NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION
NC-7 ANNUAL REPORT, JANUARY 1 - DECEMBER 31, 1992

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, Secy.	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	*Z. Wicks
6.	Minnesota	*H. Pellett, Chmn.	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	Vacant
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.	Biological Research Technician	L. Burke
	Biological Aide	J. Colvin
	Biological Aide	J. Blankman
	Biological Aide	Vacant
	Biological Aide	M. Young
	Biological Aide	I. Larsen

2. Iowa State University Staff

a.	Farm Superintendent	L. Lockhart
	(1) Field-Lab Technician III	M. Czajkowski
	(2) Field-Lab Technician II	J. Scheurmann

	(3) Clerk Typist II	L. Minor
b.	Computer Coordinator (GRIN) & Corn Curator	M. Millard
	(1) Assistant Computer Coordinator (GRIN)	P. Lundeen
	(2) Field-Lab Technician II	T. Ladjahasan
c.	Research Associate II (Plant Pathology)	C. Block
d.	Curator I (Brassica, Grasses)	R. Luhman
e.	Curator I (Vegetables)	K. Reitsma
f.	Curator I (Sunflowers)	M. Brothers
g.	Curator I (Amaranth)	D. Brenner

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

Personnel changes:

Resignations: David Baker, Field-Laboratory Technician II, was terminated during his probationary period. Carrie Dixon, Biological Aide, resigned to take a higher paying job at the National Animal Disease Center.

New hires: Becky Rasmussen was hired as part-time Office Automation Clerk. Naomi Harrold was hired as Agricultural Research Technician for the Horticulture program. Irvin Larsen and Maurianna Young were hired as Biological Aides. Jerry Scheuerman was hired as Field-Laboratory Technician II. Mark Widrlechner, Janae Colvin, Jeanne Edwards, Michael Czajkowski and Jeffrey Blankman were promoted.

Hamadi Ben-Salah, research assistant in the Cuphea program, received his Ph. D. in Plant Breeding. Richard Wilson, Research Entomologist, recruited and directed Kim Steed, a USDA/ARS research apprentice.

Construction:

The last stage of the cold-room storage shelving project was completed.

Construction of the bee overwintering facility was completed, and bees were placed in the facility to test its efficacy.

(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:

Nearly 2100 germplasm accessions were acquired by the NCRPIS during 1992 (details listed under the curators' reports).

Significant acquisitions included:

A collection of more than 1000 accessions of Brassica assembled by P. Knowles was acquired from the Crucifer Genetics Cooperative (P. Williams, University of Wisconsin).

A comprehensive collection of Mexican teosinte and maize races was acquired from Prof. H. Iltis, University of Wisconsin.

Maintenance:

More than 40,000 accessions representing more than 309 genera and 1300 species are now maintained at the NCRPIS.

Regeneration:

More than 2300 accessions were cultivated for seed increase at the NCRPIS or at tropical sites.

Five hundred and ninety-six accessions were regenerated using honey bees in cages. Much of this effort was devoted to Cucumis.

Fifty-one accessions were regenerated via both fly and bee pollination.

Distribution:

More than 15,000 seed packets were distributed to researchers in the U. S. (ca. 75% of the total) and abroad (the remaining 25%).

Sixty vegetative cuttings were distributed. More than 500 individual landscape plants were distributed for long-term evaluation at 29 sites in the North Central Region. The number of ornamental accessions distributed this year ranked a close second to 1991's record level.

Testing germplasm's germination, viability, and health:

More than 1,800 accessions were assayed for their germination/viability percentages.

The disease infecting some NCRPIS melon accessions was identified as a non-fluorescent pseudomonad bacterium which can be transmitted via seeds. Efforts to characterize the disease further continue.

Inventory and data entry:

The entire Cuphea, Daucus, and Cucumis melo collection was inventoried.

Seed lists for maize and sunflowers were produced and distributed.

Characterization:

Morphological characterization data were recorded for maize, Brassica, millets, carrots, amaranths, cucurbits, and other crops. With amaranths, characterization data are helping with de-activating redundant samples.

The karyotypes for the genomes of Cuphea lanceolata and C. viscossisima were determined.

The utility of particular morphological characters for elucidating infraracial relationships in maize from the southwestern U. S./northwestern Mexico and the northern U. S. is under study in a joint project with University of North Dakota and University of Wisconsin.

Evaluation:

Evaluations of tissue-culture induced R_1 Cuphea families showed that they contain higher quantities of lauric, capric, and caprylic acid than did their parental stocks.

Accessions of Agastache spp. were evaluated for host-plant resistance to Verticillium.

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

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

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

More than 200 accessions of cultivated sunflower were evaluated for host-plant resistance to Alternaria spp.

Research continued with seed transmission and disease etiology of Erwinia stewartii, the causal agent for Stewart's wilt. This disease was especially widespread in Iowa during 1992 because of the mild winter and cool, wet summer.

Enhancement:

Populations of two mint genera are being selected as superior nectar sources for bees.

More than 500 F_3 or F_4 (Cuphea viscosissima X C. lanceolata) derived lines were selected for autofertility and non-dormancy. These lines were subject to additional testing and selection.

The selection program for non-shattering amaranth hybrids continued. Several potential sources of pollen sterility in elite amaranth germplasm were identified.

(The cases listed under "Utilization" were selected from among **the Accession Performance Reports received at the NCRPIS during 1992.)**

Utilization:

D. Davis, University of Minnesota, St. Paul, ***MN,*** evaluated maize accessions for host-plant resistance to European corn borer.

T. Foley, **Holden's** Foundation Seeds, Inc., Williamsburg, IA, evaluated traditional North American maize **races** for their agronomic utility.

S. Graham, Kent State University, Kent, OH, determined the chromosome number of cultivated Cuphea ignea, and hybridized this species with related **taxa.**

T. Gross, North Dakota State University, Fargo, ND, screened accessions of

Helianthus spp. for host-plant resistance to sunflower beetle feeding.

B. Haglan, Norwalk, IA , planted traditional North American maize races as part of a demonstration garden of plants grown by Native Americans.

E. Hammond, Iowa State University, Ames, IA, studied the vernolic acid biochemical pathway from Vernonia antihelminthica accessions.

J. Hanzel, North Dakota State University, Fargo, ND, assayed accessions of Crambe spp. for glucosinolate content.

Y. Jin, North Dakota State University, Fargo, ND, screened Echinochloa accessions for host-plant resistance to rust species.

P. Kaufman, University of Michigan, Ann Arbor, MI, used accessions of Panicum miliaceum to study gravitropic response mechanisms in cereals.

R. Klepper, Trans Agra International, Storm Lake, IA, evaluated the agronomic merit of Amaranthus caudatus accessions.

G. Pollak, Fansler Genetics, Guthrie Center, IA, evaluated South American maize accessions for their agronomic merit.

L. Pollak, USDA/ARS, Ames, IA, evaluated South American, West Indian, and North American maize accessions for their agronomic merit.

H. Quemada, Asgrow/Upjohn, Kalamazoo, MI, evaluated the horticultural merit of transgenic C. pepo var. pepo X C. pepo var. texana hybrids (the C. pepo var. pepo parent contained viral coat protein genes).

