NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1993

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 — T.A. Fretz, Iowa

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

C. State Experiment Stations Representatives

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

*Voting members

D. U. S. Department of Agriculture

1.	ARS National Program Staff, Germplasm	*Vacant
2.	ARS Plant Introduction Office	*G. White
3.	ARS Area Director, Midwest Area	R. Dunkle
4.	Cooperative State Research Service	D. MacKenzie
5.	Soil Conservation Service	*E. Jacobson
6.	National 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	P. Bretting
	Secretary	L. Wilson-Voss
	Office Automation Clerk	B. Rasmussen
b.	Research Agronomist	W. Roath
	Agricultural Research Technician	J. Van Roekel
c.	Horticulturist	M. Widrlechner
	Agricultural Research Technician	N. Harrold
	Biological Aide	J. Edwards
d.	Research Entomologist	R. Wilson
	Agricultural Research Technician	S. McClurg
	Biological Aide	R. Schweppe
	Biological Research Technician	C. Abel
e.	Agricultural Research Technician	D. Kovach
	Biological Research Technician	L. Burke
	Biological Aide	Vacant
	Biological Aide	M. Young-Smith
	Biological Aide	I. Larsen

2. Iowa State University Staff

a.	Research Station Superintendent II	L. Lockhart
	(1) Field-Lab Technician III	M. Czajkowski
	(2) Field-Lab Technician II	J. Scheurmann
b.	Curator II	M. Millard

	(1) Field-Lab Technician II	T. Ladjahasan
c.	System Support Specialist II	P. Lundeen
	(1) Clerk Typist II	L. Minor
d.	Asst. Scientist II (Plant Pathology)	C. Block
e.	Curator II (Brassica, Grasses)	R. Luhman
f.	Curator II (Vegetables)	K. Reitsma
g.	Curator II (Sunflowers)	M. Brothers
h.	Curator II (Amaranth)	D. Brenner

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

Personnel changes:

Resignations: Janae Colvin, Biological Aide, accepted a job with a higher promotion potential at the National Animal Disease Center. Jeffrey Blankman, Biological Aide, resigned to continue his education full-time at Iowa State University. Naomi Harrold, Agricultural Research Technician, moved to Illinois, where her husband had accepted a position.
New hires: David Kovach was hired as an Agricultural Research Technician. Mary Brothers was hired as Sunflower Curator. Federal hiring was slowed by a freeze that lasted much of the spring and summer.
Promotions: William Van Roekel was promoted to GS-7. Jeanne Edwards, Irvin Larsen, Becky Rasmussen, and Maurianna Young-Smith were promoted to GS-4. All of the P & S employees were promoted as a result of re-classification: Charles Block--Assistant Scientist II; Larry Lockhart--Research Station Superintendent II; Peter Lundeen--System Support Specialist II; David Brenner, Mary Brothers, Richard Luhman, Kathleen Reitsma, and Mark Millard--all Curator II.

Construction:

Construction of a greenhouse attached to the Entomology Building was initiated, but proceeded very slowly because of the abnormally wet year.

(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:

More than 1900 germplasm accessions were acquired by the NCRPIS during 1993 (details listed under the curators' reports).

Significant acquisitions included:

More than 260 accessions of Brassica were acquired from Prof. César Gomez-Campo of Spain.

Dr. W. Roath, Dr. M. Widrlechner, and graduate student R. Fuentes-Granados collected germplasm of Cuphea, Zinnia, and Sanvitalia during a five-week plant exploration in north central Mexico.

Forty-four maize inbred lines were secured at the request of the American Seed Trade Association's Gorn Variety Identification Committee to serve as "authentic"

sources for PVP purposes. These inbreds are being regenerated at the NCRPIS and elsewhere and are being assayed via isozyme and RFLP analysis for varietal purity.

Maintenance:

More than 41,000 accessions representing more than 300 genera and 1500 species are now maintained at the NCRPIS.

Germplasm cryostorage capabilities were significantly enhanced by the addition of new liquid nitrogen and -80° C equipment.

In an extensive effort also involving personnel at the National Seed Storage Laboratory, all non-accessioned NCRPIS accessions were assigned either Ames or P. I. numbers before provisions of the Convention for Biodiversity went into effect in late December, 1993.

More than 2500 accessions were "backed-up" in long-term storage at the National Seed Storage Laboratory (NSSL).

A computerized bar-coding system for seed storage packets and containers was implemented.

An alarm system was installed to protect the seed storage facilities.

The NCRPIS's seed storage and seed science capabilities were significantly enhanced when a GS-8 USDA/ARS technician with an M. S. in seed science was hired. This addition, the excellent service provided by our other seed technician, and the allocation of additional resources to seed processing, has enabled us to reduce substantially the number of unprocessed accessions and to increase the proportion of our collection which is "backed-up" at the NSSL.

The NCRPIS Operations Manual was finally compiled and distributed to all NCRPIS staff, and to the Associate Deputy Administrator, Genetic Resources.

Regeneration:

More than 1600 accessions were cultivated for seed increase at the NCRPIS or at tropical sites. The success rate for germplasm regeneration was greatly diminished by the abnormally high rainfall during the spring and summer of 1993 (see below).

Six hundred and sixty one accessions were regenerated using insect pollinators in cages.

The NCRPIS's germplasm regeneration program received valuable assistance from seed companies. Limagrain and Northrup King regenerated maize, Asgrow and ARCO regenerated carrots, and Spreckles regenerated Beta,

An encouraging number of honey bees survived the winter in the NCRPIS's new "bee-overwintering" facility. This facility should decrease the annual cost of the controlled pollination program, and protect the NCRPIS's bee colonies from pests and diseases.

The utility of positive pressure cabinets for regenerating Spinacia accessions in the greenhouse was tested.

Distribution:

More than 18,000 seed packets were distributed to researchers in the U. S. (ca. 75% of the total) and abroad (the remaining 25%).

One hundred and ninety vegetative cuttings were distributed. More than 550 individual landscape plants were distributed for long-term evaluation at 29 sites in the North Central Region.

Testing germplasm's germination, viability, and health:

More than 4853 accessions were assayed for their germination/viability percentages.

Inventory and data entry:

Substantial resources (especially personnel) were allocated to reducing the backlog of field and characterization data which have not yet been entered into computer files.

A local-area network (LAN) was established at the NCRPIS farm headquarters. This network may aid especially our curatorial effort.

The NCRPIS computer staff continued to cooperate with other sites in the National Plant Germplasm System in the initial development of a revised version (GRIN3) of the Germplasm Resources Information Network.

Characterization:

Morphological characterization data were recorded for maize, Brassica, millets, carrots, amaranths, cucurbits, and other crops. With amaranths, characterization data are facilitating de-activation of redundant samples.

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. A protoype of "Corn-Base", a database for managing maize ear images, is now being tested.

Isozyme analyses revealed that genetic diversity in anise hyssop is apportioned largely within populations.

Evaluation:

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.

Accessions of maize, millets, brassicas, Cuphea, and mints were evaluated for general agronomic or horticultural merit.

More than 200 maize accessions were evaluated for host-plant resistance (in silks) to corn earworm feeding. Five hundred maize accessions were evaluated for host-plant resistance to 1st generation European Corn Borer, and one hundred and seventy accessions were evaluated for host-plant resistance to 1st generation European Corn Borer.

Climatic variables recently identified from lo-year survival rates of Yugoslavian woody plants introduced to the Midwest served as criteria for selecting eastern European regions for future plant exploration.

Twenty-four amaranth accessions were evaluated for host-plant resistance to lygus bug feeding.

Efforts to refine an assay for host-plant resistance to sunflower moth and corn earworm feeding continued.

Evaluation of the entire NPGS active collection of cultivated sunflower for host-plant resistance to Puccinia helianthi race 4 was completed.

Research continued with seed transmission and disease etiology of Erwinia stewartii, the causal agent for Stewart's wilt.

Enhancement:

An interspecific mint hybrid is being developed as a potentially superior nectar source for honey bees. Genetic enhancement of another mint species is also underway.

Colchicine-doubled fertile (cuphea lutea X C. viscosissima) F_2 lines were screened for capric and lauric acid content which was found to be equivalent to that of the C. viscosissima parent.

Pollen-sterile accessions of Amaranthus and Chenopodium were identified. This germplasm may be useful in breeding programs for these crops.

Health, safety, and EEO progress:

Many of the NCRPIS staff attended seminars regarding Worker Right-to-Know Laws, and Tractor Safety. Several staff members attended seminars regarding supervision, OSHA Laboratory training, and Dust Mask Training.

All field workers received training in the proper use of dust masks. All NCRPIS laboratories compiled extensive files of Material Safety Data Sheets for all chemicals in use, and assembled detailed protocol for all experimental procedures.

Charlene Gooch, of ISU's Employee Assistance Program, made a short presentation to the staff regarding the former program. Jan Padgitt, ISU's Affirmative Action Officer, was consulted regarding ways of tactfully informing visiting scientists (especially international visitors) about NCRPIS, ISU, and USDA/ARS expectations with respect to acceptable behavior toward NCRPIS employees.

Several NCRPIS staff arranged a "Native American" dinner which featured Native American cuisine and a Native American guest speaker.

Program Review:

The NCRPIS underwent a program review during 18-21 April 1993 by two teams, one composed of four SAES directors from the North Central Region, and another composed of USDA/ARS, university, and private-sector scientists.

The main recommendations issuing from the review include: developing contingency plans for budgetary crises that rank NCRPIS functions by priority; backing-up all NCRPIS accessions at the NSSL and obtaining duplicates of NSSL accessions for the NCRPIS; expediting the appropriate disposition of "Ames-numbered accessions;" updating passport information and incorporating data into GRIN speedily; improving methods of characterizing utilization and retrieving information regarding germplasm's biological behavior; expanding outreach activities to publicize the NCRPIS and its mission; increasing the NCRPIS staff's computer competence; considering the re-location of certain NCRPIS crops (e.g., beets, carrots, cucurbits).

The review team endorsed the NCRPIS's aspiration to become the best management site for seed-propagated germplasm in the world.

The NCRPIS staff drafted a plan for implementing the 1993 NCRPIS Review Team's recommendations which was reviewed and endorsed by relevant USDA/ARS, NCR-SAES, and ISU officials.

The 1993 Flood:

More than 50" of rain fell between 1 Apr. and 1 Oct. 1994. Without the 4-wheel-drive tractor purchased in early 1993, little tilling and planting would have been possible during 1993. The rainfall initially affected the NCRPIS's regeneration effort by delaying planting several weeks. The last accessions were sown ca. 15 June: only about two-thirds of the usual total number of accessions were planted.

The effect of the heavy rain on the field plantings varied greatly according to the crop and the field in which the crop was cultivated. The Helianthus and Calendula regeneration efforts were comparatively successful, as substantial quantities of high-quality achenes were secured. In contrast, relatively few of the cucurbit regenerations were successful, and all of the Cuphea and coriander field trials were lost, as was much of the Helianthus disease evaluation trial. To sum, it is estimated that the 1993 regeneration program yielded only ca. 40% of the high-quality seed that is secured during a normal year.

V. INDIVIDUAL PROGRESS REPORTS

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

Acquisition:

New accessions: We acquired 38 Cuphea accessions in 1993.

Significant progress: We collected C. lanceolata and three other Cuphea species in Mexico during September and October 1993. Dr. Widrlechner, NCRPIS Horticulturist, and Mr. R. Fuentes, Graduate Research Assistant, also collected Zinnia and Sanvitalia species from the same area. We were joined in this cooperative venture by Mr. A, Campos from Instituto de Biologia, Universidad Nacional Autónoma de Mexico. Twenty of the 31 Cuphea accessions collected during this trip were specimens of C. lanceolata. Two accessions of C. aequipetala, two of C. hyssopifolia, and seven accessions of C. wrightii were also collected.

Maintenance and distribution:

Number and percentage of total Cuphea accessions

1993	# of accessions	% of accessions in collection
Available	204	24
Distributed	157	18
Duplicated at NSSL	278	32
Regenerated	80*	9
Germinated	256	30

*These accessions were grown in 1993; their seed is being processed at the time of this report.

Distribution of C. lanceolata and C. viscosissima

1993	# of accessions	# of packets
C. lanceolata	34	54
C. viscosissima	71	101
Other species	52	92
Total	157	247

Significant progress: Although 1993 was a difficult year for Cuphea in the field because of the excessive precipitation, we did make some progress in regenerating unavailable accessions. We do not yet know the number of accessions grown in 1993 that have enough seed for distribution and for backup at NSSL. We nearly doubled the number of accessions backed up in 1993 over the previous years (278 total accessions are now duplicated at NSSL as compared to 145 as of Jan. 1993). We did secure additional seed of some of the Brazilian accessions that did not germinate in 1992. These will be grown in 1994. Interest in Cuphea continues to be dominated by foreign scientists (149 seed packets were sent to foreign requesters in 1993 compared to 98 to domestic requesters).

Characterization/taxonomy:

The data from accessions regenerated in 1992 were entered into GRIN, and characterization data for accessions regenerated in 1993 are being recorded. Photographs of 1993 field grown accessions were taken and filed.

Evaluation/Enhancement:

Four hundred and seventy-eight F_3 half-sib hybrid Cuphea families, selected in 1992 for seedling emergence at Ames, were grown in replicated trials at two locations in 1993. Two accessions, one hybrid and one C. lanceolata cultivar, served as checks. Seedling emergence was nil at Ames and only spotty at Crawfordsville due to excessive rain. Individual plants from lines with greater than 50% seedling emergence at Crawfordsville were harvested. Seeds from these plants will be planted at two locations in 1994 to determine adaptability. F_2 seed from colchicine-doubled fertile C. lutea X C. viscosissima hybrid plants had capric and lauric acid content equal to the C. viscosissima parent.

Forty-six 3rd-cycle coriander half-sib families selected for increased oil content were grown in replicated trials at two locations. The Ames trials were abandoned because of poor seedling emergence due to excessive rain. The Crawfordsville trials were harvested, and agronomic data (including yield) were recorded. Seed has been forwarded to NCAUR to determine oil content. Yields were disappointing, with a maximum of approximately 600 kg/ha. On the other hand, the yield of the highest-yielding half-sib family was 470% of the commercial-check cultivar,

Meetings attended:

NC-7 Regional Technical Advisory Committee, and NPGS Research Meeting, Ft. Collins.

Final Cuphea project review at Oregon State University, Corvallis.

American Society of Agronomy and Crop Science Society of America, Cincinnati, OH.

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:

Roath, W.W. 1993. Pollen storage in sunflower, Helianthus annuus. 15th Sunflower Research Workshop. Fargo, ND.

