at NSSL. Since we did not store Brassicaceae or millet seed in 1994, no additional accessions were backed up.

The 1994 Brassicaceae regeneration attempts totaled 226 accessions (Table 3). We used remnant seed to make a second attempt at regenerating the Sinapis that flowered before field transplanting in 1993. Additionally, we regenerated in thre greenhouse 20 Crambe accessions from NSSL that had very low germinations. Seventeen of the 226 accessions failed to germinate and will be considered for the inactive file. Of the remaining 209 accessions 165 were field transplanted (164 leaf cutter or honeybee pollinated) and 44 were regenerated in the greenhouse. We harvested and processed one hundred fifty-two field and thirty greenhouse accessions.

In 1994 we attempted to regenerate 41 millet accessions (Table 3). Forty accessions were transplanted to the field and 39 were harvested. Screened cages were erected over most of the regenerations to prevent damage from birds. Some of the material headed late and therefore the later than normal killing frost was beneficial for harvesting these accessions. One Panicum accession, however, did not head. Two of the Panicum accessions need to be reidentified as Echinochloa. Five plots dug from the field in the fall of 1993 for either first or additional harvests had no further harvests and were discarded.

Seventeen of the 26 successful Linum plantings were intended for regeneration and identification (Table 3). To date, two of the seventeen were harvested, five have died in the greenhouse, and ten remain in the greenhouse for 1995 field transplanting. The remaining nine accessions were grown for identification only.

Table 3 indicates that ca. 883 germinations were completed during calendar year 1994. Five year germinations have been completed on Echinochloa and Panicum. The three Brachiaria germinated in 1994 will br transferred to the Southern Regional Plant Introduction Station in Griffin, Georgia.

Table 2: Brassicaceae and Poaceae seed (excluding Zea) distributed from the NCRPIS in 1994.

GENUS	PACKETS DISTRIBUTED	ACCESSIONS DISTRIBUTED
Alyssum	1	1
Berteroa	1	1
Brassica	2328	1346
Brassicoraphanus	1	1
Camelina	5	5
Crambe	60	41
Echinochloa	4	4
Eruca	1	1
Iberis	1	1
Isatis	1	1
Lepidium	9	9

Linum	5	5
Panicum	104	89
Setaria	182	161
Sinapis	18	16
TOTAL	2721	1682

Table 3: 1994 Brassicaceae and Poaceae (excluding Zea) growouts.

GENUS	ATTEMPTS	FIELD	GREENHOUSE	FIELD HARVESTED	GREENHOUSE HARVESTED
Alliaria	1	0	0	0	0
Alyssum	13	11	0	7	0
Aurinia	2	2	0	2	0
Berteroa	1	1	0	0	0
Biscutella	7	0	5	0	1
Brassica	76	73	1	71	1
Camelina	2	2	0	2	0
Crambe	32	0	28	0	24
Eruca	1	1	0	1	0
Erucastrum	5	5	0	5	0
Erysimum	14	12	1	11	1
Goldbachia	2	0	1	0	1
Hesperis	1	1	0	1	0
Isatis	2	2	0	1	0
Lepidium	19	19	0	19	0
Linum	57	0	26	0	2
Matthiola	6	3	2	1	1
Panicum	15	14	0	13	0
Setaria	26	26	0	26	0
Sinapis	32	30	0	30	0
Thlaspi	9	7	1	4	1
TOTAL	323	209	65	194	32

TABLE 4: Brassicaceae and Poaceae (excluding Zea) germinations performed in calendar year 1994.

GERMINATIONS FOR CALENDAR YEAR 1993		
GENUS	NUMBER OF ACCESSIONS	NUMBER OF SEED LOTS
Brachiaria	3	3
Echinochloa	87	87
Panicum	796	796
TOTAL	883	883

Characterization/taxonomy:

During the 1994 Brassica increase, flowering date, corolla color, silique arrangement, plant height, harvest date(s), and number of plants harvested were recorded. For the grass increase, heading date, stem number, texture, habit, leaf number and width, panicle length, width, and type, harvest date(s) and number of plants harvested were recorded.