P. Simon, USDA/ARS, Madison, WI, screened Daucus accessions for host-plant resistance to nematodes,

F. Stoenescu, ICI Seeds, Inc., Kindred, ND, assayed Helianthus accessions for host-plant resistance to Sclerotinia.

B. Stiles, North Dakota State University, Fargo, ND, characterized patterns of volatile terpenes in Helianthus spp. accessions

D. Skinner, USDA/ARS, Manhattan, KS screened Coronilla and Melilotus spp. as part of a broad-based study of alfalfa rust's host range.

V. INDIVIDUAL PROGRESS REPORTS

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

Acquisition:

New accessions: We acquired three Cuphea accessions in 1992.

Significant progress: We submitted a plant exploration proposal to NPGS for collecting C. lanceolata and other Cuphea species in Mexico. The proposal was funded and this plant exploration, to be conducted in September and October 1993, will be a joint effort with Dr. Widrlechner, NCRPIS Horticulturist, to collect

Zinnia and Sanvitalia species from the same region.

Maintenance and distribution:

Number and percentage of total Cuphea accessions:

1992	# of accessions	% of accessions in collection
Available	89	11
Distributed	142	17
Duplicated at NSSL	145	17
Regenerated	120	14
Germinated	173	21

Accessions grown for seed increase in 1992; seed being processed at the time of this report.

Distribution of C. lanceolata and C. viscosissima

1992	# of accessions	# of packets
C. lanceolata	23	27
C. viscosissima	41	47
Other species	78	100
Total	142	174

Significant progress: We first tried to regenerate germplasm from the 1989 Brazilian plant exploration this year. Certain accessions did not germinate well. Seed is being processed for storage at present; therefore, the exact number of accessions successfully regenerated is unknown.

Characterization/taxonomy:

Characterization data for the regenerated accessions are being recorded and will be entered into GRIN. The accessions were photographed and the images were filed.

Karyotypes of C. lanceolata and C. viscosissima were described.

Evaluation:

The R, families from calli induced from immature embryos were placed in field trials during 1991 to evaluate somaclonally-induced variation. Certain somaclones had significantly greater percent seed germination, leaf area, plant height, lauric acid, capric acid, and caprylic acid, than did their parents.

Thirty-four C. viscosissima accessions and their F_2 progeny were planted at the NCRPIS in order to evaluate the frequency of outcrossing. Nuclear DNA was extracted and RAPD (random amplified polymorphic DNA) polymorphisms were resolved. K. Ritland's[1] software will serve to estimate outcrossing and the mating system.

Fifteen C. viscosissima accessions with wild type flower and stem color were crossed with a mutant accession (PI 534750) with pale flower and stem color. The S_1 and S_2 progeny from these crosses were planted at Ames during 1992. The number of wild type and mutant plants were counted, and chi square tests were calculated for the S_2 plants. All S_1 plants were wild type, and the S_2 included 237 wild type plants and 88 mutant plants (chi square = 0.748). No cross-over plants were found. The mutant gene is recessive, simply inherited, and apparently pleiotropic for pale stems and flowers.

Enhancement:

Four improved cultivars developed by S. Knapp's program (two C. lanceolata, and two C. viscosissima X C. lanceolata hybrids) were increased in cooperation with Oregon State University so they can be released in 1993.

A cultivar (IH 50) from Dr. Knapp's program at Oregon State University had a high rate of emergence and seedling vigor in 1992. It is being crossed with other cultivars to initiate selection for improved emergence and seedling vigor.

Nearly 530 F_4 or F_5 (C. viscosissima X C. lanceolata) derived lines were selected for auto-fertility and nondormancy. Seed is being harvested from these lines for additional selection and testing for development of improved germplasm.

Meetings attended:

Iowa Academy of Science, Cedar Rapids, IA.

Leopold Center for Sustainable Agriculture Conference, Ames.

NC-7 Regional Technical Advisory Committee, Ames.

International Crop Science Congress, Ames.

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[1]Ritland, K. 1990. A series of FORTRAN computer programs for estimating plant mating systems. J. Hered. 81:235-237.

Annual Cuphea project review, Oregon State University, Corvallis.

Association for the Advancement of Industrial Crops, St. Louis, MO.

New Crops Crop Advisory Committee, St. Louis, MO.

American Society of Agronomy and Crop Science Society of America, Minneapolis, MN.

Plant Genome I: International Conference on the Plant Genome. San Diego, CA.

Numerous Plant Breeding Seminars, Crop Improvement Committee meetings, and Outlying Research Station meetings, Agronomy Department, ISU.

Location EEO Committee meetings, NADC.

Presentations or seminars:

Ben-Salah, H., and W.W. Roath 1992. Somaclonal variation in Cuphea viscosissima Jacq. Agron Abstr. ASA, Madison, WI, p. 200.

Chen, W., and W.W. Roath. 1992. Computer enhancement of Giemsa C-banded karyotype of Cuphea lanceolata Aiton and Cuphea viscosissima Jacq. Agron. Abstr. ASA, Madison, WI, p. 201.

Chen, W., W.W. Roath, and B. Nikolau. 1992. A rapid protocol for isolating DNA from lyophilized tissue of two Cuphea species. Program Abstr. 104th Session IAS, Cedar Falls, IA 7:3.

Roath, W.W. 1992. Exploration for Cuphea germplasm. Agron. Abstr. ASA, Madison, WI, p. 205.

Roath, W.W. 1992. Cuphea? Iowa Chapter ASA, Ames.

Roath, W.W. 1992. Cuphea research in the United States. Building Bridges: Coop. Res. Educ. Iowa Agric. Conf. Proc. Leopold Center Sustainable Agric. :89.

Roath, W.W., and M.P. Widrlechner 1992. Building a Cuphea collection. International Crop Science Congress Abstr. No. 97 :88.

Publications:

Ben-Salah, H. 1992. Tissue culture and somaclonal variation of Cuphea viscosissima Jacq. accessions. Ph.D. dissert. Iowa State University, Ames.

Ramos, L.C.S., W.W. Roath, T.B. Cavalcanti, and J.H. Kirkbride. 1992. Cuphea (Lythraceae) Descriptors. Staff Report Iowa State University Agric. Exp. Stn., Ames, IA.

Roath, W.W., M.P. Widrlechner, and J.H. Kirkbride. 1993. Collecting Cuphea in Brazil, Mexico, and the United States. Submitted to Plant Genetic Resources Newsletter. Accepted 2-18-93.

Roath, W.W., M.P. Widrlechner, and R. Kleiman. 1992. Morphological and agronomic variability in Cuphea viscosissima Jacq. Indust. Crops Prod. 1:5-10.

Widrlechner, M.P., R.L. Clark, W.W. Roath, and R.L. Wilson. 1992. An analysis of the literature of ex situ germplasm preservation. Plant Genet. Newsl. 88/89:31-36.

Wilson, R.L., and W.W. Roath. 1992. Potential of three lepidopteran species as pests and three hymenopteran species as pollinators of Cuphea. J. Kan. Entomol. Soc. 65:316-320.