Roath, W.W. 1993. Collecting germplasm in the U.S., Mexico, and Brazil. ISU Women's Club. Ames.

Roath, W.W. 1993. Cuphea development. Lecture to Agronomy 412. ISU.

Roath, W.W. 1993. Seedling emergence of Cuphea Adans. Poster Session, Crop Science Society Meeting, Cincinnati.

Publications:

Roath, W.W. 1993. Agronomy. *In*: C.W. Finkel (ed.): Encyclopedia of Soil Science and Technology. Accepted 29 Jan. 93. Chapman and Hall, New York.

Roath, W.W. 1993. Pollen storage in sunflower, Helianthus annuus. Proc. 15th Sunflower Research Workshop, p. 100-105. Fargo, ND.

Roath, W.W. 1993. Seedling emergence of Cuphea Adans. Agron. Abstr.:193.

Roath, W.W., M.P. Widrlechner, and J.H. Kirkbride. 1993. Collecting Cuphea in Brazil, Mexico, and the United States. IBPGR Newsletter 93:29-33.

Publications in review:

Ben-Salah, H., W.W. Roath, and R.C. Shoemaker. Callus growth and plantlet regeneration of Cuphea viscosissima Jacq. accessions. Submitted to Euphytica, 1992.

Ben-Salah, H., and W.W. Roath. Somaclonal variation in Cuphea viscosissima Jacq. Accepted by Journal of Industrial Crops and Products, 1994.

Chen, W. and W.W. Roath. Karyotype of Cuphea lanceolata Aiton and Cuphea

viscosissima Jacq. In preparation,

Roath, W.W., M.P. Widrlechner, and R. Kleiman. Morphological and agronomic variability in Cuphea viscosissima Jacq. Submitted to Journal of Industrial Crops and Products, 1993.

Widrlechner, M.P., W.W. Roath, R. Fuentes, and A. Campos. Collecting Cuphea ita l i a , and Zinnia in Mexico. In preparation.

Other items:

Graduate student Weiping Chen has elected to continue his studies in the Genetics Department.

The Cooperative Research Agreement with Oregon State University has been terminated.

Conclusions:

The Cuphea project's current objectives are to complete Cuphea characterization, evaluation, and enhancement as resources will allow before the project's termination at the end of the current fiscal year.

Strengths and weaknesses:

Strengths

The program's strengths have been high quality technical assistance, much of which is provided by the program's technician. 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. The cooperative work with Dr. Steven Knapp at OSU has provided a source of information and enhanced germplasm that has contributed greatly to the program's success.

Weaknesses

This program is scheduled to expire midway through fiscal year 1995. But much additional research and development is needed before Cuphea can be commercialized. A major goal at the start of the project in 1986 was to commercialize Cuphea for the midwest; this goal has not yet been attained. The recent break-throughs of developing shatter-resistant cultivars with vigorous seedlings provide the potential of removing major constraints to commercialization. Unfortunately, NCRPIS's Cuphea domestication project will end before this plant is ever cultivated commercially in the U.S. Midwest.

Plans:

Seed regeneration and characterization of the known self-pollinated species from the Brazilian and Mexican collections will continue in 1994 when approximately 100 additional accessions will be grown. A detailed

germplasm management plan for Cuphea will be developed to guide future efforts for managing this important collection.

We will continue research with the C. viscosissima X C. lanceolata hybrids during the 1994 growing season with-the goal of releasing germplasm lines adapted to the Midwest in the fall of 1994. F_3 and F_4 derived-lines selected for seedling emergence at Ames in 1992 and Crawfordsville in 1993 will be grown in replicated trials at these two locations in 1994. Also, derived shatter-resistant lines grown at Crawfordsville will be grown at both Ames and Crawfordsville during 1994. The best of these lines will evaluated for seedling emergence, shatter resistance, seed yield, and oil content and then released as germplasm. Additional F_3 to F_4 lines will be evaluated for seedling emergence and shatter resistance at Ames and at Crawfordsville if possible. This material will be made available to the ongoing Oregon State University Cuphea domestication project.

The fifteen to twenty coriander lines with the highest yield of seed oil will be grown in replicated trials at two locations in 1994. The best of these advanced lines will be released as germplasm sources of petroselinic acid.

B. Entomology (R. Wilson)

Progress:

Field

Corn - Corn earworm evaluation: Two hundred and eight PI maize accessions with some red kernels were evaluated in Ames for host-plant resistance to silk feeding resistance. Fresh silks were collected, dried, milled, and incorporated into a laboratory diet. Data are not completely analyzed at this time. One hundred forty-eight partially red kernel accessions were evaluated in Tifton, GA for silk feeding resistance. Three rated equal to the resistant check. Fifteen pure red kernel maize accessions were evaluated in Ames and Tifton for silk feeding resistance. Four accessions were equal to the resistant check at both locations. Eight maize accessions were evaluated at Ames and Tifton for silk feeding resistance. One was equal to the resistant check for host-plant resistance at both locations.

European corn borer evaluation: Five hundred PI maize accessions were evaluated in the field for host-plant resistance to first generation leaf-feeding. Thirty-nine rated resistant. One hundred and fifty maize accessions were evaluated for resistance to second generation European corn borer. Data from these tests are not yet analyzed.

In Cooperation with Linda Pollak (USDA-ARS, Ames), 195 LAMP maize accessions were evaluated for host-plant resistance to first generation European corn borer. Thirty-five rated as resistant, Twenty LAMP lines were rated for host-plant resistance to second generation borer. Data from these tests are not yet analyzed.

Graduate student Craig Abel finished his evaluation of maize PI accessions from Peru for host-plant resistance to European corn borer. Craig prepared

the data for presentation at the ESA North Central Branch meeting and has written a manuscript for publication. His M.S. thesis on this research was completed and he received his M.S. in December.

Sunflower - Research continued on refining the sunflower moth evaluation technique for both cultivated and wild-type sunflowers. Ninety-one PI cultivated sunflower accessions and 10 wild-type accessions were planted for evaluation. These data are not analyzed at this time.

Amaranth - Fifty amaranth accessions were planted but only 24 were evaluated for resistance to the tarnished plant bug. None were more resistant than the susceptible check cultivar "Plainsman". Excessively rainy weather caused problems with this test.

"Plainsman" amaranth was planted in 8 field cages. Honey bees were placed in four of the cages for pollination. The other four cages relied on self-pollination. Data from this experiment are not analyzed at this time.

Brassica - A field cage test was conducted to compare the pollination efficiency of honey bees, alfalfa leafcutting bees, and a solitary bee (Osmia cornifrons). Two problems prevented this test from being fully successful. One was the cool, rainy summer that seemed to slow the insects' pollination activity and the second was that the Osmia cornifrons emerged and died before the Brassica was ready to pollinate. However, PI 392025 produced significantly more seed when pollinated by the alfalfa leafcutting bees than it did when pollinated with honey bees, or with no pollinating insects.

Laboratory

Diets - Efforts to make corn earworm rearing more efficient continue. Investigations include: storing diet for various lengths of time in the refrigerator or freezer before using; revitalizing the colony with wild corn earworms collected from the field in the fall; and not sexing pupae before placing in the oviposition chamber.

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

A colony of corn earworms is being maintained so that we'll have sufficient numbers of insects for use in our laboratory evaluation program.

A colony of green peach aphids is being maintained in the greenhouse so that we'll have sufficient numbers of insects for use in our greenhouse evaluation of Brassica.

We purchased 3500 Osmia cornifrons to use for cage pollination of various crops. The bees are shipped in straws and have been divided into lots and stored at different temperatures and humidities for use during 1994.

Greenhouse

Two hundred ninety PI Brassica accessions were evaluated in the greenhouse

for host-plant resistance to green peach aphid. Ten plants were planted per row in greenhouse flats. The plants were infested with green peach aphids and rated for damage one month after infestation. None of the accessions was rated resistant. One plant from PI 469898 was selected because it was not killed by the aphids. It has been transplanted into a pot and hopefully will produce seed for future testing.

Miscellaneous

Graduate Students - I served as major advisor for an M.S. candidate in Entomology (Craig Abel). He received his degree in December 1993. Craig plans to continue graduate education and pursue a Ph.D in Entomology.

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

Manuscript review:

During 1993, I peer-reviewed several manuscripts from the Journal of Economic Entomology, Crop Protection, and the Journal of the Kansas Entomological Society.

Cooperative research:

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

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

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

I am cooperating with Brad Binder (ARS, Ames, IA) on chemical analysis of corn silks in order to elucidate mechanisms of host-plant resistance to corn earworm.

I cooperated with Frank Davis (ARS, Mississippi State, MS), Bill Wiseman (ARS, Tifton, GA), and Dean Barry (ARS, Columbia, MO) in evaluating 11 European corn borer resistant lines found by Craig Abel in his research for a MS degree in Entomology.

I cooperated with Jean Dyer (ARS, Ames, IA) in the exchange of insects being reared. She provided us with European corn borers for our germplasm evaluation and we provided her corn earworms for use by an Egyptian visitor and by Randy Pingel (a graduate student in Entomology).

One of John Obryki's students collected lygus bugs from our amaranth plots.

EEO activities:

I organized and attended a program for the NCRPIS on "Employee Assistance Program at ISU", Mar. 2, 1993.

Attended an "Employee Relations Workshop" at NADC, Ames, May 4, 1993.

Viewed video "Practice Safe Science" at the NCRPIS, Ames, May 10, 1993.

Attended "Team Building" seminar at NADC on Aug. 26, 1993.

Attended "Ethics Training" at NADC on Sept. 22, 1993.

Attended "Cultural Awareness" seminar at Soil Tilth Lab on Dec. 3, 1993.

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, Atlanta, GA, Feb. 16-17, 1993.

Annual meeting of the Amaranth Institute, Ames, IA, Aug. 20, 1993. I served with Dave Brenner as local arrangements committee.

Annual meeting of the ESA North Central Branch, Fargo, ND, March 21-24, 1993. Sharon McClurg also attended this meeting.

Annual NC-7 Regional Technical Advisory Committee meeting, Ft. Collins, CC, June 28-30, 1993.

NCRPIS Program Review, Ames, IA, April 19-21, 1993.

Attended Northrup King open house, Ames, IA, Aug. 3, 1993.

Short courses/training:

Attended "Tractor Safety" meeting, ISU, Ames, IA, Mar. 18, 1993,

Attended "Dust Mask Training" at NCRPIS, Ames, IA, Mar. 25, 1993.

Attended "Worker Right To Know Law" meeting at ISU, Ames, IA, April 1, 1993.

Attended session on "General Scientist Orientation" at Soil Tilth Lab, Ames, May 4, 1993.

Papers presented at meetings:

Coauthored paper given by Craig Abel "Evaluation of Plant Introduction Peruvian Maize for Resistance to European Corn Borer Feeding" at the ESA North Central Branch meeting, Fargo, ND, March 21-24, 1993.

"Status of Entomology Research at the North Central Regional Plant Introduction Station" at the NCRPIS Program Review, Ames, IA, April 19, 1993.

"Entomology Research at the North Central Regional Plant Introduction Station" at the NC-7 Regional Technical Advisory Committee meeting, Ft. Collins, CO, June 28-30, 1993.

Other:

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

Current president of the Iowa Chapter of OPEDA.

Attended Popcorn Field Day at McHone Seeds, Ames, IA, Sept. 9, 1993.

Elected to Board of Directors of the Amaranth Institute for a three-year term.

Plans:

Field

Evaluate 250 maize PI accessions for host-plant resistance to corn earworm silk feeding.

Evaluate 1000 maize PI accessions for resistance to leaf feeding by European corn borer.

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

Evaluate 50 amaranth PI accessions for resistance to tarnished plant bug.

Cooperate with Rick Luhman to compare honey bees, alfalfa leafcutting 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 100 sunflower (cultivated type) and 10 (wild type) PI accessions for resistance to sunflower moth.

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

Evaluate 11 Peruvian maize accessions with European corn borer resistance and for resistance to sugarcane borer in cooperation with Bill White (ARS, Lahouma, LA).

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.

If time permits, we plan to work on an artificial diet for squash vine borer. We tried this a few years ago without any success.

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 serve 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.

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 to advise graduate students.

Continue to develop cooperative research projects.

Publications:

Abel, C.A. and R.L. Wilson. 1993. Evaluation of plant introduction Peruvian maize for resistance to European corn borer feeding. Abst. 48th N. Cent. Branch Meeting, Entomol. Soc. Am., 34, #158.

Wilson, R.L. and D.L. Olson. 1993. Tarnished plant bug, Lygus lineolaris (Palisot de Beauvois) (Hemiptera: Miridae): Effect on yield of grain amaranth, Amaranthus cruentus L., in field cages. J. Kan. Entomol. Soc. 65, 450-452.

Wilson, R.L., L.M. Pollak, and K.E. Ziegler. 1993. Evaluation of the U.S. National Germplasm System popcorn collection for resistance to corn earworm (Lepidoptera: Noctuidae) and European corn borer (Lepidoptera: Pyralidae). J. Econ. Entomol. 86, 952-956.

Wilson, R.L. 1993. Entomology research at the North Central Regional Plant Introduction Station, Ames, IA. Abs. NPGS Res. Workshop, 24.

Abel, C.A. and R.L. Wilson. 1993. Evaluation of plant introduction Peruvian maize for resistance to European corn borer feeding. Abs. NPGS Res. Workshop, 24. held at Ft. Collins, CO; June 29-30, 1993.

C. Horticulture (M.P. Widrlechner)

Germplasm Collections

Acquisition:

According to GRIN reports, I received 245 new accessions of ornamentals and 6 accessions of mint-family plants during 1993. Many of these accessions came from exchanges initiated through Indices Seminum and transfers from other NPGS sites (Geneva and National Arboretum). The most extensive exchange resulted from George White's efforts to obtain wild-collected ornamental accessions from the genebank in Gatersleben, Germany, resulting in 65 accessions. I participated in an exploration to Mexico in September and October, 1993, resulting in the acquisition of 23 accessions of Zinnia and 11 of Sanvitalia.

Maintenance:

Available for distribution:

Ornamentals (NC-7 priority site) 461/1523 (30%) (123 genera)
Ornamentals (For trials or transfers) 58/222 (26%) (74 genera)
Mint-family Plants (Bee Pasture) 16/117 (14%) (11 genera)

Distribution:

I distributed 95 plants, 190 cuttings, and 72 seed packets of ornamentals to meet germplasm requests, and 641 plants as part of the NC-7 Trials. Ornamental germplasm requests were lower than the record levels of 1991-92. I attribute this to the fact that no seed or plant lists were prepared for distribution in 1993, these being delayed until passport data on GRIN could be made as complete as possible. There were 26 seed packets of bee pasture accessions distributed in 1993.