Examination of various pollinators for Brassica continued. This research is being done in cooperation with Dr. Richard Wilson-Research Entomologist, and Craig Abel, Bee Technician. It was shown that Osmia cornifrons may be a better pollinator than honey bees.

Meetings attended:

I attended the GRIN training session held at Beltsville, MD in July. This meeting was held prior to the release of GRIN III and was mainly conducted to accustom GRIN users to the GRIN tables.

I attended the Crucifer Crop Advisory Committee meeting (in conjunction with the Horticultural Society Meetings) at Corvallis Oregon. The main points of the meeting were:

A. The need for a CAC-approved descriptor list was emphasized. It was decided that the current descriptors would be CAC approved unless comments were received from CAC members before October 31, 1994. No comments were received

B. The need for Brassica evaluations were discussed.

I attended two Forage and Turf Grass Crop Advisory Commitee Meetings. Both meetings focused heavily on core subsets. During the first meeting in August at Lincoln, Nebraska it was decided that none of the warm season grasses warranted a core subset. The same conclusion was made for the cool season grasses at Seattle, Washington (ASA meeting).

Publications:

W.W. Roath, R.L. Wilson, M.P. Widrlechner, and R.L. Luhman. 1994. Germplasm: The Foundation of Sustainable Agriculture.

Other Activities:

In June 1994 our Systems Support Specialist II resigned. Since than myself, a second curator, and the seed storage technician have been attempting to cover for this vacancy. I estimate that 25% of my time has been spent in this capactity. Various duties have included:

1. Keeping up with new developments in GRIN III and passing those developments onto other NCRPIS GRIN users.

2. Hooking a 486 DX2 and Pentium up to Microsoft Windows for Workgroups and the Novell Network.

3. Setting up a 486 computer for the Amaranthus Curator.

4. Checking old data for GRIN entry accuracy.

5. Loading software.

6. Checking computers for memory configurations and possible conflicts.

Future Activities:

The 1995 winter/spring seed processing activities will include processing and storing the 1994 grass and Brassicaceae increase. Additionally the 1991, 1992, and 1993 grass regeneration and the 1993 Brassica regeneration will be stored.

The 1994 field regeneration will include ca. 200 Brassicaceae accessions and ca. 50 grass accessions. Forty-eight cages will be used for an experiment involving alternative Brassicaceae pollinators.

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

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

AMARANTHUS: 3,127 accessions

Acquisition and inactivation:

Seventeen accessions were acquired, including an unusual determinate accession (PI 584523) donated by Dr. Peter Kulakow. The determinate characteristic could be useful for developing new grain cultivars.

Thirty-two accessions were inactivated or merged due to duplication within the collection.

Maintenance and distribution:

1994	#	% of collection
Accessions available for distribution	1376	44
Seed orders	47	NA
Packets distributed	771	NA
Accessions distributed	437	14
Accessions duplicated at NSSL	555	18
Accessions planted to regenerate in 1994	139	4
Accessions germinated	288	9

Four hundred and seventy-five harvested accessions await storing before they are made available.

This was an unproductive year for regenerations as compared with the 286 accessions regenerated in 1993. Plantings were stopped in June 1994 to transfer operations to the greenhouse on the ISU campus. Unfortunately the shortage of daylength control still prevents large plantings at the new location.

A distribution of A. pumilus to Canada was prevented for a second year by endangered species regulations. An export permit application was submitted to the Fish and Wildlife Service in September 1994, and could be approved in early 1995.

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

Of the 771 packets distributed, 313 were in one large order to Dr. Harold Corke in Hong Kong.

Four accessions with Ames numbers were assigned PI numbers.

Characterization/taxonomy/evaluation:

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

Ninety-six accessions were re-identified. Most of the identifications were based on grow-outs during seed regenerations. Approximately 1,000 accessions are still identified only as Amaranthus species.

We entered passport information in GRIN for 268 accessions from Latin America and Nepal. Much of this information was in the form of collector's notes that were placed in the original seed packets. In many cases, we found latitudes and longitudes from place name data. This also filled the large "unknown country" gaps in our GRIN data.