Publications in review:

Ben-Salah, H., W.W. Roath, and R.C. Shoemaker. 1993. Callus growth and plantlet regeneration of Cuphea viscosissima Jacq. accessions. Submitted to Euphytica.

Other items:

Visiting scientists

Dr. A. Gathman spent 2 months this past summer working in the molecular marker lab. He initiated the mating system research with C. viscosissima.

Graduate students

Dr. Ben-Salah completed his Ph.D. program. We are in the process of publishing the information included in his dissertation. Somaclones with improved'characteristics that Dr. Ben-Salah helped to develop are being incorporated into the cultivar improvement program.

Mr. Chen has characterized the karyotype for C. lanceolata and C. viscosissima. He is continuing work on determining the mating system for C. viscosissima, and developing fertile progeny from the C. viscosissima X C. lutea hybrid.

Conclusions:

The Cuphea project's current objectives are:

Completing a comprehensive ex situ collection of Cuphea germplasm.

Continuing Cuphea characterization, evaluation, and enhancement.

Identifying and elucidating the biosynthetic pathways and the genetic regulation of the biosynthesis and deposition of medium chain-length fatty acids in Cuphea.

Coordinating the ARS effort to domesticate Cuphea.

Strengths and weaknesses:

Strengths

The program's technician and two graduate research assistants have provided invaluable high-quality technical assistance. The addition of a Biological Aide in the molecular marker lab may also enhance the project's productivity. Additional strengths include 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 can be accomplished efficiently. The cooperative work with Dr. Knapp at OSU provides an additional source of information and germplasm so that progress can proceed at an even greater pace.

Weaknesses

The primary programmatic weakness is the continued erosion of financial support. This project's funding has not been increased since it began seven years ago, so it has had to compensate for wage and price increases while simultaneously increasing productivity. Additional greenhouse space is required because plants are crowded so closely that seeds shed by one plant may fall in another plant's pot. The decision to terminate the USDA/ARS and Oregon State University Specific Cooperative Agreement at the end of 1993 is, in my opinion, rather premature. Taking into account our germplasm and that of Dr. Knapp, we may be able to commercialize Cuphea within a rather short time. Shatter resistance, and increased emergence and seedling vigor has been identified in OSU material, The means of increasing lauric acid in the C. viscosissima X C. lanceolata hybrid are within the realms of existing technology. These-factors must simply be assembled into an improved cultivar for commercial release. In my opinion, this could be accomplished within three to five years. Terminating the ARS/OSU Specific Cooperative Agreement program and/or not renewing the Cuphea CRIS will only delay the successful completion of this project.

Plans:

The planning for collecting Cuphea, Sanvitalia, and Zinnia in northern Mexico continue. We are in the process of securing licenses to conduct the expedition.

Increase, characterization, and evaluation of the self-pollinated species from the Brazilian collection will continue in 1993, when approximately 100 accessions will be grown.

We will concentrate on the C. viscosissima X C. lanceolata hybrids during the next two years, with the goal of releasing in the fall of 1994 the ten best Midwest-adapted germplasm lines derived from this hybrid. The plan for accomplishing this follows:

1992-93 Greenhouse: 200-300 single-seed descent lines will be grown for 3-4 cycles to select plants homozygous for non-dormancy and autogamy.

1993 Field: Ten-seed hills will be planted in two replications, two locations to select for emergence, yield and oil content.

1994 Field: The top 50% of the remaining lines will be grown from bulked seed from the two 1993 locations in four replication - two location yield trials. Plots will be 1 m x 6 m to increase the number of seeds. Yield and oil content will be assayed and the best 10 lines selected for germplasm release.

Indehiscent placentae and improved seedling emergence are being crossed into improved cultivars. Selection for nondormancy, auto-fertility, and indehiscent placentae will occur during 1493-94 in the greenhouse. Improved emergence will be selected from 1994 field-grown cultivars.

The following studies of fatty acid biosynthesis are planned:

Secure fertile C. viscosissima X C. lutea and/or C. lanceolata X C. lutea hybrids by backcrossing and/or chromosome doubling.

Construct c. lutea and c. viscosissima genomic libraries in plasmid or lamda vectors.

Identify low copy number Cuphea genomic fragment from genomic libraries.

Isolate genomic DNA from the hybrid populations from item 1 above.

Genetic analysis of RFLP linkages with capric and lauric acid loci.

B. Entomology (R. Wilson)

Progress:

Field

Corn - Corn earworm evaluation: Two hundred eighteen maize accessions were evaluated for silk feeding resistance. Fresh silks were collected, dried, milled, and incorporated into a laboratory diet. Data are not complete at this time. Two maize races, 'Confite Puntiagudo'(21 accessions) and 'Dulcillo de Noroeste' (10 accessions) were evaluated in Ames, IA, Tifton, GA, and Hermiston, OR for resistance to corn earworm. A few of the accessions exhibited resistance at all three locations.

European corn borer evaluation: Seven hundred and fifty maize accessions were evaluated in the field for first generation leaf-feeding resistance. Fifty-two were rated as resistant.

In cooperation with Linda Pollak (USDA-ARS, Ames), 200 Latin American Maize Program maize accessions were evaluated for resistance to first generation European corn borer. Fourteen rated resistant.

Graduate student Craig Abel continued his evaluation of maize accessions from Peru. Fourteen accessions were initially found to be resistant to first generation European corn borer. They were re-tested and the resistance was verified in 11 accessions. Craig is preparing the data for presentation at the ESA North Central Branch meeting. He has begun to write his MS thesis, which includes this research.

Sunflower - Efforts to refine the sunflower moth evaluation technique for both cultivated and wild-type sunflowers continued. Many accessions in the sunflower collection are self-incompatible, so with the cultivated types, we will let the test heads open pollinate for one week before infesting them with sunflower moths and then bagging them. The heads of wild sunflowers are too small to bag, so we must use two cages per accession during evaluation. Both cages will contain honey bees for pollinating, and *one* cage will contain sunflower moths for resistance evaluation whereas the other cage will be a control without moths.

Amaranth - Fifty amaranth accessions were evaluated for host plant resistance to the tarnished plant bug. Four accessions had fewer than 5% of the number of nymphs and number of nymphs per female as compared to the susceptible check.

Brassica - The pollination efficiency of honey bees, flies, and a combination of both insects was estimated in field cages. The cool, rainy summer seemed to reduce insect pollination in general, but there were no statistical differences between these treatments.

Laboratory

Diets - Evaluation for host-plant resistance to corn earworm is accomplished by incorporating dried maize silks into laboratory diets and

then weighing corn earworm larvae after feeding on the test diet for 8 days. This technique takes longer to collect data but reduces the variance we had when using fresh silks.

Several different diets for rearing squash vine borers in the laboratory were tested, but none as successful.

Rearing - A colony of sunflower moths is being maintained for our field evaluation program.

A colony of corn earworms is being maintained for our laboratory evaluation program.

A colony of green peach aphids was started from field-collected insects found on Brassica. The colony was subsequently destroyed by parasites, and has been re-established.