Duplicated at NSSL

Ornamentals (NC-7 Priority Site) 110/1523 (7%)*
Mint-family Plants (Bee Pasture) 3/117 (3%)

* This does not include 23 accessions prepared for back-up at NSSL. These will be shipped as soon as PI numbers can be obtained.

Regenerated

Ornamentals (NC-7 Priority Site) 96/1523 (6%)*
Ornamentals (For trials or transfers) 11/222 (5%)
Mint-family Plants (Bee Pasture) 0/117 (0%)

* This includes 54 successful cage increases, 15 woody ornamental seed increases, and 27 woody plant grow-outs.

Tested for Germinability/Viability

Ornamentals (all accessions held as seed) 197/1489 (13%)"
Mint-family Plants (Bee Pasture) 19/117 (16%)

* These data are cumulative. Thirty-five accessions were tested in 1993.

Significant Progress

We had a surprisingly successful year for caged seed increase from herbaceous ornamentals, especially for Calendula, considering the unusually wet growing season. We made additional progress with germination testing of herbaceous ornamentals and over 50 additional seedlots are scheduled for germination in early 1994. Updated seed lists will be completed and distributed to cooperators and to institutions providing Indices Seminum early in 1994, after all passport data have been proofed on GRIN. During the second half of 1993, we made a concerted effort to make all passport data for ornamentals on GRIN as complete and accurate as possible. An initial round of proofing was completed in December and errors noted are now being corrected. The transfer of plants and seeds of Malus and Prunus to Geneva and Davis, respectively, was completed in 1993.

Characterization/taxonomy:

During 1993, 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 29 accessions of Calendula. In all, 12 accessions (mostly Calendula) were reidentified. Also in 1993, a standard NCRPIS-wide tracking form to document reidentifications was developed and is now being used for all crops at the Station.

Evaluation:

Roger Fuentes-Granados, a post-graduate student under my direction, defended his thesis and received his M.S. degree in December. His thesis research examined patterns of genetic diversity in Agastache foeniculum and the response of Agastache and other Lamiaceae to Verticillium. Starch gel electrophoresis was used to identify 19 putative enzyme-coding loci, 7 of which were polymorphic in A. foeniculum. Patterns of genetic diversity suggest that A. foeniculum is primarily allogamous and that significant within-population variability is present in many populations. A strain of Verticillium isolated from A. rugosa was evaluated for host range. It was found to infest 4 genera of Lamiaceae and was pathogenic to Salvia and Pycnanthemum.

Lester Wilson (ISU Food Science), Roger and I prepared a grant proposal to the Herb Society of American entitled, "Identifying Genetic Markers and Their Role in Selecting Chemotypes in Perennial Lamiaceae," that was funded for $2500 in late 1993. These funds will be used to support further evaluation of essential oils and their genetic control in Agastache.

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

Enhancement:

Late in 1993, Roger Fuentes-Granados and I developed a successful protocol for making controlled crosses in Agastache. Parents have been chosen to produce populations to elucidate the genetic control of isozyme banding patterns. These techniques can also be used to enhance Agastache populations for horticultural characteristics, nectar production, and essential oil composition. These topics will be included in Roger's Ph.D. research. The project to select Salvia azurea populations for adaptation to heavier soils and a shorter growing season is now awaiting the results from trials at four sites (see above).

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - 576 plants of 9 accessions were sent on request to regional cooperators for planting at 30 sites (an additional 65 plants of these accessions were sent to arboreta).

The NC-7 Ornamentals Subcommittee met in Nashville, Tennessee in July,

1993. The choice of plants for future testing, computerization of data collection, and dissemination of trial results through free-standing software such as ObjectVision, were the main topics of discussion.

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. Old-format "Ten-year Performance Report" forms have now been completely supplanted by the computer-generated forms. In 1993, the backlog of returned forms was compiled and entered into GRIN. User-friendly, free-standing data collection and summarization programs are now under development through the use of ObjectVision.

Four newsletter updates and three special letters were sent to trial site cooperators in 1993, to keep them informed about current developments at Ames and throughout the program.

I gave three presentations which examined the roles environmental factors can play to focus the search for new landscape plants for Iowa and the North Central U.S. I have continued the research presented in 1992 to the IPPS (publication date early 1994) by obtaining additional information on the floristics, soils, plant communities, and climates of Eastern Europe (especially of Romania and Ukraine).

In October, Jeanne Edwards was promoted to Biological Science Technician (part-time) GS-4.

Naomi Harrold delivered plants to trial sites in Nebraska, Kansas, and Colorado. I also visited the trial site in Morris, Minnesota to confirm records and to examine the Salvia azurea evaluation. I visited the trial site in Cincinnati, Ohio to confer with a new cooperator.

Germplasm activities in crops other than those I curate:

Ten requests for accessions with special horticultural characteristics were handled, resulting in the distribution of 955 packets of seed.

A 1992 test planting of Anethum was analyzed for essential oil composition and concentration at Purdue University. I co-authored a manuscript, recently submitted to the Journal of Agricultural & Food Chemistry, that presents results for dill seed and leaf oils.

In late 1993, I began a project to re-analyze the holdings of prairie plant germplasm in the NPGS and to analyze usage patterns for a presentation at the 14th North American Prairie Conference (July, 1994).

I analyzed seed deterioration in Helianthus annuus by reviewing germination data on GRIN where samples produced in the 1950s had been repeatedly germinated over time at NCRPIS. These analyses were performed following standard seed deterioration models of Ellis and Roberts and the results suggest that samples should remain in good condition for 20-30 years. These results will be prepared for publication in consultation with Mary Brothers and David Kovach in 1994,

I helped Bill Roath prepare two manuscripts reporting 1) the release of a new ornamental hybrid Cuphea 'Starfire' (to be submitted to HortScience) and 2) patterns of agronomic variability in collections of Cuphea viscosissima from the eastern U.S (submitted to Industrial Crops & Products).

Other research and training activities:

A study of the literature of germplasm preservation, i.e. research on seed, pollen and tissue culture storage and longevity, using citation analysis, was published in the FAO/IBPGR Plant Genetic Resources Newsletter in 1992. A similar citation analysis of the literature of germplasm multiplication has been completed and a manuscript was under preparation in 1993, but little progress was made in interpreting the results. I plan to finish this project in 1994.

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 submitted to Plant Breeding Reviews and the presentation was given to a workshop at the ASHS annual meeting in July.

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 four sections of the subgenus. Only section Alleghenienses remains to be studied in detail. This work will be done during 1994. Field work should also be more or less completed with the 1994 field season.

Meetings attended:

March - Shade Tree Short Course (Ames, IA)

May - American Rhododendron Society (Tacoma,WA)

June - Woody Landscape Plant CAC (Glenn Dale, MD)

June - NPGS Research Workshop, the NC-7 and Joint Regional Technical Committees, PGOC, and Herbaceous Ornamental CAC (Ft. Collins, CO)

July - ASHS annual meeting, including NC-7 Ornamental Subcommittee, Leafy Vegetable CAC, Root & Bulb Vegetable CAC, and Cucurbit CAC (Nashville, TN)

August - International Society of Arboriculture annual meeting (Bismarck, ND)

November - ASA/CSSA annual meeting, including Forage & Turf Grass CAC (Cincinnati, OH)

Presentations and seminars:

Searching for Iowa's new shade trees: invited presentation to Iowa Shade Tree Short Course.

The search for landscape plants from Eastern Europe: presentation to NPGS Research Workshop.

Tough trees for tough environments - An Eastern European case study: invited presentation to ISA.

Publications which appeared in print in 1993:

Bretting, Peter K., and Mark P. Widrlechner. 1993. Genetic markers and plant genetic resource management. HortScience 28: 472 (abstract).

Roath, W.W., M.P. Widrlechner, and J.H. Kirkbride. 1993. Collecting Cuphea in Brazil, Mexico and the United States. FAO/IBPGR Plant Genetic Resources Newsletter 93: 29-33.

Widrlechner, Mark P. 1993, The search for new landscape plants from Eastern Europe. NPGS Research Workshop June 29-30, 1993, Fort Collins, CO. p. 23 (abstract).

Other items:

During the first four months of 1993, I prepared materials which summarized my research and curation efforts for a joint ARS/CSRS (SAES) review of NCRPIS. I assisted with the preparation of stationwide documentation, such as an update of the Operations Manual and other materials for the Review Team's packet. I also advised other curators on their presentations and summarization of work.

In June, I served on a CSRS Review Team appointed to examine research in the Department of Agriculture and Natural Resources at Delaware State University, Dover, an 1890 Land Grant Institution. I was impressed with the high level of teaching and research activities, considering the available resources. I have established excellent contacts with Arthur Tucker that have led to my serving 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 DSU.

Conclusions:

Curation

1993 was a fairly productive year for germplasm increase, but the unusually wet weather caused many problems and delays in field work. In the spring, we established our largest cage-increase field for ornamentals (30 standard cages, 6 sunflower cages for Malvaceae, and 4 sunflower cages for a test of woody-plant seed increase). Progress renovating long-term field plantings was uneven; many plantings were removed following large-scale transfers, but saturated soils hindered replanting and delayed until 1994 the construction of new fencing for vines. The wet weather may also cause significant overwintering losses to herbaceous plants in the cage field from crown rots and similar pathogens.

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 were delayed in 1993 until all passport data could be made as complete and accurate as possible given the information in our files. Initial changes were completed in December and a final proofing of all records should be completed by February, 1994.

Research

In contrast to 1992, only one paper and two abstracts appeared in print in 1993. In addition, there are two papers on Eastern Europe / Midwest U.S. comparative studies that will be published early in 1994. Much of my time devoted to research in 1993 centered on three areas: assisting Roger Fuentes-Granados with the completion of his thesis and the development of a Ph.D. program; further analyses of Eastern European floristics, climates, and soils; and preparations for and reporting on the fall expedition to Mexico.

Roger's M.S. thesis should lead to two publications. One on verticillium wilt evaluations is being prepared for the Journal of Herbs, Spices Medicinal Plants. The other, on genetic diversity in Agastache, will-hopefully be presented to the 14th North American Prairie Conference in July, 1994.

Other projects underway that should lead to research publications include an analysis of prairie plant germplasm in NPGS and its usage and 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:*

Phytosanitary matters continued to be an important responsibility. Seed shipments frequently require a declaration that the seed was produced in an area free of specific diseases. Regular inspection programs have been instituted for corn (since 1990), sunflower (1991) and Cucurbita pepo (1993).

Sunflower: Sunflower increase plots were inspected twice during the growing season for downy mildew, Pseudomonas syringae, bacterial diseases, and virus diseases. Six downy mildew infected plants were removed from the field prior to flowering so that the field could be certified free of downy mildew. No other diseases were found except for Alternaria leaf blight. Alternaria leaf blight defoliated 50% of the leaves on many accessions.

Maize: All corn seed increase plots (60 accessions of inbred lines) were inspected for incidence and severity of leaf diseases. Common rust, common smut, northern leaf blight, carbonum leaf spot, yellow leaf blight and anthracnose were identified. Rust was a widespread and serious problem in seed production fields in 1993. Rust severity ranged from 2%-80% of the leaf area killed. Five accessions showed very good resistance with only 2-3% leaf area affected: PI 550440 (inbred B64), PI 558532 (inbred Mo17), Ames 8397 (inbred B73Ht), Ames 20070 (inbred HP301) and Ames 20132 (inbred *NC268).* The other diseases caused little damage on most of the accessions. The anthracnose fungus, Colletotrichum graminicola, was regularly observed as a secondary invader of rust pustules. Darluca filum, a fungus that is hyperparasitic on rusts, was abundant by mid-August and may have slowed the rust epiphytotic.

Stewart's bacterial wilt of corn, present in such abundance in 1992, was absent in 1993. No flea beetles were seen all summer. The cold winter and heavy spring and summer rains probably killed them.

Cucurbita pepo:

Squash mosaic virus is the only seed transmitted virus of cucurbits observed in 1993. Squash mosaic was common in the seed increase plots in both 1991 and 1992. The likely source of the disease was infected seed. The virus is spread from the source plants by cucumber beetles and by mechanical transmission (e.g. pollinating). To ensure that only "clean" plants were transplanted, a program was established to screen greenhouse seedlings before transplanting. Of 81 accessions tested (1055 plants), 19 accessions had one or more infected plants as determined by ELISA test. All infected plants were destroyed. This program will need to become a standard operating procedure for seed production.

RESEARCH NOTES:

Sunflower Accession Evaluation:

One hundred and thirty-eight accession were planted for Alternaria leaf

blight evaluation, 55 as re-tests and 83 new accessions, Abnormally heavy rains and flooding destroyed 90% of the plantings in one field and 50% in a second field. Alternaria evaluations on the remaining plots were confounded by Phomopsis leaf blight, an uncommon disease in Iowa. No useful field data were obtained for Alternaria resistance or Phomopsis resistance during 1993.

Seed Transmission Research

The potential spread of Stewart's bacterial wilt via seed continued to be the main phytosanitary issue relating to international shipment of seed corn.

More than 40,000 corn seedlings were bioassayed for seed transmission of E. stewartii by stem printing onto selected agar media, Seed transmission from heavily infected seed lots (>25% infected seed) occurred at a rate of 0.05 percent, about 1 plant per 2000 seedlings. No seed transmission was detected from lightly infected (<10% infected seed) seed lots. The low rate of seed transmission is consistent with results from two previous years. An ELISA based seed health test was developed which successfully estimates the percentage of infected seed. By combining seed transmission information with the ELISA seed health test, we are able to assess the risk of seed transmission from any given seed lot.

Miscellaneous:

Cryostorage facilities for maintaining pathogen cultures, seeds and pollen were greatly improved. We purchased a 110 liter liquid nitrogen tank (Locater 4 model) with capacity for 2800 2ml vials. All of the fungal and bacterial culture collection as well as some small seed and pollen storage experiments (ca. 800 vials) were transferred from the larger tank at the farm to campus, Vials are currently being stored in liquid nitrogen vapor. The tank at the farm will be stored for the immediate future and possibly renovated with a rotating platform and storage racks to make it more useful for a future expansion of seed cryostorage. In addition, a -80°C upright freezer was purchased. The freezer houses fungal and bacterial cultures, antibodies, and plant tissue samples.