Enhancement and/or utilization:

In 1993 two non-shattering lineages were developed from an accession that has non-circumscissile utricles (PI 572261) . In 1994 they both matured at an appropriate time in field plantings. One line had severe lodging and the other line had severe Lygus bug damage. The lines were crossed with shattering types to study inheritance of the non-shattering character.

Plans:

The highest priority is to adapt the campus greenhouse making it better suited for amaranth seed regeneration.

A draft of the Amaranth Management Plan (13 pages) was distributed for comment at the November 1994 New Crops CAC meeting. Any comments will be incorporated in the document before approval is requested at the 1995 CAC meeting.

I will edit the eighth issue of Legacy, the Amaranth Institute newsletter, which will be published in the spring of 1995.

The 1995 GRIN data entry plans include entry of the herbarium holdings for all of my crops, including the National Arboretum holdings which will be entered from a list prepared by Richard Spjut. We will start entering data into the new amaranth characterizing system.

CELOSIA: 20 accessions

Acquisition: None.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	11	55
Seed orders	2	NA
Packets distributed	3	NA
Accessions duplicated at NSSL	4	20
Accessions regenerated in 1994	0	0
Accessions germinated	0	0

Characterization/taxonomy/evaluation:

One accession was re-identified from Amaranthus to Celosia, and one was re-identified from Celosia to Amaranthus.

Three accessions were sent to NSSL for backup.

Plans:

Viable Ames-numbered accessions should be assigned PI numbers.

CHENOPODIUM: 195 accessions

Acquisition:

Fifty-two accessions were acquired. Nine of the new accessions are from southern Chile and were donated by Dr. Marisol Berti of the Universidad de Concepcion, Chile. These Chilean accessions are potential new sources of adaptation to temperate conditions. Thirty nine of the new accessions are from Bolivia, and were collected by Dr. Sarah Ward of Colorado State University. Two local Iowa accessions of Chenopodium berlanderi were collected to cross with quinoa as a source of temperate adaptation.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	65	33
Seed orders	5	NA
Packets distributed	63	NA
Accessions duplicated at NSSL	32	16
Accessions planted to regenerate in 1994	22	11
Accessions germinated	9	5

Two of the accessions regenerated in 1994 are from southern South America and might therefore have valuable temperate adaptation that could be useful in the United States.

The quinoa crop is in a period of intense international new crop interest. We can support the crop's development by assembling temperate and low-land adapted germplasm.

Eight accessions were sent to NSSL for backup.

One accession with a NSL number was assigned a PI number.

CORONILLA, DALEA, GALEGA, and MARINA: 161 accessions

Acquisition:

Four accessions were acquired, including a wild collection of Coronilla varia by G.A. Pederson and K.H. Quesenberry.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	86	53
Seed orders	5	NA
Packets distributed	15	NA
Accessions duplicated at NSSL	70	43
Accessions regenerated in 1994	1	1
Accessions planted for 1995	24	15
Accessions germinated	11	7

Long term field plantings of 24 accessions were established. Most should be harvested after caged pollination in 1995.

A planting of Dalea leporina in Fresno, California resulted in healthy plants and an excellent seed harvest. The seeds have not yet been tested for germination but they look healthy.

Sixty-five accessions were backed up at NSSL.

MELILOTUS: 830 accessions

Acquisition: One wild accession was acquired. Samples of 4 accessions were requested from the National Seed Storage Lab because they needed regeneration.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	579	69
Seed orders	2	NA
Packets distributed	5	NA
Accessions duplicated at NSSL	542	65
Accessions regenerated in 1994	53	6
Accessions planted for 1995	86	10
Accessions germinated	0	0

Ninety-three harvested accessions from earlier years were stored. Two-hundred-seventy-eight accessions were backed up at NSSL. Fifty-three new harvests await storage.

The 1994 plantings included many obsolete cultivars, other improved germplasm, and accessions that could be useful in the core collection (see below).

Characterization/taxonomy/evaluation:

The Clover and Special Purpose Forage Legume CAC chair, Dr. K. Quesenberry, has asked me to select a Melilotus core subset that composes 10% of the collection. The accessions were selected and the preliminary core list was approved by the CAC. This list is based on taxonomic diversity, ecoregional diversity, the quality of our inventory, and the quality of our passport data.