Greenhouse

A test was run to determine if alfalfa, amaranth, or mustard was most attractive to tarnished plant bug for oviposition. Tarnished plant bugs laid significantly more eggs on mustard than on amaranth, and they laid significantly more eggs on amaranth than on alfa fa.

Miscellaneous

Graduate Students - I serve as major advisor for one MS candidate in Entomology (Craig Abel). He is scheduled to receive his degree in August 1993.

I serve on graduate committees of one other MS (Entomology) and one Ph.D. (Agronomy) candidate.

Manuscript review:

During 1992, I peer-reviewed several manuscripts for the editor of the Journal of Economic Entomology.

Cooperative research:

I collaborated with Linda Pollak (USDA/ARS, Ames, IA) to evaluate maize for leaf-feeding resistance to European corn borer.

Bill Wiseman (USDA/ARS, Tifton, GA), Gary Reed (Oregon State University, Hermiston, OR), and I cooperated with evaluating maize for corn earworm resistance.

I collaborated with Rick Luhman (NCRPIS Brassica/millets curator) to study pollinators of Brassica.

EEO ***activities:***

I participated in the USDA/ARS Research Apprentice Program during the

summer of 1992. The program provided research experience for an Asian, female high school student.

I attended a workshop at NADC, Ames, entitled "Sexual Harassment Training Update", Feb. 19, 1992.

I viewed the video, "Prejudice" on June 9, 1992.

I viewed a video on "Diversity" on May 19, 1992.

Entomology and Agronomy Department activities:

I regularly attend faculty meetings held in both departments.

I attended Agronomy meeting on Tractor Safety.

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

***Meetings** attended:*

National meeting of the Entomological Society of America, Baltimore, MD, Dec. 6-9, 1992.

Annual meeting of the Amaranth Institute, Fargo, ND, Aug. 20-22, 1992.

Biennial meeting of Host Plant Resistance Workshop, Indianapolis, IN, Feb. ***24-27, 1992.***

Annual meeting of the ESA North Central Branch, Kansas City, MO, March ***15-18, 1992.***

Seventh Great Plains Sunflower Insect Workshop, Fargo, ND, April 7-8, 1992.

Annual NC-7 Regional Technical Advisory Committee meeting, Ames, IA, July ***23-24, 1992.***

International Workshop on Non-Apis Bees and Their Role as Crop Pollinators, Logan, UT, Aug.lO-13, 1992.

World Food Prize Symposium, Ames, IA, Oct. 13, 1992.

Short courses/training:

Project Vincent Workshop, ISU, March 19, 1992.

Attended seminar on "Team Building" at NADC, Ames, IA, Aug. 19, 1992.

Attended Wellness Festival, NADC, Ames, IA, May 20, 1992.

Papers presented at meetings:

"Corn earworm fecundity and oviposition preference tests using resistant and susceptible maize" at the ESA North Central Branch meeting, Kansas City, MO, March 15-18, 1992.

"Update on the sunflower collection at the North Central Regional Plant Introduction Station*' at the Seventh Great Plains Sunflower Insect Workshop, Fargo, ND, April 7-8, 1992.

"Entomology at the USDA-ARS Plant Introduction Station" during the Area Director's visit, Ames, IA, May 7, 1992.

"Entomology at the Plant Introduction Station" at the NC-7 Regional Technical Advisory Committee meeting, Ames, IA, July 23-24, 1992.

Other:

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

Current president of the fowa Chapter of OPEDA.

Attended Popcorn Field Day at McHone Seeds, Ames, IA, Sept. lo, 1992.

Plans:

Field

Evaluate 250 maize accessions for corn earworm silk feeding resistance.

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

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

Evaluate 50 amaranth accessions for resistance to tarnished plant bug.

Compare honey bees, alfalfa leafcutting bees, and Osmia cornifrons for pollination efficiency with Brassica.

Participate in a cooperative research project to field-test corn earworm-resistant maize in Georgia (Bill Wiseman) and Oregon (Gary Reed).

Evaluate 100 cultivated and 10 wild sunflower accessions for resistance to sunflower moth.

Sample tarnished plant bug on amaranth to determine if insect populations are larger on the terminal head or on lateral heads.

Sample general insect population on amaranth plants.

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

Laboratory

Prepare corn earworm evaluation diets from field-collected silks.

Continue to develop a laboratory diet for squash vine borer.

Continue to rear sunflower moths.

Continue to rear corn earworms.

Establish a colony of green peach aphids.

Since sunflower moth larvae feed on pollen, we plan to incorporate 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 (USDA/ARS, Ames) to identify chemicals conferring resistance to European corn borer and corn earworm.

Greenhouse

Evaluate Brassica accessions for host-plant resistance to green peach aphid.

Miscellaneous:

Continue to participate actively as a faculty member 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:

Wilson, R.L. 1992. Corn earworm fecundity and oviposition preference tests using resistant and susceptible maize. Abs. Submitted Papers, N. Central Branch, Entomol. Soc. **Tuner.: 122.**

Wilson, R.L. 1992. Update on the sunflower collection at the USDA-ARS North Central Regional Plant Introduction Station, Iowa State University, Ames, IA. Proc. Seventh Great Plains Sunflower Insect Workshop: 27-29.

Wiseman, B.R., M.E. Snook, R.L. Wilson and D.J. Isenhour. 1992. Allelochemical content of selected popcorn silks: effects on growth of corn earworm larvae (Lepidoptera: Noctuidae). J. Econ. Entomol. 85: 2500-2504.

Wilson, R.L. 1992. What the heck is a tarnished plant bug? Legacy 5: 4-5.

Widrlechner, M.P., R.L. Clark, W.W. Roath and R.L. Wilson. 1992. An analysis of the literature of ex situ germplasm preservation. FAO/IBPGR Plant Genet. Research Newsletter 88/89: 31-35.

Wilson, R.L. and W.W. Roath. 1992. Potential of three lepidopteran species as pests and three hymenopteran species as pollinators of Cuphea. J. Kan. Entomol. Soc. 65: 316-320.

C. Horticulture (M.P. Widrlechner)

Germplasm Collections

Acquisition:

According to GRIN reports, I received 174 new accessions of ornamentals and 4 accessions of mint-family plants during 1992. Most of these accessions **came** from exchanges initiated through Indices Seminum. Genetic diversity of Calendula was expanded by acquiring two important groups of accessions: one group from Robert Kleiman, USDA-ARS, Peoria, and the other from Louis van Soest, CPRO-DLO, Wageningen. There were no important explorations during 1992. However, agency approval was received to conduct an exploration in Mexico for Zinnia and Sanvitalia in 1993.

Maintenance:

Available for distribution:

Ornamentals (NC-7 priority site) 404/1280 (32%) (117 genera)
Ornamentals (For trials or transfers) 74/331 (22%) (93 genera)
Mint-family Plants (Bee Pasture) 29/122 (24%) (11 genera)

Distribution:

I distributed 111 plants, 60 cuttings, and 152 seed packets of ornamentals to meet germplasm requests, and 608 plants as part of the NC-7 Trials. Ornamental germplasm requests were slightly lower than the record levels in 1991. There were 27 seed packets of bee pasture accessions distributed in 1992.