Meetings/presentations:

Invited to speak on "Stewart's bacterial wilt in corn and seed transmission research" at the 15th Annual seed Technology Conference at ISU, Feb. 24-25, 1993.

Presented an overview of the NCRPIS plant pathology program to the station review team in April, 1993.

Attended the National Plant Germplasm meetings at Ft. Collins, CO during June, 1993. Presented an overview of the NCRPIS plant pathology program at the NC-7 Technical Committee meeting.

Organized and hosted a "disease identification" tour at the Field Extension Education Laboratory and the NCRPIS for 16 visiting Egyptian and Pakistani seed analysts, July; 1993.

Attended the national meeting of the American Phytopathological Society in Nashville, TN, Nov. 6-10, 1993. Participated in meetings as a member of the 'Seed Pathology' committee and the 'Collections and Germplasm' committee.

Participated in several tours of the NCRPIS.

Served on the Agronomy Department's Greenhouse and Growth Chamber Committee.

Attended weekly plant pathology seminars and weekly staff meetings.

Research plans:

Sunflower Accession Evaluation: Alternaria evaluations were originally intended to be completed in 1993. Because of the crop failure the evaluations will be extended through 1994, Evaluations will be a combination of re-testing putatively resistant PI's and previously untested accessions.

Corn: Research on the rate of seed transmission of Erwinia stewartii is essentially complete. Approximately 40 naturally infected seed lots of

different genotypes will be examined to measure seed infection percentages.

Phytosanitary inspections of seed increase plots will continue for sunflower, *corn* and Cucurbita pepo. Additional field and greenhouse inspections are needed in other crops. Decision regarding which crops and which diseases to survey will be made in consultation with the crop curators. Competent disease inspections are tedious, but are certainly essential for the international exchange of seed.

A international collaborative proposal to characterize a new bacterial disease of melons did not receive funding by the USDA/OICD/RSED program office. We will continue to investigate this problem with available funds.

Planned meetings/presentations:

Attend the Sunflower Research Forum at Fargo, ND on Jan. 13-14, 1994 and attend the Crop Advisory committee meeting held in conjunction with the research forum.

Attend the 16th annual Seed Technology Conference at ISU, Feb. 15-16, 1994. Present a poster on "Assessing risk of seed transmission from naturally infected seedlots".

Attend the Regional Seed Quality Workshop at Urbana-Champaign, IL on Mar. 21-22, 1994 to present research results.

Attend the APS national meeting in Albuquerque, NM August 6-10, 1994. Oral presentation on Stewart's wilt research results.

Attend the Cucurbitaceae 1994 meeting at South Padre Island, TX in Nov., 1994.

In cooperation with the vegetable curator, present a poster detailing cucurbit collections and cucurbit research at the NCRPIS at the Cucurbitaceae 1994 meeting.

E. Farm Superintendent (L. Lockhart)

General:

Supervised and coordinated daily operations at the NCRPIS. This includes management of all facilities, fields, and greenhouse space. Supervised or conducted 87 pesticide applications in the field and/or greenhouses. Coordinated and scheduled the student labor force of 23 FTE's.

Labor:

During the calendar year 1993, 249 applications for hourly employment were received and reviewed. There were 59 interviews resulting in 43 hourly employees hired. Three employees were dismissed for poor work performance and two for habitual tardiness. Currently there are 45 (16.4 FTE) part-time hourly employees working at the NCRPIS.

The hiring of Jerry Scheuerman as a Field Lab/Tech has been a tremendous asset to the farm operation. With the extra help on maintenance projects I have been able to devote significant periods of time to the ever-increasing regulatory issues facing the NCRPIS. I can only anticipate this trend will continue.

Maintenance projects completed:

Planned -20% cold room and seed storage remodeling project with seed storage personnel.

Constructed mist bench in the farm greenhouse to facilitate horticultural propagations.

Installed security locks and alarm systems to prevent unauthorized entry to seed storage rooms.

Designed and constructed a cross-bar handling system to improve efficiency of cage construction.

Tours:

This past year I organized and conducted 18 tours.

Conferences, training, etc. attended:

Numerous departmental seminars

Worker Right-to-Know Update, ISU

Chemical Waste Disposal, ISU

ASA-CSSA-SSA Annual Meeting

Respirator Training Certification EH&S

CPR and First Aid Training

Lock-out/Tagout, ISU

Worker Protection Standard Training, ISU

ASTA, Chicago

NC-7 RTAC, Ft Collins

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

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 1994:*

Maintenance

Serve as a liaison between contractors, ISU Agricultural Experiment

Station, and utility providers to ensure construction of entomology greenhouse proceeds as smoothly as possible.

Remodel seed storage work room if resources are available.

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

Construct compost bin for greenhouse organic material.

Other:

Implement Lockout/Tagout Program

Implement Worker Protection Standard Program

F. Controlled insect pollination program (C, Abel)

Progress:

Cage pollinations: Four hundred and four cages housed honey bees for control pollinating 664 accessions. Abnormally cool and wet weather reduced the number of insect-pollinated accessions this year.

Beekeeping: We purchased 350 2 lb. packages of honeybees this year. Two hundred and twenty of these were placed directly into nucleus hives (nucs) for Brassica pollinating and the remaining packages supplied nucs for our summer pollinating season.

Four hundred and forty nucs were wintered in the indoor wintering facility during the winter of 1992-93. Seventy-seven (17%) nucs survived. Uncaged nucs had a higher survival rate (42%) than nucs that were used in pollinating cages the previous summer (8%). It is believed that the uncaged nucs, which did not go into pollinating cages during the summer, continued rearing brood throughout the summer. Therefore, these nucs would have younger and larger populations of bees going into the winter. The caged nucs discontinued rearing broods once placed in the cages. This decreased their ability to survive the long storage period inside the wintering facility.

Five hundred and fifty nucs were placed into the indoor wintering facility this fall. The nucs were divided into four treatments. This study will determine the best pre-wintering preparation needed for the nucs going into the wintering facility.

In 1992, we wintered 28 large hives in the indoor wintering facility. Twenty-three hives survived giving us a 82% success rate. This compares to a 26% success rate with wintering large hives outdoors during the 1992-93 winter. On average, the surviving indoor-wintered hives had a larger number of bees and a greater quantity of brood by May 1st than the surviving outdoor wintered hives.

Forty large hives were placed in the indoor wintering facility this fall.

Two additional beeyards were established on NADC property bringing our total number of off-station bee yards at 7. These off-station yards are crucial to our nuc making efforts in the spring.

It was determined that corn syrup is superior to sugar syrup for supplemental feeding of honey bees in terms of cost and quality as a food source.

We assisted Kim Lewers (ISU Agronomy Dept. graduate student) during her study on optimal honey bee densities for pollinating soybeans.

Bombus: Thirty-three Bombus bimaculatus queens were captured between 4/28/93 and 5/06/93. Eighttsen established colonies in the lab. Two colonies were used to control pollinate Coronilla in the field. Six colonies reached sufficient size to produce ca. 40 queens and males. Unfortunately, we were unable to mate these queens.

During Fall 1993, we made significant improvements in the design of the Bombus rearing domiciles. One improvement was a new feeding apparatus which will allow us to feed colonies weekly rather than daily.

Megachile rotundata [Alfalfa leafcutter (ALC)]: A Brassica pollinator experiment was carried out in 1993. There was no significant difference in seed produced between the control (no pollinators), honey bees, and ALC pollinator treatments on accession 537015. However, with accession 392025, there was significantly (P = 0.05) more seed produced in cages which contained ALC than the control or honey bee cages.

Future plans:

Capture 90 Bombus bimaculatus queens this spring for a rearing study. Begin the year-round production of B. bimaculatus colonies for use in pollinator studies. Rear other native Bombus spp. to determine their suitability as pollinators of some of our plant germplasm species.

Collect and catalog native pollinators, from species of entomophilous plants we maintain at the station, for future work in determining the efficacy of native insect pollinators as pollinating agents for germplasm.

Use ALC in 50 Brassica increase cages, Spring 1994.

Assist R. L. Wilson in comparing Apis mellifera, Megachile rotundata, Osmia cornifrons, and Bombus bimaculatus as pollinators of Brassica spp., Cucumis melo, and Cucumis sativus.

Assist R. L. Wilson with studying the biology of Osmia cornifrons and improve techniques for rearing and storing this species.

Make plans to plant bee pasture to aid in feeding our honey bees during July and August.

By 1996, discontinue purchasing honey bees from Texas improving our nuc wintering success rate to 40% and by using other pollinators as determined by pollinator studies of Brassica spp., Cucumis melo, Cucumis sativus, Helianthus spp., and other entomophilous species that are maintained at NCRPIS.

Miscellaneous:

Attended the 1993 North Central Branch Entomological Society of America meetings in Fargo, ND.

Attended a Chemical Hygiene Plan Training session.

Attended Employee Assistance Program session.

Wrote "Management of Insect Pollinators" section of the NCRPIS Operations Manual.

Gave talk on NCRPIS control pollinating efforts to the NCRPIS Review

Committee.

Attended four Word Perfect 5.1 sessions at: the ISU Durham Center.

Attended American Seed Trade Association Meetings at Chicago, IL.

State of the operation:

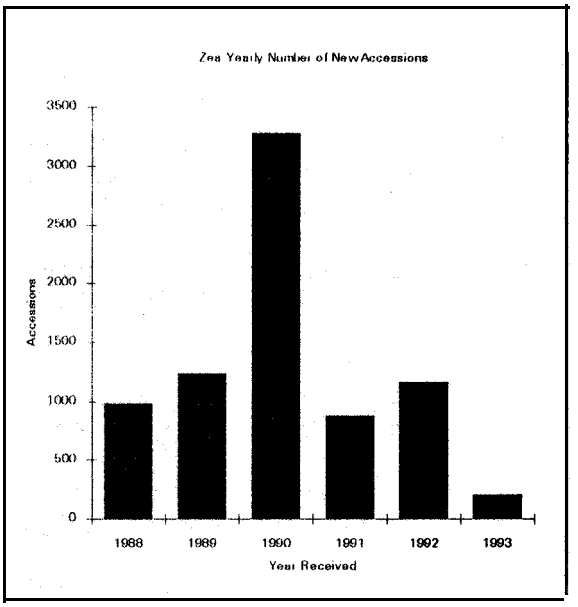
The insect management operation is currently undergoing an important transition. We are moving from traditional methods (i.e. the yearly purchase and use of honey bees) to more efficient methods designed specifically for each plant species increased at the station. The use of optimal pollinating agents may not only yield more cost efficient methods, but will also maintain our plant collections better. As with any transition, there will be some risks involved in using new methods. It will be important to monitor these new methods carefully while they are being implemented. Standard methods should be maintained as backups until the new methods have proven themselves effective and reliable over a number of years.

G. Zea Curator (Mark Millard)

Activities

Curatorial Information

A NCRPIS review was completed in 1993. The team complimented the maize curatorial program. The NCRPIS review team recognized the maize collection's management plan as an important step for setting priorities in the acquisition area.



Acquisition:

New accessions received

During 1993, 205 Zea accessions were acquired. Of these, 148 were accessions received through quarantine increase on St. Croix. This represents a considerable reduction in accessions received from previous years, and reflects the fact that tropical maize accessions, regenerated with USDA and USAID help, are now going to NSSL initially. Later, important representatives of these collections will also be divided by NSSL and placed at the NCRPIS.

NSSL received during 1993 1256 new accessions. As noted previously, many of these are destined ultimately for the NCRPIS, The maize curator at the NCRPIS had a significant role in reviewing passport data for these accessions and assigning accession numbers.

Samples of seed of the last 11 of 44 Plant Variety Protection (PVP) reference inbred lines were received in 1993. An attempt was made in regenerating 29 of the 44 lines not yet cleared for distribution.

Significant progress

Local accession numbers at the NSSL and the NCRPIS, or permanent PI numbers, were assigned to all pending Zea accessions before the end of calendar year 1993. Special efforts were made in this area to make sure accessions held in the NPGS were documented in response to new international protocols instituted at the end of 1993.

Maintenance and distribution:

#/% available for distribution--Sixty-eight percent (8684) of the 12,805 accessions held in December 1993 were available for distribution. The largest portion of unavailable accessions continues to be the 1600 accessions in the Galinat-Mangelsdorf collection. Low seed quantities and poor viability continue to inhibit progress with this collection.

#/% distributed--We distributed 3011 packets of Zea seed in 1993. This represents 15% (1945) of all Zea accessions.

#/% duplicated at NSSL--NSSL has seed of 66% (8483) of the Zea accessions held at NCRPIS. 1258 accessions were sent in 1993,

#/% accessions regenerated--In 1993, 238 accessions were regenerated, fewer than 2% of the total Zea collection. This figure includes 50 tropical accessions regenerated in Hawaii by Northrup-King, and 118 accessions regenerated in Puerto Rico. 148 accessions were received from the quarantine nurseries on St. Croix in 1993,

#/% tested for viability--We tested 20% (2521) of the Zea accessions for viability in 1993. This percentage keeps us on schedule for germination retests every 5 years.

The #/% of collection with permanent PI accession numbers is 77% (9863) of the total Zea accessions. 813 (6.7%) of all accessions were given PI numbers in 1993.

Significant progress--With automation, germinations of accessions have increased to levels needed for accurate monitoring of collection status.

The #/% of the maize collection backed-up at the NSSL increased substantially this year.

15 of the 44 PVP reference lines were cleared for distribution. 35 orders of 280 packets were filled from this material in 1993.

Limagrain Genetics in Iowa for the first time assisted in regenerating 10 accessions.

We received an excellent increase of 50 accessions by Northrup King at their Kauai location. This increase was the best regeneration overall in 1993.

Cooperation provided by the staff at the Isabela, Puerto Rico Research Station of the Tropical Research Station, Mayaquez, Puerto Rico reached all time highs in a difficult year. All the staff involved were most helpful.

Special thanks are given to Mr. Adolfo Quiles, Agronomist, who provided day-to-day supervision of the nursery.

The first shipment of balanced (perfect) samples to NSSL for future regenerations was made in 1993. The protocol for the procedure was finally standardized after several years of development. Special thanks to the new seed storage technician, David Kovach, in making this procedure more efficient. He designed and built several devices to help unskilled temporary labor separate balanced samples making the process more precise and efficient.

This was the first year in which all field data was obtained by field electronic data entry.

This was the first year in which all harvest labels were bar coded for faster more precise data entry.

1993 was the first year in which germination data was captured directly to computer. Subsequently also in 1993, the procedure has been expanded to a computer network where multiple individuals can enter data simultaneously.