Dr. Richard Smith of USDA, ARS in Madison, Wisconsin is working on a characterization system for Melilotus.

Much information was entered in GRIN, including latitudes and longitudes that were determined from collector's notes published in the Plant Inventory books.

Four accessions were re-identified taxonomically, one as a Trigonella which, therefore, was transferred to Pullman, Washington.

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 passport data from the Plant Introduction inventories and from the packets of Ames numbered accessions.

To prepare information for the CAC-sponsored "Conservation Legume Varieties of the United States" handbook. This project includes determining which cultivars are available commercially, and describing them.

To experiment with greenhouse pollination using caged leafcutter bees. This will be done in cooperation with Craig Abel and others on the Entomology staff.

PERILLA (19 accessions)

Acquisition: None.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	19	100
Seed orders	2	NA
Packets distributed	34	NA
Accessions duplicated at NSSL	15	79
Accessions regenerated in 1994	0	0
Accessions germinated	0	0

Three accessions were backed up at NSSL.

SPINACIA: (304 accessions)

Acquisition: None.

Maintenance and distribution:

1994	#	% of total number of accessions
Accessions available for distribution	206	68
Seed orders	1	NA
Packets distributed	79	NA

Accessions duplicated at NSSL	257	86
Accessions planted for harvest in 1995	1	.3
Accessions germinated	0	0

The Spinacia collection was assigned to me in August 1994. As a wind pollinated and greenhouse-grown group its regeneration protocol resembles those of Amaranthus and Chenopodium. Spinacia accessions can need long or short days for blooming, determining the correct daylength adds a difficulty that we do not have in Amaranthus and Chenopodium.

A 1994 staff review of collections at the NCRPIS determined that the Spinacia collection had perhaps the most pressing need for curatorial attention. The problems include open pollinated seeds and low germinations of old original seeds.

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 the USDA. Despite Joe Kojima's excellent work, harvests were poor due to poor collaboration. Seventy-one harvests were returned but most had fewer than 25 grams of seeds, 37 of the harvests had less than 1,000 seeds.

Fifty-nine accessions are at the NSSL and not backed up at the NCRPIS. CAC members are investigating the value of these accessions.

One accession was planted in our greenhouse for harvesting in 1995. This was a small start to gain experience with the crop.

Characterization/taxonomy/evaluation:

A draft characterization list of 20 Spinacia descriptors was distributed to two Leafy Vegetable CAC members and, after their comments are returned, new revisions will be circulated to additional experts.

Plans:

I plan to gradually expand the size of Spinacia regeneration plantings as I gain experience with the crop.

Miscellaneous progress:

I edited the 1994 issue of Legacy, the official newsletter of the Amaranth Institute.

I assisted the Amaranth Institute by serving as recording secretary at board meetings.

I prepared a directory for the Amaranth Institute based on a mail survey. My list of amaranth sources for seeds was revised and distributed widely through the Amaranth Institute and with seed orders.

I prepared four written progress reports for CACs.

I reviewed two manuscripts for non-NCRPIS scientists.

I completed a course during the spring semester at Iowa State University: STAT 402 Design and the Analysis of Experiments.

Professional meetings attended:

January 20, 1994 Pryor seminar: Management problems of the technical person in a leadership role.

June 22-24, 1994 Clover and Special Purpose Legume, Crop Advisory Committee meetings with the Thirteenth Trifolium Conference, Charlottetown, Prince Edward Island, Canada.

August 19, 1994 Amaranth Institute Annual Meeting, University of Missouri, Columbia, Missouri.

Publications and presentations:

Davidson, D., D. Brenner, and P. Rayas-Duarte. 1994. Amaranth. BioOptions (newsletter). 5(2):7-8

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.

Melilotus germplasm regeneration: oral presentation at the Thirteenth Trifolium Conference, June 22-24 Charlottetown, Prince Edward Island.

Acknowledgements:

I acknowledge the capable efforts of crew leader Bryan Fries, who has become an expert in GRIN entry and has handled the rush of seed harvesting and cleaning with greater efficiency each year.