Duplicated at NSSL

Ornamentals (NC-7 Priority Site) 77/1280 (6%)*
Mint-family Plants (Bee Pasture) 3/122 (3%)

* This does not include 33 accessions prepared for back-up at NSSL. These will be shipped as soon as PI numbers can be obtained for some samples.

Regenerated

Ornamentals (NC-7 Priority Site) 80/1280 (6%)*
Ornamentals (For trials or transfers) 3/331 (1%)
Mint-family Plants (Bee Pasture) 1/122 (1%)

* This includes 37 successful cage increases, 16 woody ornamental seed increases, and 27 woody plant grow-outs.

Tested for Germinability/Viability

Ornamentals (all accessions held as seed) 174/1284 (14%)*
Mint-family Plants (Bee Pasture) 30/122 (25%)

* These data are cumulative. GRIN reports indicate that 56 accessions were tested in 1992.

Significant Progress

We had a surprisingly successful year for caged seed increase from herbaceous ornamentals, including both annuals and field-overwintered biennials and perennials, considering the unusual moisture conditions and record low growing-degree days during the growing season. We made considerable progress with germination testing of herbaceous ornamentals. Updated seed lists were completed and distributed to cooperators and to Indices Seminum in June and updated plant lists were distributed in August.

Characterization/taxonomy:

During 1992, there were no organized characterization/taxomony projects on the crops that I curate. All herbaceous ornamentals in the cage increase field were checked to verify identifications. Four accessions were reidentified. In 1993, we will develop a standard NCRPIS-wide tracking form to document reidentifications.

Evaluation:

Five hundred and twenty-nine plants of 10 landscape-plant accessions *were* distributed for testing in 1992 (see below). Evaluation results from the NC-7 Regional Ornamental Trials, examining the performance of landscape plants introduced from Yugoslavia, were published in the Journal of Environmental Horticulture (see below). Three years of honey bee preference data were published in the Proceedings of the 12th North American Prairie Conference. Essential oil analyses of Agastache, based on the use of headspace analysis were published in the 'Journal of Agricultural & Food Chemistry in 3992, Fourteen accessions of Agastache were screened by Roger Fuentes-Granados, an M.S. candidate under my direction, for their reaction to three strains of Verticillium. A Verticillium strain originally isolated from Agastache was able to infest Agastache accessions to varying degrees, especially Agastache rugosa, which was the most highly susceptible. The other two strains of Verticillium did not infest these plants. In the fall, Roger began a project to refine protocols for starch gel electrophoretic resolution of isozymes in Agastache. These isozyme data will be used to measure genetic diveristy in Agastache.

Enhancement:

Hybrids between Agastache rugosa and Agastache foeniculum are being propagated for future testing as nectar sources. Two cycles of selection for early flowering, seed production, and persistence were made in **Salvia azurea.** This selected population was increased in 1992 to provide a base population for multi-site testing.

Coordination of the NC-7 Regional Ornamental Trials:

Plant Distribution - 529 plant3 of 10 accessions were sent on request to regional cooperators for planting at 29 sites (an additional 79 plants of these accessions were sent to arboreta).

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. Responses are presently being compiled and entered into GRIN.

The NC-7 Ornamentals Subcommitte did not meet in 1992. A meeting is scheduled for July, 1993.

Five newsletter updates and three special letters *were* sent to trial site cooperators in 1992, to keep them informed about current developments at Ames and throughout the program.

Two manuscripts, summarizing the performance of trial plants, appeared in print in 1992. The first, written by Jeff Iles of ISU and me, reported the best-performing accessions at the ISU trial site. This paper appeared in American Nurseryman in March, 1992. The second paper summarized the performance of 27 populations of landscape plants from Yugoslavia that were distributed for testing in the late 1970s. This paper was published in the

Journal of Environmental Horticulture in December, 1992. In December, I also presented a paper discussing recommendations on future Eastern European plant exploration, based on the results of the Yugoslav test results. This paper has been submitted to the Combined Proceedings of the International Plant Propagators' Society for publication in 1993.

In March, 1992, I hired a new Agricultural Research Technician, Naomi Harrold, based on a new position description designed to increase the involvement of this position with the Ornamental Trials.

Naomi Harrold and I delivered plants to trial sites in Missouri, Illinois, Indiana and Ohio. We also visited the trial site in Waseca, Minnesota to confirm records and to mark plants for removal,

Germplasm activities in crops other than those I curate:

Eighteen requests for accessions with special horticultural characteristics were handled, resulting in the distribution of 351 packets of seed.

Through cooperative work with Jack Staub's USDA/ARS lab at the University of Wisconsin, a survey of isozymes in paired open-pollinated and cage-pollinated seed samples of 157 accessions of Cucumis sativus was completed in 1991. The results of this survey were published in the FAO/IBPGR Plant Genetic Resources Newsletter in 1992. Cooperative work with this lab continued in 1992 with a preliminary study of isozyme diversity in melon.

An examination of NPGS collections of Chinese medicinal plants was completed in 1991 and a compilation of the results appeared in the Herb, Spice, and Medicinal Plant Digest in early 1992. I have begun to assemble information on plants used in "western" medicine to prepare a similar compilation.

I am coordinating a team to prepare a cover story highlighting our collections of root and tuber vegetables for a future issue of HortScience.

I assisted Kathleen Reitsma in the design and coordination of a project to analyze our Anethum collection for essential oil composition. Samples were produced at NCRPIS and analyses are being performed by James Simon at Purdue University.

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 will be prepared for review in 1993.

During Fall Semester 1992, I actively participated in a team coordinated by Ron Cantrell to reorganize and teach Agronomy 523, Plant Genetic Resource Management at Iowa State University. In the future, this course will serve both to educate graduate students and to assist with staff development.

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.

Meetings attended:

March - Shade Tree Short Course (Ames, IA)

May - American Rhododendron Society (Long Island, NY)

June - American Assoc. of Botanical Gardens & Arboreta and Center for

Development of Hardy Landscape Plants (Columbus, OH), and Woody Landscape Plant CAC (Mentor, OH)

July - International Crop Science Congress and NC-7 Regional Technical Advisory Committee (Ames, IA)

October - Association for the Advancement of Industrial Crops and New Crops CAC (Saint Louis, MO), and American Chestnut Foundation (Niagara Falls, NY)

December - Eastern Region - International Plant Propagators' Society (Saint Louis, MO)

Presentations and seminars:

ISU Agronomy 523 - presented a series of lectures as part of this graduate level course in Plant Genetic Resource Management.

Annual Meeting of the American Association of Botanical Gardens & Arboreta - presented a talk, "Techniques to Preserve Genetic Diversity in Your Collections.*'

Annual Meeting of the Eastern Region of the International Plant Propagators' Society - presented a talk, "Is Eastern Europe a Useful Source of New Landscape Plants for the Midwest?"

Publications which appeared in print in 1992:

Iles, J.K., and M.P. Widrlechner. 1992. Recommended landscape plants from the heartland. American Nurseryman 175(11): 20-27.

Roath, W.W., and M.P. Widrlechner. 1992. Building a Cuphea collection (poster). Abstracts of the First Intl. Crop Sci. Congr., p. 69.