Characterization/taxonomy:

#/% characterized/classified--This status has changed little from 1992, however we have entered all fieldbook data after 1980 into PC computer files. Final checking needs to be done and then this data can be entered into GRIN. It is estimated that 40% of current NCRPIS accessions have all available passport data entered into GRIN. Twenty-five percent of Zea accessions bear some racial classification, generally provided by collectors or the banks in Colombia, Mexico, or Peru. These racial designations may need verification. Most accessions grown by the NCRPIS have accession characterization data recorded during increase. Perhaps only 30% of these data have been extracted from fieldbooks and entered into GRIN.

Significant progress--We achieved complete data conversion of old observation data in GRIN obtained during previous regenerations to new database format. Emphasis was placed on compatibility with CIMMYT and LAMP databases and the international descriptor set.

This was the first year in which observation data from the regeneration nursery has been entered into GRIN within days of its acquisition.

Due to weather and resource shortages the morphological evaluations of U.S. material was placed on hold in 1993.

Evaluation:

#/% evaluated--494 accessions were evaluated for resistance to first generation European corn borer feeding by the NCRPIS entomology group. 60% (7727) of the accessions have been evaluated for host-plant resistance. Additional preliminary screening for corn earworm resistance expressed as reduced silk feeding was performed by the entomology group. Taking up the review team's suggestion, screening on second-third generation corn borer resistance was begun.

During the last four years, the Acting 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. ELISA tests were begun on seed produced before field observations were made, or on seed produced elsewhere, to satisfy international restrictions on seed where the Stewart's wilt status is unknown.

Significant progress--The first generation European corn borer observation represents the highest percentage of the collection evaluated for any trait. The evaluation program was reviewed by the curator, Research Leader, and station researchers while developing the Zea management plan. It was decided that evaluations at the NCRPIS would stress materials already on hand and that outside cooperators would be encouraged to evaluate in Zea with non-NCRPIS financial support. Quantities of seed were sent to Georgia and Missouri for such cooperative evaluation efforts in 1993.

Dr. David Smith of the Maize Crop Advisory Committee presented a report on the wants and needs of the maize collection user community in plant pathology disease resistance screening. He indicated that there was much interest in doing such screening of the collection, but not many resources. He plans with NCRPIS personnel to follow up and prepare a proposal which could be submitted to the committee in 1994.

Enhancement and/or utilization:

#/% enhanced--No enhancement program has been undertaken with Zea at the NCRPIS.

Significant progress--The seed industry, with the Maize CAC's concurrence, has begun a major effort in obtaining funding at the national level for an enhancement program in maize. The efforts have begun with much in-kind support from industry, allowing the initial enhancement of the LAMP top 5% accessions in 1993.

Support/administrative personnel:

Significant accomplishments--The Zea technician made significant progress in the computer automation arena. He attended two workshops and has begun using the computer for data entry almost exclusively.

The secretarial staff at the NCRPIS is praised for arranging the maize curatorial project's travel during the last few years. Winter nursery travel is often unpredictable and time consuming in arranging.

Heavy demands were placed on order processing personnel while the curator was traveling.. Thanks to them for "filling in" during this difficult time.

Travel and Meetings attended:

The maize curator and a temporary ISU student-employee travelled to Isabella, Puerto Rico to assist in pollination of the 1993 tropical nursery. The trip provided an excellent experience for one of the maize project's most valued employees, John Westphal.

The GRIN site meeting was held in conjunction with the PGOC meeting, regional technical advisory committee meetings, and NPGS research meeting in late June, 1993. GRIN3 is expected to go on line in mid-1994.

I attended the 1993 Maize CAC meeting at the American Seed Trade

Association meetings, December 7-10.

Presentations or seminars:

Numerous visitors and groups toured NCRPIS and learned procedures for maize curation. Among them were the NCRPIS review team.

A brief presentation concerning the maize curatorial effort was made both before the NCRPIS review team meeting and the Regional Technical advisory committee meeting.

Miscellaneous:

The Specific Cooperative Agreement with Iowa State University's Seed Science Laboratory to create a computerized visual database for corn ears continued and has been extended one year into 1995. Dr. Misra and Dr. Shyy continue this work, with the Research Leader/Coordinator and myself

representing the NCRPIS in the cooperative agreement. Drs. Misra and Shyy attended the research meeting at Fort Collins of NPGS staff to present their developments and to exchange ideas with others in this area.

Conclusions:

State of the program

In summary, we are keeping up with maize accession maintenance tasks, but just so. Additional tropical and rescue regenerations are necessary. An increased effort to computerize old data and obtain better characterization data is required.

Strengths and weaknesses: what facilitated or hindered progress

The most difficult challenge in 1993 was the poor weather for increase in Ames. The planting was reduced in size and yet what was grown, mainly PVP reference accessions, will need to be regrown.

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 turnover of temporary personnel. 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. Towards this end, the research leader has allowed and strongly encouraged the maize curator to divorce himself from non-maize responsibilities. This has proven difficult to accomplish, as staff shortages and turnover has encouraged overlap of duties to "get the job done". It is expected that, in the coming years, the benefits of having a "full time" maize curator will become apparent.

Northrup King indicated that they did not have the resources for another fifty accession increase at Kauai, Hawaii in 1994. As mentioned before this was the best nursery in 1993. It is hoped that we can restore this relationship as conditions in the seed industry improve. Pioneer Hi-Bred International has offered to regenerate 50 tropical maize accessions for us during 1994.

Future plans:

Acquisition plans

It was re-affirmed by the CAC that all Caribbean accessions held by CIMMYT should also be available at the NCRPIS. We will try to obtain this material in 1994, as budget allows. This process began in 1993 with the receipt of a list from CIMMYT of accessions for which they hold excess amounts of seed.

Maize from Guatemala, Bolivia, Ecuador, Paraguay, and Brazil is not well-represented in the NCRPIS collections. I will try to obtain at least the racial type collections from these countries. Almost all of the LAMP top 5% accessions have been acquired by the NCRPIS and plans are to include much of the top 20%.

Maintenance:

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

The number of Zea accessions to be regenerated in 1994 will be similar to that in 1993. Hand pollinations of corn is one of the most demanding tasks for student hourly labor. The labor allocated to the maize project was again reduced for the summer of 1994. One hundred to 150 accession increases are planned.

Fifty accessions will be sent to Puerto Rico for winter increase. In late 1994 another 100 accessions will be sent to Puerto Rico for increase to move up the increase time-table.

Characterization and evaluation work

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

Approximately 200 accessions will be screened for corn earworm resistance by the entomology program.

Approximately 200 accessions will be screened for second-third generation corn borer resistance/tolerance by the entomology program.

The LAMP evaluation data will be entered into GRIN. These will include characterization-evaluation data for more than 25,000 accessions in the accessions' area of adaptation. These data may total more than half a million observations.

I will continue entering fieldbook data into GRIN.

Experimental work requiring the maize program's resources

The cooperative research with Iowa State and their imaging team will need close attention as equipment and software purchases are completed, This year, a database model will be developed. Testing of the database and its efficiency will begin.

Travel

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

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

I will probably only attend one meeting in 1994 related to the new GRIN3 software as my duties in this area diminish.

H. **Beta-Spinacia (P. Lundeen)**

Beta:

Evaluation of alternate regeneration sites continues. Germination data and seed have not yet arrived from Pullman, but the reports from the first year plots for regeneration are good. Seed for a second year of evaluation have been sent to Pullman. These will be grown at two locations (Pullman and Central Ferry). Accessions were also sent to Ft. Collins for evaluation of regeneration conditions,

Five new accessions were received in 1993, 129 accessions from NSSL and 71 increase lots from Utah. The 129 accessions from NSSL included 97 accessions not previously recieved at NC-7, and 32 additional increases.

Four hundred and seventy eight samples were sent to NSSL as back-up. Much of this material was original seed or samples with low germination

percentages. Of the 1,445 accessions Ames, 63% are now backed up at NSSL. Currently there are 423 accessions available for distribution.

The next CAC meeting will coincide with the ASSBT meetings in March 1995.

Spinacia:

Eight new accessions were added to the Spinacia collection, raising the current collection size to 304 accessions at NCRPIS. All but 101 are available for distribution, although only 12 accessions have distribution lots resulting from control-pollination.

Regenerations of 7 accessions of Spinacia were attempted under greenhouse conditions using positive pressure chambers. Seed was harvested from half the accessions planted, and awaits cleaning and storage.

I. Computer Coordination (P. Lundeen)

Training:

ISU training

ISU short courses in computing are available through the university. Few of the current staff have taken advantage of these courses this year.

Monthly computer meetings

Computer meetings still serve as training sessions for basic computer topics instead of general discussion sessions. Sessions have been limited by the computer personnel's lack of time to develop topics of interest.

Individual training

Individual training is still a major part of this position. Several of the curators have been assisting in basic GRIN training, and farm procedures. The NCRPIS staffs' different levels of expertise, and variability in computer hardware and software makes goal-oriented training necessary.

Data entry

Most evaluation data arrives on diskette, and most of the curators have shifted orders, evaluation data, etc. to computerized files. Data entry of germinations has helped new employees understand and gain familliarity with the accession and inventory coding systems. Additional germination entry has been handled by the receptionists.

Documentation:

Operations manual

Login procedures documentation was revamped before Janae Colvin quit. We plan to update the full order processing procedures in the Operations Manual to reflect recent changes, as time permits.

Procedures & codes

Procedures and the first draft of a taxonomy re-identification form were developed. A three part form was put on hold until the procedures were evaluated for six months.

Coordination & supervision:

Login--We received approximately 1900 new accessions in 1993. The passport data on all but 200 of these was entered manually. Part of the planned seed storage remodelling includes moving the login position to seed storage, under the supervision of Mark Widrlechner. A concerted effort was made to load basic passport for all accessions into GRIN by the end of December, 1993.

Order processing--We received approximately 900 germplasm requests in 1993. Although part of the increase in orders was due to documentation of 'information only' orders, there was also an increase in germplasm requests.

Purchasing and upgrades:

Purchases

We purchased five new 486 PCs this year. One of these was an AST 486/66Dh installed as a network server at the farm. The others included a Gateway PC for the entomology crew, a Compaq PC for the secretary, and two Zeniths for the farm.

A 20-user Novell Netware 3.11 software, a desktop scanner, a CD ROM reader, a Zebra bar code printer, and a DAT back-up system were all purchased to improve efficiency.

Upgrades

We are continually shifting PCs, giving the most experienced people the newest PC's and upgrading everyone down the line. This requires much time, adjusting software to different versions of DOS, different drives, etc. Hiring an hourly employee interested in PC maintenance has improved efficiency of upgrading PCs.

The increased size of the network has altered priorities and improved data security and hardware upgrade speed. Virus protection and structural uniformity have become high priorities for the network. The network has also improved the efficiency of shifting PCs. Back-ups should now be conducted through the server.

The old 186 PCs have produced some additional problems when attached to the network. Hopefully, these problems can be overcome and the network can increase the use of these PCs.

PC Cleaning

Currently, cleaning only occurs when the user does so, or because of hardware problems'. This may change as we catch up with higher priority tasks.

Significant projects of 1993:

Networks

The farm network was expanded to a 20 user network with only minor problems, due to the experience received when installing the 5 user network. While the efficiency of adding new stations has increased, tripling the number of users has taken time and caused additional problems. Communications and data security procedures have become priorities. Station procedures and some software are now available on the server. There are still major improvements needed for the network, including the addition of a print server, OS/2 connections, and communications access to GRIN through the server,

The three "networked" computers on campus are now fully functional and now share files and printers. No further additions to this network are foreseen.

Bar code equipment

Integrating bar coding equipment with our current inventory ID's has been complicated. Software recommended by other sites has not been effective in recognizing our upper and lower case inventory codes. Creating bar codes for inventory IDs (for germinations, and seed storage operations) has been accomplished, but has not yet been incorporated station wide. The new Zebra printer should improve label printing, once it is operational.

PC & Software Tracking/Registration

Tracking software and hardware registrations for the 42 PCs in use at NCRPIS is challenging. Currently, PC hardware registrations and most software versions are recorded on a summary file in Excel. This information is updated as purchases arrive and the information is verified as time permits.

Facilities:

The current space available for computer operations is cramped. Significant time is spent reorganizing the limited space available before any new hardware upgrades, or testing can occur.

Priorities:

The priority list for this position has not significantly changed since last year. Items marked with an '*' are new to the list. Items marked with a '-' have been downgraded in importance.

s--Accounting programs, Research Leader's requests, computer breakdowns, individual help and training, reports for seed storage, processing germinations, increase & germination orders & labels, *network installation & operation, new inventory lots, *beta testing of new projects (G205 PC, etc.), purchasing hardware & software.

Moderate-- Curator requests, order processing & IO orders, PRIME System maintenance, field book pages, hardware upgrades, software upgrades,

passport proofing, purchasing research, documenting procedures.

Low--Database checking, checking for duplicate accessions, computer back-ups, loading observations, monthly training sessions, defining descriptors, PC cleaning & maintenance, general programming research, computer software evaluation, filing & project documentation.

J. Vegetables (K. Reitsma)

Activities--General Summary

Acquisition:

New accessions: 709

Status: 5628 PI-numbers, 1862 Ames-numbers, 7490 total.

Maintenance and distribution:

3747 accessions (50%) available for distribution; 6058 packets (3165 accessions, 42% of collection) distributed; 2767 accessions (37%) duplicated at NSSL; 804 accessions (11%) attempted regenerations; 0 accessions tested for germinability/viability.

Activities--Specific Crop Summaries

ASPARAGUS

Acquisition:

New accessions received: One new accession was received in 1993.

Status: 146 PI-numbers, 18 Ames-numbers, 158 total.

Maintenance and distribution:

#/% available for Distribution--As of January 1994, 44 (28%) of 148 accessions are available far distribution.

#/% distributed--Forty-three packets (32 accessions, 20% of collection) were distributed in 1993.

#/% 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 1994 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--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 not a viable alternative for maintaining the Asparagus collection at NCRPIS.

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 fieldbooks, 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: There have been several inquiries concerning the vegetable asparagus. Three of the requests were for seed to be used in asparagus breeding programs to broaden the genetic base of vegetable asparagus cultivar production.

CICHORIUM

Acquisition:

New accessions received: None.

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

Maintenance and distribution:

#/% available for distribution--Forty-two PI numbered accessions (21%) of 200 accessions of chicory were available as of January 1993. An additional 31 Ames numbered accessions could be made available upon request.

#/% distributed--In 1993, 70 packets (69 accessions, 35% of collection) were distributed as domestic requests.