Linda Minor provided valuable help with merging duplicate accessions.

Richard Luhman provided helpful computer guidance.

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

Mark Widrlechner helped me to revise numerous drafts of several manuscripts.

K. Sunflower and Miscellaneous asters (M. Brothers)

Acquisition:

New accessions:

In 1994, 74 new Helianthus accessions were received at the NCRPIS and logged into the GRIN database. Sixty-three of these new acquisitions were wild Helianthus species collected throughout the Canadian provinces of Alberta, Saskatchewan and Manitoba. Prior to this exploration trip, the Sunflower collection lacked wild Helianthus species from Canada.

Maintenance and distribution:

#/% available for distribution--The sunflower collection consists of 1464 cultivated H. annuus accessions and 2164 accessions of wild Helianthus species (97 of these accessions are presently maintained in the perennial field plantings) for a total of 3628 accessions. Nine hundred seventy-two (66%) cultivated H. annuus accessions and 598 (28%) wild Helianthus accessions are available for distribution. Overall, 43% of the collection (1570 of the 3628 accessions) is available for distribution to the scientific community. A total of 2288 accessions (64%) have PI numbers.

Thirty-six of the 260 miscellaneous asters (14%) are available for distribution. Fifty-one accessions (20%) have PI numbers.

#/% distributed--We received 48 Helianthus requests (12 foreign and 36 domestic) and distributed 1694 seed packets representing 1026 accessions or 28% of the collection.

Six packets (four accessions) of Vernonia were distributed to two foreign requestors.

#/% duplicated at NSSL--Thirty-six Helianthus accessions were sent to NSSL; 27% (980 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 1994.

#/% regenerated--In 1994, 20 cultivated H. annuus accessions were hand-pollinated in the greenhouse. Hand-pollinated, field increases were attempted on 125 cultivated accessions including ten accessions regenerated at Woodland, California by Pioneer Hi-Bred and 15 accessions regenerated at Fargo, North Dakota by Cargill Hybrid Seeds. Sixty-four wild annual accessions were germinated for regeneration; 39 of these accessions were transplanted to the field and caged for controlled pollinations using honey bees. Six of the wild annual accessions were hand pollinated in the greenhouse. Tubers from six H. tuberosus accessions were harvested and are available for distribution. In 1994, regenerations were attempted on 6% (215 accessions) of the total sunflower collection.

#/% tested for germinability/viability--Scheduled, five-year germination testing was conducted on 709 Helianthus accessions. Germinability was also tested on 55 accessions increased in 1993 and 98 accessions increased in 1991.

Significant progress--The curatorial program developed for the management of the perennial field collection has been implemented. Twenty-one perennial Helianthus plots were relocated and 30 plots were permanently removed from the perennial nursery. The 1991 and 1993 increases were inventoried and stored.

Characterization/taxonomy:

#/% characterized/classified--Plant and achene characterization data were recorded for all accessions increased in 1994. Tuber characterization notes were compiled for six H. tuberosus accessions. The characterization data were recorded using a 200LX Hewlett Packard palmtop which allows for direct loading into GRIN.

Significant progress--Assisted in reconciling two Helianthus descriptor lists (NC7-Helianthus and Sunflower). The resulting CAC-approved descriptor list eliminates duplication of data.

Support personnel:

Significant accomplishments--The Helianthus biological technician, Irv Larsen, attended Pesticide Applicator recertification courses; he is certified in categories 1A, 1B, 1C, 10, 3G and 30. Irv also enrolled in Computer Science 103 and Principles of Crop Production (Agronomy 114) at Iowa State University. Irv modified the cabling system used to reinforce the sunflower cages. The modifications include: cutting the cable to uniform lengths and attaching four cables from each corner of the cage to a center post. Irv's modifications will increase the longevity of the cages and result in a net savings to the NCRPIS.

Meetings attended:

Eighth Great Plains Sunflower Insect Workshop, Fargo, North Dakota. April 13-14, 1994.

Agronomy 523, Plant Genetic Resource Management, Iowa State University. September-December 1994.

Helianthus exploration trip throughout Alberta, Saskatchewan and Manitoba, Canada. September 6-15,1994.