Roath, W.W., M.P. Widrlechner, and R. Kleiman. 1992. Morphological and agronomic variability in Cuphea viscosissima Jacq. Industrial Crops & Products 1: 5-10.

Widrlechner, M.P. 1992. A field evaluation of native mint family plants as honey bee forage in Iowa. Proc. 12th N. Amer. Prairie Conf., pp. 39-42.

Widrlechner, M.P. 1992. Techniques to preserve genetic diversity in your collections. Collected Abstracts - 1992 Annual Meeting of the Amer. Assoc. Bot. Gard. & Arb., p. 5.

Widrlechner, M.P., R.L. Clark, W.W. Roath, and R.L. Wilson. 1992. An analysis of the literature of ex situ germplasm preservation. FAO/IBPGR Plant Genet. Res. Newsl. 88/89: 31-35.

Widrlechner, M.P., and S. Foster. 1991. (appeared in 1992). Chinese medicinal plants in the U.S. National Plant Germplasm System. Herb, Spice, and Medicinal Plant Digest 9(4): 1-5.

Widrlechner, M.P., E.R. Hasselkus, D.E. Herman, J.K. Iles, J.C. Pair, E.T.

Paparozei, R.E. Schutzki, and D.K. Wildung. 1992. Performance of landscape plants from Yugoslavia in the North Central United States. J. Envtl. Hortic. 10: 192-198.

Widrlechner, M.P., L.D. Knerr, J.E. Staub, and K.R. Reitsma. 1992. Biochemical evaluation of germplasm regeneration methods for cucumber, Cucumis sativus L. FAO/IBPGR Plant Genet. Res. Newsl. 88/89: 1-4.

Wilson, L.A., N.P. Senechal, and M.P. Widrlechner. 1992. Headspace analysis of the volatile oils of Agastache. J. Agric. & Food Chem. 40: 1362-1366.

Other ***items:***

In early 1992, a formal bench audit was completed as part of a long-term reanalysis of the congruence between my duties and my position description. This process led to a new position description and a reclassification of my grade. The new position description recognizes my research duties and

formalizes my role in guiding and advising the other NCRPIS curators **and in** providing training and other assistance in the management of the NCRPIS.

Conclusions:

Curation

1992 was a reasonably productive year for germplasm increase. Unusual weather conditions were not a great hindrance. We were able to secure large seed increases from the cage field established in 1991 and to begin renovation of permanent plantings following large-scale transfers to the National Arboretum. I have a skillful crew, ably led by Naomi Harrold, and expect that we will make even more progress during 1993 because we will approximately double the size of our cage field.

We have increased our efforts with germination testing to document the viability of our ornamental collections. Now that NSSL is ready to receive more seed samples, a higher proportion of these collections will be duplicated there.

Transfers of genera that belong to other priority sites progressed well in 1992. Nearly all samples to be sent to the National Arboretum and to Corvallis have been transferred and seed transfers to the repositories in Davis and Geneva will occur in early 1993.

Research

Eight papers and two abstracts appeared in print in 1992, making it a very productive year for publishing research results. Besides the publications that appeared in print during the year, there are four other papers that are scheduled to be published in 1993. The bee pasture project is progressing well with the help of Roger Fuentes-Granados. He has **screened** Agastache populations for resistance to verticillium wilt and is developing isozyme electrophoretic approaches for assessing genetic diversity in Agastache. Other projects that have progressed well in 1992 include research on comparisons of Eastern European and Midwestern climatic conditions and planning for the 1993 exploration to Mexico. During the coming year, I want to obtain GIS software for the NCRPIS and to learn how to apply GIS to the analyzing relationships between genetic diversity and ecogeographic variation.

D. Plant Pathology (C. Block)

Field research:

Sunflower: About 240 cultivated sunflower accessions were evaluated for Alternaria leaf blight resistance in replicated trials (6 reps). Of these 240 accessions, 90 were tested for the second time. Heavier than normal rainfall made 1992 a good test year. Hybrid 894, the check, normally sustains 20-25% leaf area affected, but is considered moderately resistant, because little defoliation occurs. More than 20 accessions had significantly better leaf ratings than 894, as measured by area under a

disease progress curve (AUDPC): Ames 3082, A-3083, A-3221, A-3222, A-3223, A-3224, A-3275, A-3294, A-3335, A-3342, A-3371, A-3372, A-3378, A-3379, A-3381, A-3382, PI's 340783, 340786, 343812, 371934, and 377528.

Maize: All seed increase plots (140 PI's) were inspected for incidence and severity of leaf diseases. Common rust, common smut, northern leaf blight and Stewart's bacterial wilt were the only diseases identified.

Rust was scored on a modified Cobb rating scale, converted to l-9, based on percent leaf area affected where 1=0-1%; 2=2-5%; 3=6-10%; 4=11-20%; 5=21-35%; 6=36-50%; 7=51-75%; 8=76-90% and 9= 91-1008. Fifty-eight accessions in the increase plots rated 2 or lower for rust. Only 17 accessions were quite susceptible, rating 6 or higher.

Smut ranged from 0% plants infected in the resistant accessions to 75% infected plants in highly susceptible accessions.

Northern leaf blight (NLB) was detectable on many accessions, but the infections generally were not severe. Seven accessions were very susceptible to NLB: PI 213783, PI 255978, NSL-4830, NSL-30861, Ames 18889, Ames 18892, Ames 18895.

Stewart's bacterial wilt was unusually abundant. In most years at Ames, we find plants with Stewart's wilt occasionally, but the disease rarely affects maize significantly. The mild winter of 1991-92 favored the survival of the overwintering flea beetle vectors. Stewart's wilt was the major maize disease during the growing season. Flea beetle feeding was conspicuous on every row of plants. Based on the extensive beetle feeding, we assumed that all accessions were exposed to the pathogen. Clear differences in disease development and resistance were evident. Percent leaf area affected ranged from 0% in the most resistant to 75% in the most susceptible genotypes. No Stewart's wilt lesions were detected on accessions 213744 (landrace), 222496 (landrace), 558517 (MO 10), 558523 (MO 5), 558529 (MO 13), 558530 (MO 14W), 558533 (MO 21R), and NSL 20626 (Illinois High Oil). Other highly resistant accessions, with only 1-2% leaf area affected, included: PI's 210402 (Robyn), 221869 (Johnson County White), 558521 (MO2RF), 561565 (B95), and Ames numbers 14247 (Mexican June), A-18879 (B75), A-18880 (B77), A-18881 (B79), A-18883 (B86), A-18999 (Ab28A).

In addition to the seed increase plots, 87 accessions were evaluated for disease reaction in the race characterization plots and 36 inbreds were evaluated in the inbred field. In the race characterization plots, many of the accessions were rust susceptible, and rated 7-9 on the evaluation scale. Stewart's wilt also caused extensive leaf necrosis, 25-50% on most of the accessions. Among the inbred entries, there was a wide range of disease reaction. Rust scores ranged from l-8, plants with smut ranged from 0-50%, and Stewart's wilt scores ranged from 2-75% leaf area killed.