#/% duplicated at NSSL--Nineteen chicory accessions (10% of collection) are duplicated at NSSL. An additional 21 accessions can be backed-up when PIs are assigned.

#/% regenerated--In January 1993, 35 Cichorium accessions (17% of collection) were started in the greenhouse for regeneration in summer biennial cages. Thirty accessions germinated for transplanting to field cages, and 11 of 13 accessions harvested had small amounts of mature seed.

#/% tested for germinabilitp/viability--Germinations will be performed on the 1992 and 1993 increases in 1994.

Significant progress--None. Due to environmental stresses, the 1992 and 1993 regenerations were unproductive.

Characterization/taxonomy:

#/% characterized/classified--Only 33% of the chicory collection has the country of origin specified on GRIN. Little information has been entered in GRIN for Ames-numbered accessions received before GRIN was established. Most of the chicory collection is Ames-numbered, and any additional passport data from documentation received with the accessions will be entered on GRIN before PIs are assigned.

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 1994

meeting.

Evaluation:

#/% evaluated and significant progress: None, as there has been relatively little user interest in this crop.

Enhancement:

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

CUCUMIS MELO

Acquisition:

New accessions received: 456

Status: 2408 PI-numbers, 715 Ames-numbers, 3123 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 1508 (48%) of 3123 accessions are available for distribution.

#/% distributed--In 1993, 2700 packets (1527 accessions, 49% of the collection) were distributed for 44 orders--2517 packets were shipped as domestic requests and 183 packets were shipped as foreign requests.

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

#/% regenerated--The 1993 melon regenerations focused on the germplasm recently collected in India. Of the 437 melon accessions selected for the 1993 regenerations 248 *were* PI numbers with low distribution quantities and 189 were new Ames numbered India accessions.

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

Significant progress--The collection "clean-up" is progressing slowly. Many of the accessions must be grown at least two years in a row to produce enough seed to make the accession available for distribution.

Characterization/taxonomy:

#/% characterized/classified--Each time an accession is regenerated, the plants and fruits are characterized, and the fruits are photographed.

Significant progress--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 pollinations,

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 (data have been loaded to GRIN.)

Enhancement:

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

CUCUMIS SATIWS

Acquisition:

New accessions received: 204

Status: 962 PI-numbers, 347 Ames-numbers, 1309 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 813 (62%) of 1309 accessions are available for distribution,

#/% distributed-- In 1993, 2162 packets or 845 accessions (65%) were shipped in a total of 19 orders-- 40 packets were sent as domestic requests, and 2122 as foreign requests.

#/% duplicated at NSSL--There are 718 (55%) accessions duplicated at NSSL.

#/% regenerated--All 180 accessions of cucumber regenerated in 1993 were new Ames numbered accessions from the India collection.

#/% tested for germinability/viability: None.

Significant progress--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--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. The data for the early Ames numbers are not on GRIN because the accessions were received before GRIN was established. These data will be entered and verified for each Ames-numbered accession before a PI is assigned.

Significant progress--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 fieldbook notes have been put in Key Entry files, but we must determine what information should be entered on GRIN and in what format).

Evaluation:

#/% evaluated: None.

Significant progress: None.

Enhancement:

#/% enhanced and significant progress: None.

CUCUMIS species (wild Cucumis)

Acquisition:

New accessions received: None.

Status: 276 PI-numbers, 10 Ames-numbers, 286 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 107 (37%) of 286 accessions are available for distribution.

#/% distributed--In 1993, 183 packets (109 accessions, 38% of collection) were distributed in a total of 14 orders--84 packets were sent as domestic orders and 99 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. I hope to complete storage by April.

#/% regenerated--Twelve C. metuliferus accessions failed to flower in the 1992 summer field cages.- Cuttings were taken from the plants in the field, and roots were dug and placed in the greenhouse for hand pollinated increases. Fruits were harvested from 10 accessions in April 1993.

#/% tested for germinability/viability--Ninety-two germinations were performed on 87 wild Cucumis accessions (30% of the collections) in preparation to send duplicate material to NSSL.

Significant progress--Accessions in this collection need special handling. Many species require long growing seasons or have become persistent weeds in observation fields. Greenhouse increases will be the primary means of 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 fieldbooks and the fruits are photographed.

Significant progress--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 pollinations. 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.

Evaluation:

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

Enhancement:

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

CUCURBITA

Acquisition:

New accessions received-- We received 6 new accessions this year.

Status: 783 PI-numbers, 177 Ames-numbers, 960 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 567 (59%) of 960 accessions are available for distribution.

#/% distributed--A total of 366 packets (316 accessions, 33% of the collection) were distributed in a total of 8 orders--69 packets were sent as domestic requests and 297 packets were distributed as foreign requests.

#/% duplicated at NSSL--There are 410 accessions (43% of the collection) duplicated at NSSL.

#/% regen,erated--Regeneration attempts on 96 (10%) accessions were unsuccessful. Planting was delayed due to weather and due to virus screening. After transplanting to the field, plant growth was hindered by the VERY wet growing season.

#/% 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 using 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 affect 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.

Significant progress--No characterization data for the vegetables have been entered on GRIN since the late 1970s. (Some fieldbook 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 1994 CAC meeting.

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: 8

Status: 570 PI-numbers, 201 Ames-numbers, 771 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 456 (59%) of 771 accessions are available for distribution.

#/% distributed--In 1993, 241 packets (153 accessions, 20% of the collection) were distributed for a total of 13 orders--l23 were sent as domestic requests and 118 packets as foreign requests.

#/% duplicated at NSSL--Only 280 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 1994,

#/% 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--

Characterization/taxonomy:

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

Significant progress--No characterization data for the vegetables have been entered on GRIN since the late 1970s. (Some fieldbook 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).

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 Sanuary 1994, 41 (55%) of 75 accessions are available for distribution.

#/% distributed--In 1993, 144 packets (51 accessions, 68% of the collection) were shipped in a total of 4 orders. Seventy-three packets were distributed as domestic requests, and 71 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.

Significant progress--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 fieldbook notes have been put in Key Entry files, but we have to determine what information should be entered onto GRIN and its format,)

Evaluation:

#/% evaluated and significant progress: None

Enhancement:

#/% enhanced and significant progress: None.

PETROSELINUM

Acquisition:

New accessions received: 1

Status: 133 PI-numbers, 15 Ames-numbers, 148 total.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 63 (43%) of 148 accessions are available for distribution.

#/% distributed: None.

#/% duplicated at NSSL--Twenty-three accessions (16%) have been duplicated at NSSL. More parsley accessions could be sent but their germinations do not meet NSSL's standards. These accessions may be sent for backup in NSSL's "surplus storage" area in 1994.

#/% regenerated: None

#/% germinability/viability: None

Significant progress--Many of the accessions in the parsley collection require a growing season longer than that of Ames. Green fruit is harvested from most of the accessions and its viability declines rapidly. Seed viability seems to decrease quickly even when fully mature fruit is harvested. Seed quality is questionable, and few accessions are ever requested, so regenerations have been assigned a lower priority.

Characterization/taxonomy:

#/% characterized/classified--Ninety-nine percent of the collection has country of origin specified on GRIN, and 44% of these accessions have an alternate "id" on GRIN.

Significant progress--No characterization data for the vegetables have been entered on GRIN since the late 1970's. (Some fieldbook notes have been put in Key Entry files, but we must determine what information to include on GRIN and its format.)

Evaluation:

#/% evaluated and significant progress: None

Enhancement:

#/% enhanced and significant progress: None, as there is no enhancement

program in the **vegetable** crops at NCRPIS.

MINTS

Acquisition:

New accessions received: 1

Status

Genera included: 1 Calamintha, 1 Dracocephalum, 1 Mosla, 17 Origanum. 14 PI-numbers, 6 Ames-numbers, 20 total accessions.

Maintenance and distribution:

#/% available for distribution--Four accessions (20%) are currently available for distribution.

#/% distributed--One accession was distributed in 1993.

#/% duplicated at NSSL: None

#/% regenerated: None

#/% tested for germinability/viability: None

Significant progress--Some of these genera are perennial and may require greenhouse cultivation for two to three years to regenerate enough seed for distribution.

Characterization/taxonomy:

#/% characterized/classified--Seventy percent of the collection has country of origin specified on GRIN, and only 30% of these accessions have an alternate id on GRIN.

Significant progress: None.

Evaluation;

#/% evaluated and significant progress: None

Enhancement:

#/% enhanced and significant progress: None.

UMBELS

Acquisition:

New accessions received-- **We** received the following 32 new accessions in the NC7-umbels sitecrop: 12 Angelica, 3 Carum, 11 Coriandrum, 1 Cuminum, 1 Foeniculum, 1 Pastinaca, 2 Pimpinella, 1 Sium.

Status:

The **NC7-umbels sitecrop** has 219 PI-numbers, 235 Ames-numbers, for a total of 440 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, 3 Foeniculum, 1 Levisticum, 2 Muretia, 41 Pastinaca, 30 Pimpinella, 1 Schumannia, 2 Sium, 6 Torilis, 1 Trachyspermum, and 5 unidentified Apiaceae.

Maintenance and distribution:

#/% available for distribution--As of January 1994, 56 (12%) of 440 accessions are available for distribution.

#/% distributed--Of 148 packets distributed (62 accessions, 14% of the collection), 52 packets were shipped for domestic requests, and 96 packets for foreign requests.

#/% duplicated at NSSL--Only 34 accessions (7%) are duplicated at NSSL. Due to low germinations, few accessions of these genera are duplicated at NSSL.

#/% regenerated--Fifty accessions each of Coriandrum and Anethum were to be direct seeded, using the two-row planter, into the field for cage increase in 1993. We were unable to do this because of the wet growing season.

#/% tested for germinability/viability: None

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.

Meetings attended:

I attended the following CAC meetings held in conjunction with the American Society for Horticultural Science (ASHS), Nashville, TN, July 22-29, 1993:

-Root and Bulb Vegetable Crop Advisory Committee
-Leafy Vegetable Crop Advisory Committee
-Cucurbit Crop Advisory Committee

Conclusions:

In general, 1993 regenerations were not very successful. Honey bees were introduced into all 30 biennial cages, but harvests were very poor. Seed for most of the Daucus and Cichorium was immature (green) at frost,

Honey bees were introduced into 41% of the Cucumis cages (approximately 70% of the cucumber cages had bees introduced). Fruits were harvested from approximately 179 cages (107 cucumber, 72 melon.) Many of the fruits were immature. Seed quality and seed quantity will not be known until germination tests are conducted and the collections are inventoried at storage time.

Approximately 750 cages will be prepared for this summer's field increases: 650 Cucumis, 100 Cucurbita, 50 Daucus, 50 Coriandrum, 34 Cichorium, and 30 miscellaneous mints and umbels (to be paired with carrots in cages).

The Plant Pathologist visually inspects cucurbit seedlings before transplanting them to the field for regeneration each year. Because of the increasing concern about seedborne diseases in the cucurbits, we will begin to screen all cucurbit seedlings for virus infection with an ELISA protocol before transplanting accessions to the field.

K. Crucifers and Grasses (R. Luhman)

Acquisition:

In 1993 the NCRPIS logged into the GRIN database 264 new Brassicaceae accessions and six new Poaceae (excluding Zea) accessions. These accessions have been given local Ames numbers and will be considered for formal entry into the National Plant Germplasm System. Additionally, five

Brassicaceae accessions from the Northeast Regional Plant Introduction Station, two Brassicaceae accessions from the Southern Regional Plant Introduction Station, and two Poaceae accessions from the Southern Regional Plant Introduction Station were transferred to the NCRPIS. Approximately 80% of the 264 new Brassicaceae accessions were various wild species received from Dr. Cesar Gómez-Campo in Spain. The information on the 1000+ packets of Brassica received from Dr. Paul Williams (Dr. Paul Knowles' collection-University of California) in 1992 was compared to information on scanned images of the original cards and it was determined that all but 27 accessions were already included in the National Plant Germplasm System. The remainder of the new Brassicaceae accessions logged into GRIN in 1993 came from various sources in the Northern hemisphere. The six new grasses were introduced from the former Soviet Union.

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 1300+ Brassica accessions received from the Northern Regional Research Laboratory in Peoria, Illinois in 1988 and most of the 1500+ Echinochloa, Panicum, and Setaria accessions forwarded to us in 1987 from the Plant Introduction Office lack Plant Introduction numbers. Much of the passport information that we have received on the non-PI'd Indian millets contradicts what was previously entered into the GRIN database, so seed and field comparisons are required to determine the validity of the information.

Three thousand, five hundred and fifty-eight packets of Brassica (1,028 accessions), one packet of Brassicoraphanus (one accession), 14 packets of Camelina (seven accessions), 49 packets of Crambe (32 accessions), four packets of Echinochloa (four accessions), one packet of Eruca (one accession), one packet of Isatis (one accession), five packets of Lepidium (five accessions), one packet of Linum (one accession), 378 packets of Panicum (201 accessions), 461 packets of Setaria (279 accessions), 26 packets of Sinapis (25 accessions) and one packet of Tridens (one accession) were distributed in 1993.

In 1993, duplicates of 237 Erassica accessions were sent to the National Seed Storage Laboratory. At present, 36% of the total accessions and 74% of the PI'd accessions that I manage are duplicated at NSSL.

The 1993 Brassicaceae regeneration attempts totaled 277 accessions (136 Brassica, 31 Crambe, eight Lepidium, and 102 Sinapis). Four accessions did not germinate and will be considered for the inactive file. A very rainy April resulted in a three week delay in field transplanting of 215 accessions. Fifteen accessions were left for greenhouse increase. The remaining regenerations were discarded due to excessive flowering. Remnant seed will be used in a future year to make another attempt at regenerating these accessions. For a portion of the regenerations, we were forced to choose a site used in 1991, resulting in some volunteers (mostly Brassica juncea). Some of these regenerations may need to be grown in observation plots to check for species purity. May, June, and July continued to be very rainy, resulting in poor seed quality and/or delayed harvest. One-hundred and ninety one field and 11 greenhouse regenerations were

harvested, cleaned, and are awaiting germination and storage.

The 1993 millet regeneration effort was extensively reduced from previous years (58 accessions attempted) due to (1) the wetter than normal spring and (2) questions about quarantine of a 1987 millet shipment (ca. 5500 packets) to the NCRPIS. The 28 accessions harvested this fall have been cleaned but have not yet been germinated and stored. Two Echinochloa, two Setaria and one Panicum accession were dug from the field and have been established in the greenhouse. These five accessions have not yet set seed.