Powerful Communication Skills, National Seminars Group. November 1, 1994

Presentations or seminars:

Discussed the curation of sunflowers with numerous groups/individuals touring the NCRPIS facilities.

Hosted a team of three visiting Chinese Scientists interested in sunflower diseases.

Presented an overview of the Helianthus collection at the Eighth Great Plains Insect Workshop.

Publications:

Gulya, T., A. Aydin, and M. Brothers. Evaluation of Sunflower for Broomrape Resistance. 1994 Sunflower Research Forum. January 13-14, 1994.

Future plans:

Conduct a Helianthus pollinator study with the Entomology project

Store and conduct viability tests on 1994 increases.

Host a July Sunflower CAC meeting.

Continue implementing the perennial field collection management plan.

Conduct genetic marker characterization of Helianthus germplasm.

Increase 33 cultivated H. annuus accessions in the greenhouse, conduct hand-pollinated increases of 150 cultivated accessions, and caged increases of 70 wild annual Helianthus accessions.

Convert all fieldbooks to a spreadsheet format and record characterization data using the HP palmtop.

L. 1994 Seed Storage report (D. Kovach)

Abstract:

This was a very active year for Seed Storage with much work accomplished and many changes taking place. The 5-year backlog of corn seed that needed storing was finished in mid-June. All the collections (except corn) were rearranged to facilitate collection growth and future curator responsibilities. This is anticipation of making one curator an oil seeds curator upon the retirement of the Research Agronomist. New labeling of the collections to accommodate bar code technology was begun and over half of the collections were relabeled. Plans for renovating the Seed Storage work space were initiated. New furniture has been purchased for this

project. Some of the preparations necessary for the planned -20 °C storage unit have been started.

Seed Storage and Shipping:

This year ended a 5-year corn seed storage backlog through intensive efforts by the seed storage staff, student assistants, and corn curator and corn technician. Other operations, such as shipping and storage of other crops, continued unabated. Table 1 summarizes this activity. The total number of seed packets distributed from Ames was 12,107.

Except for corn, all collections were rearranged in the south and north cold rooms to accommodate future collection growth. Each curator was given an area where all of his/her sitecrops are now in close proximity. The collections were also arranged in such a manner that planned reassignments of the crops, upon the retirement of the Research Agronomist, will only require the relabeling of storage areas and not the movement of any seed.

Relabeling of the collections were initiated this year to take advantage of current bar code technology. Over one half of the collection has been relabeled. All collections, except for corn, should be relabeled this year. We may have to wait till fiscal year 1996 in order to purchase the remaining labels necessary to complete the project. We plan to purchase bar code scanners for Seed Storage in FY96.

The entire Beta seed collection was transferred to WRPIS (Pullman, WA). This involved the inventorying the collection for accuracy, packaging, and providing an inventory report for W-6. The Beta collection is composed of 1,476 accessions for a total of 3,370 individual lots. This transfer process involved a full month's work of NCRPIS personnel.

New responsibilities were assigned to the Agricultural Research Technician, GS-08, this year in order to help with the change from GRIN2 (Germplasm Resource Information Network) to GRIN3. The new responsibilities included SQL programming and assistance to the interim computer specialist.

Seed Research

Dormancy studies continued on Cuphea viscosissima seeds. Good results have been obtained using modified accelerated aging treatments. These treatments consist of using alternating temperatures in conjunction with accelerating aging treatments. These results will be submitted for publication late this spring. The results obtained in these experiments should be applicable to some of the wild species stored here at Ames.

Lab Renovation and Freezer Installation:

Plans were initiated last year to renovate the Seed Storage work area. Furniture was purchased from the Kewaunee Scientific Corporation and is on site for installation. Electrical work and other work needed to be performed by Iowa State University Farm Services Maintenance has been delayed for various reasons.

A call for bids has gone out to several companies for the purchase of a -20 °C storage unit for the storage of original seed. This is to be installed in what was the east cold room. Seed in that room was relocated to either the north or south cold rooms. Special cold-resistant trays have already been purchased for storing the original seed. Special thick-mil, ziplock-type storage bags have also been ordered for the sub-zero original seed storage.