Study of seed transmission of Erwinia stewartii continued, and seed-to-plant transmission in the inbred A632 was demonstrated under field conditions for the second successive year. All seedlings were grown under netting to exclude flea beetle vectors. Seed transmission occurred from one, poor quality seedlot (44% germination). Sixty-two plants (6.1% of the total emerged) were positive, as detected by a stem printing assay. All infected plants were symptomless, until the 12-18" stage when they were tested. Two other seedlots with a high percentage of infected seed, but more than 70% germination, showed no seed transmission. The seedlots had 24% and 46% infected seed, respectively. No seed transmission was detected from 6,500 seed planted.

Eight hundred plants of A632 and the sweet corn Hybrid Pride of Canada were inoculated with *E. stewartii* to obtain infected seed for lab and greenhouse tests. Plots were regularly sprayed with Sevin insecticide to kill beetles. It was impossible to harvest seed from the non-inoculated rows because almost all plants had some Stewart's infection.

Greenhouse and laboratory:

Corn: More than 17,000 corn seedlings were bioassayed for seed transmission of *E. stewartii* by stem printing onto selected media. All suspected positive bacterial cultures were stored in 15% glycerol:water, but not all have been identified. Seed transmission from heavily-infected seedlots seems to occur at a low rate; a few plants per thousand. To date, we have never detected seed transmission from reasonably high quality seed (i.e. better than 80% germination).

Melons: Progress was made in the identification of the causal agent of the melon bacterial disease. The suspected pathogen was isolated from diseased seedlings grown from original seed planted in a growth chamber. The pathogen was grown in pure culture, and Koch's postulates were completed by inoculating susceptible plants, obtaining characteristic symptoms and re-isolating the bacterium. Nutritional, biochemical and cultural tests indicate that the bacterium is a non-fluorescent pseudomonad, but it has not yet been identified to species.

We obtained additional evidence for seed transmission. In 1991, single fruits were harvested from three different field cages of diseased melons. The fruit had no lesions or other symptoms. Fifty seeds of each PI were planted in the greenhouse in 1991, but no seed transmission was detected. In 1992, we planted all of the remaining seed, about 200-400 for each PI. One of the three, PI 126070, had 6-8 infected seedlings. Disease spread quickly to the rest of the flat under the high humidity environment. The bacterium isolated is identical in appearance, nutritional and biochemical characteristics to the isolate obtained from plants in the growth chamber.

Publications:

Block, C.C. 1992. Screening for resitance to *Alternaria helianthi* in the USDA germplasm collection. Proceedings Sunflower Research Workshop pp. 64-66.

Meetings/presentations:

Attended the Sunflower Researchers Workshop at Fargo ND, Jan 16-17, and presented a paper on "Screening for *Alternaria* leaf blight resistance in the USDA germplasm collection".

Attended the Sunflower Crop Advisory Committee meeting held at the same location.

Prepared and presented a poster on "Seed transmission of *Erwinia stewartii* in corn" at the 14th Annual Seed Technology Conference at Iowa State, Feb., 1992.

Organized and taught a portion of a special workshop on seed health testing methods at the 14th Annual Seed Technology Conference.

Oral and poster presentation on Stewart's wilt research at the Regional Seed Quality Workshop held at Urbana, Illinois Mar. 1992.

Presented an overview of the North Central Regional Plant Introduction plant pathology program to the NC-7 Regional Technical Advisory Committee in meetings held at Ames, July, 1992.

Organized and hosted a tour of the North Central Regional Plant Introduction Station for 16 visiting Egyptian and Pakistani seed analysts, July 30, 1992.

Taught a workshop on "Serological detection of seedborne pathogens in corn seed" at the ISU Seed Science Center, July, 1992.

Attended the national meeting of the American Phytopathological Society in Portland, OR, Aug. 8-13. Presented an updated poster on "Seed transmission Of Erwinia stewartii in corn" co-authored by Dr. Denis McGee and Dr. John Hill of the Seed Science Center and Dept. of Plant Pathology, respectively.

Attended the National Cucurbit Conference and Cucurbit CAC meetings in Raleigh, NC, Sept. 20-23.

Miscellaneous:

Attended ISU class on "Epidemiological Assessment of Resistance Based Disease Management Strategies", January-May, 1992.

Participated in several tours of the North Central Regional Plant Introduction Station by describing plant pathology research program.

Served on the Plant Pathology Department's Graduate Curriculum Revision Committee.

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

Appointed to two committees at the APS annual meeting in Portland; the 'Seed Pathology' committee and the 'Collections and Germplasm' committee.

Attended weekly plant pathology seminars.

Attended weekly staff meetings.

Renewed Pesticide Applicator Certification.

Research plans:

Sunflower: This will likely be the final year of Alternaria evaluations. I plan a combination of re-tests of promising accessions, and examining previously untested accessions.

Maize: Continue research on biology of seed transmission of Erwinia stewartii. Inspect seed increase plots for disease.

Melons: Continue research on pathogen identification and seed transmission of melon bacterial disease.

Planned meetings/presentations:

Attend 15th annual Seed Technology conference at ISU, Feb. 24-25, 1993 and present invited talk on Stewart's bacterial wilt in corn and seed transmission research.

Selected as a member of a panel discussion group for the Seed Technology conference, Feb., 1993.

Present talk on plant pathology program at National Plant Germplasm System meetings at Ft. Collins, CC, June, 1993.

Present paper at American Phytopathological Society meetings, Nashville, TN, November, 1993.

Attend meetings of Seed Pathology committee and Collections and Germplasm committee held in conjunction with the APS meetings.

E. Farm Superintendent (L. Lockhart)

Labor:

During the calendar year 1993, 236 applications for hourly employment were received and reviewed. There were 106 interviews resulting in 76 hourly employees hired. Five employees were dismissed for poor work performance and one for habitual tardiness. Currently there are 42 (16.3 FTE) part-time hourly employees working at the NCRPIS.

Maintenance projects completed:

Dry storage expansion

Upgraded all buildings to ISU safety inspection requirements.

Ventilated attic storage to eliminate condensation problems.

Constructed new furrow opener for cage operations.

Remodeled storage garage to serve as a bee overwintering facility.

Tours:

This past year I organized and conducted 21 tours.

Conferences, training, etc. attended:

Numerous departmental seminars

Worker Right-to-Know Update, ISU

Chemical Hygiene Plan meeting, ISU

ASA-CSSA-SSA Annual Meeting

Respirator Training Certification EH&S

Committees:

NCRPIS Extension (I chair this committee)

Biological Aide Search

Helianthus Curator Search

Purchasing:

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

Goals and plans for 1993:

Maintenance

Serve as a liaison between contractors, ISU Experiment Station, USDA, and utility providers to ensure construction of entomology greenhouse proceeds as smoothly as possible.

Construct entomology greenhouse.

Plan remodeling of seed storage work room and remodel it, if resources are available.

Design and construct a cross-bar handling system to increase efficiency of cage construction and removal.

Remove and re-construct the bio-tech fench.

Construct compost bin for greenhouse organic material.

Other:

Attend ASA-CSSA-SSA Meetings in Cincinnati.

Attend PGOC Meetings in Ft. Collins.

Automate weather data collection.

Refine safety training and documentation procedures.