Table 1 indicates that ca. 2800 germinations were completed during calendar year 1993. Five year germinations have been performed on Brassica, Crambe, Echinochloa, Eruca, Setaria, Sinapis, and other Brassicaceae collections. Additionally, germinations have been completed on all 1992 regenerations. More than 60% of these germinations have currently been entered into the GRIN database. The remainder of the germinations should be entered by June 1994.

TABLE 1: Brassicaceae and Poaceae (excluding Zea) germinations performed in calendar year 1993.

GERMINATIONS FOR CALENDAR YEAR 1993		
GENUS	NUMBER OF ACCESSIONS	NUMBER OF SEED LOTS
Brassica [ac]	979	1152
Brassica [ad]	6	8
Crambe [bc]	102	102
Echinochloa [ac]	23	33
Echinochloa [ad]	107	107
Eruca [ac]	149	149
Lepidium [ac]	67	119
Lepidium [ad]	4	4
Panicum [ad]	120	174
Panicum [bc]	50	50
Setaria [ad]	34	61
Setaria [bc]	785	785
Sinapis [ac]	2	2
Sinapis [bc]	30	30
Tridens [ae]	63	63
TOTAL	2522	2840

[a] GRIN entered
[b] awaiting GRIN entry
[c] five year germinations
[d] 1992 regeneration/check variety germinations (most of the 1992 Brassica regeneration germinations were completed in 1992).
[e] new material

Characterization/taxonomy:

During the 1993 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.

Meetings attended:

I attended the Crucifer Crop Advisory Committee meeting (in conjunction with the Crucifer Genetics Workshop) at Saskatoon, Saskatchewan in July

1993. Attendance at the meeting was relatively poor, with only five full members and three ex-officio members. The main points of the meeting were:

The 'need for a CAC-approved descriptor list was emphasized.

The need for Brassica evaluations was discussed.

There was concern that Dr. Paul Williams wasn't receiving USDA funding for maintaining his collections.

Optimal locations for regeneration of the brassicas were discussed.

The next CAC meeting will be held in Corvallis, Oregon in conjunction with the Horticultural Society of America meetings in August 1993.

I attended the Forage and Turf Grass Crop Advisory Committee meeting in Cincinnati, Ohio in November of 1993. This meeting was in conjunction with the ASA-CSSA-SSA meetings. The main points of the meeting were:

Entry of material into the GRIN database before January 29, 1993 was discussed.

The optimal site for Tripsacum regeneration was discussed.

Core collections were discussed.

Publications:

A poster titled Brassicaceae at the North Central Regional Plant Introduction Station was presented at the 1993 Crucifer Genetics Workshop in Saskatoon, Saskatchewan and at the ASA-CSSA-SSA meetings in Cincinnati, OH.

Future Activities:

The 1994 winter/spring seed processing activities will include processing and storing the 1993 grass and Brassicaceae increase.

Five year germinations will be completed on the Panicum collection.

The 1994 field regeneration will include ca. 200 Brassicaceae accessions (ca. 100 wild accessions and ca. 100 domestic accessions) and ca. **50** grass accessions. Thirty-two cages will be used for an experiment involving alternative Brassicaceae pollinators.

We will attempt to complete a CAC approved descriptor list and evaluation priorities for the Brassicaceae collection.

L. Amaranthus, Celosia, Chenapodium, Coronilla, Dalea, Galega, Marina, Melilotus, and Perilla (D. Brenner)

I acknowledge the capable efforts of crew leaders: Bryan Fries and Todd Vens, and crew members: Solomon Abel, Phil Brekke, Eric Johannsen, Scott Madden, and Sam Flomo. During the rainy days of last summer, Ron Schweppe **and** Agbaje Kehinde were temporarily on the crew working on our backlog of uncleaned seeds.

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

Linda Minor and Janae Colvin entered many secondary identifiers and other

data into the GRIN database. They processed approximately 150 pages of notes for GRIN entry.

AMARANTHUS: 3140 accessions

Acquisition and inactivation:

Twenty six accessions were acquired, including twelve advanced lines from Dr. Joshi, in India, and ten wild species, one of which, A. muricatus, is new to the collection.

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

Maintenance and distribution:

1993	#	% of collection
Accessions available for distribution	1445	46
Seed orders	44	NA
Packets distributed	1576	NA
Accessions distributed	657	21
Accessions duplicated at NSSL	554	18
Accessions regenerated in 1993	286	9
Accessions germinated	989	31

Three-hundred harvested accessions await storage before they are made available officially.

This was the most productive year ever at NCRPIS for Amaranthus regenerations; during the second most productive year (1992) included 239 accessions were regenerated. The number of seed orders remained the same as in 1992, but the 1993 total is inflated by one requestor submitting seven separate requests. The total of packets distributed 1,576 is up dramatically from 877 in 1992; part of this surge results from a 314 accession seed order from Hong Kong for evaluating seed starch characteristics.

A distribution of A. pumilus to Canada was prevented by endangered species regulations. Peter Lundeen is resolving the questions about permits so that these distributions may resume.

More greenhouse space was available than in other years because of new greenhouse construction, and because long-term greenhouse assignments allowed efficient back-to-back plantings rather than clearing the greenhouse at the end of assignments. However, as in other years, shortage of greenhouse space was the main limitation to the number of seed increases attempted.

The field plantings grew well despite planting delays due to wet weather

and wet weather after transplanting. The plants were shorter than usual but healthy.

The experimental test of our greenhouse pollen isolation tents was expanded to include four Amaranthus species. The red stem genetic marker will be used to monitor cross-pollination. The space committed to this project this year was equivalent to the space required for 36 seed regenerations.

In 1994 the seeds from this project will be germinated and evaluated.

Eighty-nine accessions with Ames numbers were assigned PI numbers.

Characterization/taxonomy/evaluation:

A characterization system is under revision for use in GRIN. A draft list of descriptors was reviewed by four experts. Comments by two additional experts are expected soon. After further revision and approval by the CAC, the system will be incorporated in GRIN.

One hundred and forty-eight accessions were re-identified. Most of the identifications were based on grow-outs. Although my paperwork is completed many of these re-identifications have not been corrected in GRIN due to the vacancy in the seed-login position. Dr. Joshi, in India, will publish a seed list with approximately 1,000 Amaranthus determinations that we can use to fill in gaps in our records.

We are completing passport information on 268 accessions from Latin America and Nepal. Much of this information is in the form of collector's notes that were placed in the original seed packets. In many cases, we can find latitudes and longitudes from provenance data. When the data are complete, the accessions will receive PI numbers.

Enhancement and/or utilization:

The new male sterile accessions selected here in 1992 were described in a short paper in Legacy. The male steriles were given PI numbers (PI 568125 to 568131) and have already been distributed four times. Hybrids made with them *were* healthy, uniform and had excellent seed set and time of maturity. PI 568127 and 568128 male sterile accessions had especially good resemblance to the cultivar PLAINSMAN. The next steps in commercial development are yield trials with hybrids, and development of a cytoplasmic maintenance system. These next steps will require outside collaboration.

A reduced seed shattering project based on crosses with an accession that has non-circumscissile utricles (PI 572261) has resulted in two non-shattering lineages. Fourteen progenies were studied in 1993 to find the desired segregates. The non-shattering phenotype is physically sturdy, but the genetic stability is unknown, and in one case the plant architecture is very poor. In 1994 small plantings will be studied for genetic stability.

Dr. David Baltensperger of the University of Nebraska, Scottsbluff is also working with these enhancement projects from seeds that we sent him.

Promising accessions:

Ames 21046 to 21057 are the most advanced material from Dr. Joshi's breeding program in India. These are probably unadapted to our climate but could be very useful for the tropics and sub-tropics.

Plans:

I will edit the forth issue of Legacy which will be published in the spring of 1994.

CELOSIA 19 accessions

Acquisition: None

Maintenance and distribution:

1993	#	% of total number of accessions
Accessions available for distribution	5	26
Seed orders	1	NA
Packets distributed	4	NA
Accessions distributed	4	47
Accessions duplicated at NSSL	0	0
Accessions regenerated in 1992	0	0
Accessions germinated	6	32

Seven harvested accessions await storing before they are made available officially.

Characterization/taxonomy/evaluation:

Dr. T Badra published a chapter on Celosia germplasm for leafy vegetable use (Badra, T. 1993. Lagos spinach (Celosia sp.) in: Williams, J. T. (ed.). Pulses and Vegetables, Chapman and Ball, London,) This paper declares an urgent need to establish collections of "primary diversity" (Badra 1993), rather than the curiosities in existing collections,

Plans:

Several accessions will be backed-up at NSSL at the time of the next routine storing.

Viable Ames-numbered accessions should be assigned PI numbers.

CHENOPODIUM (144 accessions)

Acquisition: Eleven accessions were acquired, including nine cultivated accessions from India, and accessions from Argentina, and Chile. The Argentinian and Chilean accessions are potential new sources of adaptation to temperate conditions.

Maintenance and distribution:

1993	#	% of total number of accessions
Accessions available for distribution	25	17
Seed orders	8	NA
Packets distributed	67	NA
Accessions distributed	38	26
Accessions duplicated at, NSSL	23	15
Accessions regenerated in 1992	28	19
Accessions germinated	22	15

Twenty-three harvests await storing before they are made available officially.

Of the 28 accessions planted for regeneration six failed to germinate, and should be inactivated. I estimate that 20 accessions have only dead seed and will eventually be inactivated. If they germinate, Chenopodium accessions can be regenerated consistently if they are grown in the cool part of the year, and provided with good lighting, and short daylength.

Characterization/taxonomy/evaluation: Dr. H. Wilson, at Texas A&M University will identify four accessions. He and I discussed these identifications by telephone in December 1993.

CORGNILLA, DALEA, GALEGA, and MARINA (162 accessions)

Acquisition:

Six accessions of wild species were acquired.

Maintenance and distribution:

1993	#	% of total number of accessions
Accessions available for distribution	56	35
Seed orders	8	NA
Packets distributed	13	NA
Accessions distributed	9	6

Accessions duplicated at NSSL	3	2
Accessions regenerated in 1993	12	7
Accessions germinated	4	2

The long-term legume planting was terminated after this year's harvest. we harvested caged honeybee pollinated Coronilla varia seeds from 5 of 9 cages. I think that the failures were due to S allele incompatibilities; such difficulties should therefore be reduced in the future with large population sizes. Unfortunately many of our original seed samples are small.

Pollinations of the early Coronilla varia flowers were successful, but the late flowers set seed poorly and are too late for seed maturity.

Four accessions of Dalea enneandra yielded few seeds for the second consecutive year of open pollination. A planting of Galega orientalis yielded many seeds probably because of low leafhopper insect presence this year.

Plans:

Many accessions will be backed-up at NSSL during the next routine storing.

We will start a new long-term Coronilla varia field planting of 35 accessions in 1994 for harvesting in 1995.

MELILOTUS (829 accessions)

Acquisition:

Four new accessions, two of which were transfered from NE-9.

Maintenance and distribution:

1993	*#*	% of total number of accessions
Accessions available for distribution	480	58
Seed orders	6	NA
Packets distributed	191	NA
Accessions distributed	186	22
Accessions duplicated at NSSL	227	27

Accessions regenerated in 1993	44	5
Accessions germinated	0	0

Ninety-three harvested accessions from earlier years await storing before they are made available, although many have already been distributed informally.

Of the accessions regenerating in 1993, 43 were planted in October for harvests in the summer of 1994. The size of this planting was limited by the availability of fall-winter greenhouse space. One accession was harvested in the summer of 1993.

Characterization/taxonomy/evaluation:

The Clover and Special Purpose Forage Legume CAC chair, Dr. K. Quesenberry (University of Florida), has asked me to select a Melilotus core subset that composes 10% of the collection. I will work with Dr. Richard Smith (University of Wisconsin) on this project.

Discussions at the CAC meeting in Cincinnati emphasized the need to replace our open-pollinated distribution seed lots with control-pollinated seed lots. Our practice of greenhouse (self) pollinating Melilotus album, was endorsed by the CAC even though it could cause harmful levels of inbreeding.

Dr. M. Rumbaugh has characterized most of the Melilotus collection in a CAC-supported project. His data have arrived at the NCRPIS and will be entered in GRIN.

Dr. Richard Smith is working on a system for characterizing Melilotus.

Plans:

Passport data, especially provenances, should be entered in GRIN. This will facilitate selection of a core subset and assignment of PI numbers to Ames numbers.

PERILLA (19 accessions)

Acquisition: Two accessions were acquired: both are advanced lines from the breeding program of Dr. Bong Ho Lee, of Suwon, Korea.

Maintenance and distribution:

1993	*#*	% of total number of accessions
Accessions available for distribution	15	78
Seed orders	2	NA
Packets distributed	17	NA
Accessions distributed	16	84
Accessions duplicated at NSSL	12	63
Accessions regenerated in 1991	2	11
Accessions germinated	1	5

Three harvested accessions await storing before they are made availalbe officially.

Plans:

The National Seed Storage Lab will perform a routine short-term test of Perilla seed survival in liquid nitrogen storage. Storage in liquid nitrogen might slow the rapid deterioration in perilla seeds under conventional storage.

Miscellaneous progress:

I completed STAT 401 Statistical Methods for Research Workers during the fall semester at Iowa State University.

I edited the 1993 issue of Legacy, the official newsletter of the Amaranth Institute.

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

Professional meetings attended:

NPGS Research Workshop, and NC-7 regional technical meeting, Fort Collins, Colorado, June 29-30, 1993

Clover and Special Purpose Legume, Crop Advisory Committee meetings with the American Society of Agronomy, Cincinnati, Ohio, November 7-12, 1993

Amaranth Institute Annual Meeting, Ames, Iowa, August 19-20, 1993

New Crops Crop Advisory Committee meeting with The Association for the Advancement of Industrial Crops, New Orleans, Louisiana, September 25-30, 1993.

Publications and presentations:

Brenner, D. 1993. Planting black seeds. Legacy 6(1):11

Brenner, D. 1993. Hybrid seeds for increased amaranth grain yield. Legacy 6(1):9-11.

The above paper was translated and reprinted in Argentina with my list of amaranth seed sources as:

Brenner, D. 1993. Semilla hibrida incrementar el rendimiento del amaranto. Amarantos Novedades e Informaciones 14:9-10.

Brenner, D. 1993. Perilla: botany, uses and genetic resources. in: Janick, J. and Simon, J. (eds.). New Crops. John Wiley and Sons, Inc. New York.

Williams, J.T. and D. Brenner. Grain amaranths (Amaranthus species). written for publication in: Williams, J.T. (ed.) Cereals and Pseudocereals.

Brenner, D. 1993. Amaranth seed regeneration in a greenhouse. Presentation at: NPGS Research Workshop, June 29-30, Fort Collins, Colorado.

Tours:

August 1, 1993. Led two tours of the Ames High School Prairie (Nature Preserve) for the AIBS annual meeting.

August 19, 1993. Led a tour of the NCRPIS for the Amaranth Institute annual meeting.

I made presentations about the Amaranth project at the NCRPIS Program Review and at the NC-7 Regional Technical Advisory Committee meeting. I also made presentations at several tours of the NCRPIS.

M. Sunflower and Miscellaneous asters (M. Brothers)

Acquisition:

New accessions:

In 1993, ***24*** new Helianthus accessions were received at the NCRPIS and logged into the GRIN database. In addition, we received 185 accessions of miscellaneous asters (18 genera); 183 of these were Vernonia accessions.

Significant progress--One hundred forty accessions acquired in 1991 from Gerald Seiler's Great Plains collection trip have been cleaned, inventoried, and stored. One hundred nineteen accessions with achene quantities greater than 2000 are available for distribution.

*Maintenance **and distribution:***

#/% available for distribution--The Helianthus collection consists of 1445 cultivated H. annuus accessions, 2092 accessions of wild annual Helianthus species, and 71 accessions of perennial Helianthus species for a total of 3608 accessions. Six hundred sixty-four (46%) cultivated H. annuus accessions, 404 (19%) wild annual Helianthus accessions and 47 (66%) perennial Helianthus accessions are available for distribution. Overall, 31% of the collection (1115 of the 3608 accessions) is available for distribution to the scientific community. A total of 2318 accessions (64%) have PI numbers.

Twenty-seven of the 267 miscellaneous asters (10%) are available for distribution. Fifty-three accessions (20%) have PI numbers.

#/% distributed--We distributed 2300 Helianthus achene packets representing 1236 accessions or 35% of the collection.

Thirty-six packets of Vernonia were distributed. This represents 9% of the miscellaneous asters (24 of the 267 accessions).

#/% duplicated at NSSL--Sixty-three Helianthus accessions were sent to NSSL; 25% of the total collection is now duplicated there.

Twenty-one of the miscellaneous asters (8%) are duplicated at NSSL. No additional accessions were sent in 1993.

#/% regenerated--In 1993, hand-pollinated, field increases were attempted on 59 Cultivated H. annuus accessions including three accessions regenerated at Woodland, California by Pioneer Hi-Bred. Successful increases were obtained from 55 accessions. Twenty-four wild annual accessions and 11 perennial accessions of various Helianthus species were caged for controlled pollinations using honey bees. Achenes were harvested from 18 of the wild annual accessions and 7 of the perennial accessions. In addition, tubers from 27 H. tuberosus were harvested and are available for distribution. Approximately 3% of the total Helianthus collection was regenerated in 1993.

None of the miscellaneous asters were regenerated in 1993.

#/% tested for germinability/viability--No germination testing was conducted in 1993.

Significant progress--The entire Helianthus collection was inventaried. Seven hundred nine (709) accessions are scheduled for the germination testing conducted regularly at 5-year intervals. The status of the perennial Helianthus field collection was carefully evaluated by NCRPIS staff, Dr. Gerald Seiler, and Dr. Edward Schilling. A curatorial program for the management of the perennial field collection has been devised and is now being implemented.

Characterization/taxonomy:

#/% characterized/classified--Of the 3608 Helianthus accessions, 3267 (91%) have a country of origin specified on GRIN, 3139 (87%) have an alternate id, 1606 (45%) have additional location data, and 545 (15%) have collector, developer, or institute information. Plant and achene characterization data were recorded for all accessions increased in 1993.

Two hundred fifty-eight (258; 97%) of the 267 miscellaneous asters have a country of origin specified on GRIN, 227 (85%) accessions have an alternate id, 191 (72%) accessions have additional location data and 172 (64%) accessions have collector, developer, or institute information,

Significant progress--Characterization data were completed on the 1991 Helianthus increases. Tuber characterization notes were compiled for 27 H. tuberosus accessions. The tubers were also photographed for a permanent record of each accession. Taxonomic re-identifications were completed on 11 perennial Helianthus accessions.

Evaluation:

Helianthus evaluation data for rust tolerance/resistance, oil and fatty acid content, and Orobanche tolerance/resistance have been received at the NCRPIS.

No evaluation data were received for the miscellaneous asters.

Enhancement:

There were no enhancement programs undertaken at the NCRPIS for the Helianthus or the miscellaneous aster collections.

Support personnel:

Significant accomplishments--The Helianthus biological aide, Irv Larsen, attended a training session on pesticide application and the seminar "How to supervise people." Irv also enrolled in General Botany 205 at Iowa State University.

Meetings attended:

The National Plant Germplasm System Research Workshop and Regional Technical Advisory Committee meeting; June 29-30, 1993, Fort Collins, Colorado.

Met informally with scientists at the Oilseeds Research Unit Northern Crop Science Lab; August 3-6,1993, Fargo, North Dakota.

Presentations or seminars:

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

Presented an overview of the Helianthus collection to the joint USDA/ARS-SAES Directors review committee.

Publications:

Brothers, M.E. and J.D. Kelly. 1993. Allozyme evaluation of upright common bean genotypes. Euphytica 67:65-70.

Brothers, M.E. and J.D. Kelly. 1993. Interrelationship of plant architecture and yield components in the pinto bean ideotype. Crop Sci. 33:1234-1238.

Future plans:

Conduct hand-pollinated increases of 100 cultivated H. annuus accessions and controlled-pollinated, caged increases of 50 wild annual accessions and 15 perennial accessions of various Helianthus species.

Continue implementing the perennial field collection management plan.

Begin conducting genetic marker characterization of Helianthus germplasm in the spring of 1994.

Participate in a Helianthus collection trip throughout Saskatchewan and Manitoba, Canada (September 1994)

N. 1993 Seed Storage report (D. Kovach)

Abstract:

Many changes occurred in Seed Storage during 1993. The position of Seed Technician was filled in May 1993. Also, an increased number of student workers were assigned to Seed Storage. This helped increase the number of accessions stored at Ames and backed up at NSSL. Several mechanical aids were designed and fabricated to help with processing perfect samples for Zea mays and for storing extra supplies of seed. With end-of-year money we were able to purchase equipment for testing seed moisture contents and conduct experiments on seed dormancy. Due to the backlog of accessions that need to be stored at NCRPIS, limited time was spent on seed research. However, some progress has been made on delineating the biology of Cuphea viscossissima seeds. Plans for the renovation of the seed processing area were formulated and submitted to Iowa State University architectural engineers. Future goals for Seed Storage are discussed.

1993 Accomplishments:

The following tables summarize the work accomplished by Seed Storage personnel with respect to order processing, and backing up accessions at NSSL. Unfortunately, there was no tracking system for the amount of seed stored at Ames for 1993. We estimate that ≈1,500 to 2,000 accessions were stored here at Ames. We are currently devising a system of tracking this parameter for 1994. Our goal in storing seed is to alleviate as much curator work as possible. Thus, the process of storing seed has changed from previous years. In addition, a complete inventory of the Brassica collection was done this year.

Table 1. Seed Orders		
Category	Number of Orders	Number of Packets
Amaranthus	49	1,587
Beta	23	711
Brassica	22	3,533
Chenopodium	10	69
Cucurbitaceae	72	5,256
Cuphea	12	181
Daucus	15	271
Grasses	25	843
Helianthus	65	2,265
Legumes	12	219
Miscellaneous	108	666
Zea	130	2,869
TOTAL	543	18,470

Table 2. Backed up at NSSL (or transferred)				
Category	Transferred	Perfect Samples (duplicate of bulks)	Bulk Amounts	Total Number of Individual Accessions
Beta				478
Brassica				237
Cuphea				128
Helianthus				63
Linum	92			92
Ornamentals				33
Spinacia				66
Zea		467	1,258	1,258
TOTAL				2,355

Backlog Status and Plan of Action

The backlog of two site crops are major concerns of seed storage. Previous estimates of the time required to 'catch up' with the backlog of Zea mays and Amaranthus fell far short of the actual time needed. For this we apologize. We estimate we have processed approximately 1/3 of the backlog of maize and 1/4 of the backlog of amaranth. How these backlogs occurred is not fully understood by us, but our goal is to prevent this from re-occurring. A 'backlog-of-sorts' also occurs with some Setaria seeds. This seed is currently under quarantine and also has questionable identifications. This crop is given a low priority, due not only to these problems, but also because we are not sure if it will remain at NCRPIS.

We continue to give high priority to the maize collection. Two people are currently working on storing maize. One person works on amaranth storage as time allows. We also give attention to the other site crops as needed. We do not want to devote too much time to one crop and thereby create backlogs in the other site crops. Our hope now is to be 'current' by the end of summer.

The issue of extra seed and where to store it was resolved this year. Extra seed will be stored in hermetically sealed foil-lined bags. These bags will be placed in cardboard boxes and placed on the top shelves in the south cold room. These shelves are not in use, due to the moisture dripping from the ceiling unit.

Seed Technology

This year Seed Storage assisted the processing of Zea mays by developing an aid to perfect sampling (see Figure 1). One prototype and four modified units were made. This provided for faster and more accurate perfect sampling. These units can also be used for other 'crops' if needed; e.g. Helianthus. Future plans include developing a more automated unit for perfect sampling,

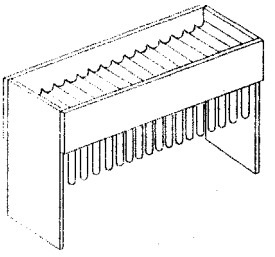


Figure 1. Perfect Sampler. Distributes seed to 16 packets.

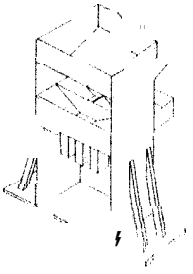


Figure 2. Seed Divider. Distributes seed to one, two, or three extra bags.

Seed Storage

also developed a mechanical aid to distributing extra seed into additional storage bags (see Figure 2). This was specifically designed to help Seed Storage personnel. In essence, it is a special application seed divider. We estimate a 50% time savings for depositing seed into extra storage bags.

Seed Research

Seeds of Cuphea viscossissima exhibit a deep innate dormancy. Preliminary studies were conducted this year on seed harvested in 1989. Studies must be considered preliminary because of the age of the seed. However, valuable information was obtained for testing freshly harvested seed. With this in mind, 1989 seeds, released from dormancy, were grown in the greenhouse to provide experimental seed. Twenty-four plants produced approximately 20,000 seeds. Experiments are proceeding *on* this freshly-harvested seed. Time constraints due to the backlog of seeds needing to be stored have limited the number of experiments conducted so far. Preliminary results suggests that dormant Cuphea viscossissima seeds respond well to cold stratification treatments, alternating temperatures with light, and the possibilities of other treatments that need further verification.

Lab Renovation and Equipment Procurement

With end-of-year money, Seed Storage was able to purchase three seed germinators, one mechanical drying oven, one auto desiccator, and a quality stereoscope. These are currently being used even though some are stored in temporary locations. The equipment will all be situated in Seed Storage after the laboratory is renovated. Renovation plans were submitted to Iowa State University architectural engineers in the last quarter of 1993. Upon completion of the architects' final designs, work will commence on making the lab space more efficient, assuming funds are available. Floor plans are shown in Figure 3.

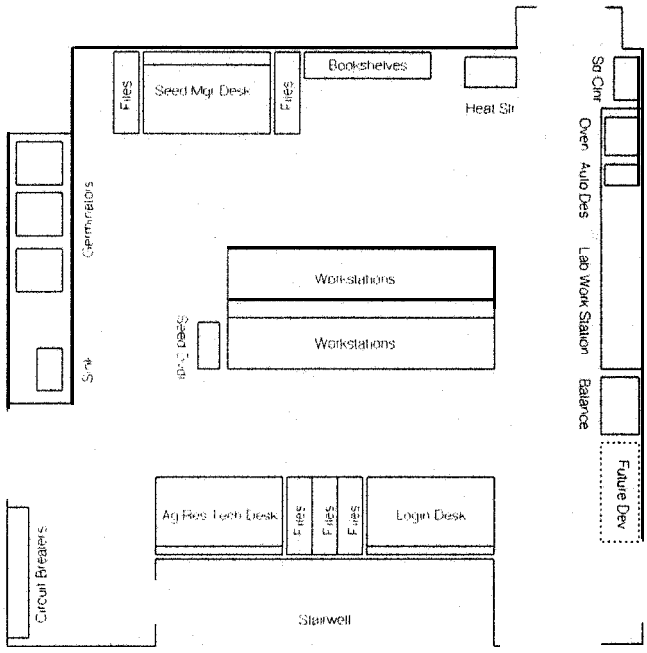


Figure 3. Proposed floor plan for the Seed Storage laboratory.

Future Outlook

Future plans for the NCRPIS involve the transfer of the Login position from Computing to Seed Storage. We also will attempt to re-classify the Biological Technician (GS-4/5) position to a GS-5/9 Agricultural Research Technician. This will more accurately reflect the work required by the position.

One of the goals of Seed Storage is to become more helpful to curators in the area of seed germination and seed health. When the backlog of seed storing is eliminated, more research into seed dormancy will be tackled by the Seed Storage manager. Other areas of research to be investigated are collection recovery, desiccation tolerance, and the development of seed

vigor tests. The matter of seed health will require the additional element of seed pathology. We propose that this area will be the responsibility of the new Agricultural Research Technician position (see above paragraph). A graphical view of the proposed changes is shown in Figure 4.

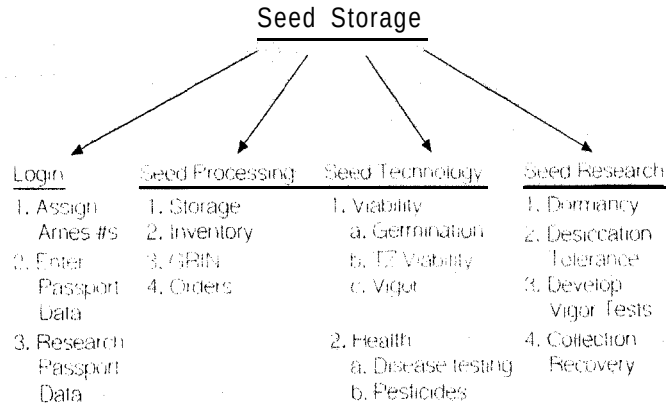


Figure 4. Proposed organizational structure of Seed Storage.