F. Controlled insect pollination program (C. Abel)

Progress:

Cage pollinations: Three hundred and eighty-six cages housing honey bees for controlled pollination facilitated regenerating 596 accessions. Abnormally cool and wet weather reduced the number of accessions successfuly pollinated by insects this year.

Fifty-one accessions of Daucus and 13 accessions of chicory were pollinated in cages by a combination of honey bees and house flies.

Beekeeping: We purchased 344 2 lb, packages of honey bees this year. Two hundred of them went directly into nucleus hives (nucs) for Brassica pollinating, and the rest supplied nucs for our summer pollinating season.

One end of a storage building was converted into an indoor wintering facility for overwintering honey bee nucs. Four hundred and forty nucs wintered in the building this winter. If successful, this facility will save us substantial funds each year.

We began securing the cage screen around the nucs with 12 cm wide polypropylene straps during cage pollinations. This kept the cage insect-proof while the nucs were in place.

Future plans:

Winter 800 nucs in the indoor wintering facility this fall.

Try to rear native Bombus spp. this spring. Both diapausing and nondiapausing queens will be captured in hopes of inducing them to produce colonies. Certain species of Bombus could prove effective pollinators of our plant germplasm.

Trap native pollinators, especially bees in the genera Osmia and Megachile, for identification and study. I will attempt to manage these native species for cage pollinations along with my supervisor, Richard Wilson.

Assist R. L. Wilson to compare efficiency of Apis mellifera, Megachile rotundata, and Osmia cornifrons as pollinators of Brassica spp.

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

Test corn syrup as a supplemental food for honey bees. If the syrup is suitable, the yearly costs of feeding our honey bees will be halved.

Miscellaneous:

Presented an Entomology departmental seminar on: "A novel use for honey bees (Apis mellifera L.): control pollinating germplasm collections."

Completed the following courses at Iowa State University: Biological Control, Host-Plant Resistance to Insects, Systematic Entomology, Entomology Seminar.

Attended the 1992 North Central Branch Entomological Society of America meetings in Kansas City, MO.

Attended the International Non-Apis Pollinator Workshop in Logan, Utah.

G. Zea Curator (Mark Millard)

Activities

Curatorial Information

Acquisition:

New accessions received

During 1992, 1184 Zea accessions were acquired. Six hundred and forty-nine **accessions** were received from the N.C. State/USDA tropical maize germplasm **bank regeneration project.** Five hundred and seventy-one accessions were received from the Mexican national germplasm bank and 78 were received from the Peruvian bank. No additional accessions will. be received through this project.

One hundred and twenty-six accessions of Mexican maize races collected by B. Benz for his thesis work at the University of Wisconsin were acquired through Hugh Iltis.

One hundred accessions of teosinte were received from Hugh Iltis, University of Wisconsin.

One hundred and sixty accessions were received from quarantine increase of mostly African material. Some of this material has resistance to diseases not yet widely found in the United States.

Thirty-one of 44 Plant Variety Protection (PVP) reference inbred lines were received in 1992. Fifteen lines were either regenerated or received in large enough quantities to assay for purity using isozyme analyses.

Significant progress

The wild Zea germplasm acquired from the University of Wisconsin makes our teosinte collection one of the most diverse outside of Mexico.

Maintaining the PVP reference lines may add an important new dimension to our maize distributions.

Maintenance and distribution:

#/% available for distribution--Sixty percent (7590) of the 12,585 accessions held in December 1992 were available for distribution.

Another 15% are partially available and could be added to the available percentage if they were placed in jars for easy distribution. The largest portion of unavailable accessions are the 1600 accessions in the Galinat-Mangelsdorf collection. Evidently, less than 50% of these accessions are viable.

#/% distributed--We distributed 4530 packets of Zea seed in 1992. This represents 22% (2765) of all Zea accessions.

#/% duplicated at NSSL--NSSL has seed of 57% (7236) of the Zea accessions held at NCRPIS. One hundred and eighty-two accessions were sent in 1992.

#/% accessions regenerated--In 1992, 288 accessions were regenerated, fewer than 3% of the total Zea collection. This figure includes 50 tropical accessions regeneratedin Hawaii by Northrup-King, and 80 accessions regenerated in Puerto Rico.

#/% tested for viability--We tested 5% (692) of the Zea accessions for viability in 1992.

Significant progress--We began to explore techniques for quality control for inbred line regeneration. The cooperation with Northrup-King was excellent and will continue in 1993. Other companies have been asked to provide additional assistance with regeneration.

Characterization/taxonomy:

#/% characterized/classified--It is estimated that 40% of current NCRFIS 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--All of the old Zea data in the "composite" record format in GRIN was converted to individual observation record type. This will enable us to provide details regarding when and how a particular observation was made. This step is a necessary preliminary to entering

much additional older information obtained during accession regeneration. It is also necessary so that observations taken in the tropics and in the temperate areas can be distinguished and no misunderstandings regarding agronomic adaptation occur.

PCGRIN requires that racial names be shorter than 10 characters. The long names were converted to codes used by CIMMYT. Other codes were developed for race names not used by CIMMYT.

We began evaluating morphological characters for their utility in characterizing races of maize native to the southwestern U.S. and northern Mexico and, in a separate experiment, northeastern 8 row corns and sweetcorns derived from them. Fifty accessions were planted in New Mexico and Ames for the southwestern races and fifty accessions were planted at Madison, Wisconsin; Grand Forks, North Dakota; and at Ames, Iowa. Despite adverse weather at all locations, vegetative characters were measured. Tassels and ears were harvested for future measurement.

Evaluation:

#/% evaluated--Seven hundred and forty-eight accessions were evaluated for resistance to first generation European corn borer feeding by the NCRPIS entomology group. Fifty-seven percent (7233) 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.

During the last three 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.

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

Enhancement and/or utilization:

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

Significant progress--Preliminary discussions regarding a germplasm enhancement program occurred during the 1992 Maize CAC meeting. The CAC proposed to consolidate proposals by L. Pollak, M.M. Goodman, and others to present to ARS for funding. We stated that, while the NCRPIS was interested in this work and at least could provide the initial material for

enhancement and conserving the final products, the NCRPIS could not fund enhancement with the current budget allocated to Zea genetic resource management.

Support/administrative personnel:

Significant accomplishments--The Zea technician attended a workshop on Biotechnology at Iowa State which included "hands on" experience with molecular markers. He also attended a conference on biosynthesis and molecular regulation of amino acids in plants held May 28-30 at Penn State University.

The Zea project was augmented temporarily by a biological aide, Irv Larsen, who will work with the sunflower curator after she arrives March 9, 93.

Meetings attended:

The combined Regional Corn Conference Research Meeting in Williamsburg, Virginia.

The Corn Breeders' School at the University of Illinois.
The PGOC and GRIN3 Advisory Committee Meetings in Beltsville, Maryland, June 13-19.

The ASA-CSSA-SSA meetings in Minneapolis, Minnesota November l-5. I attended the new C-8 germplasm section presentations, which often discussed maize.

The 1992 Maize CAC meeting at the American Seed Trade Association meetings, December 7-10. A management plan for the NCRPIS Zea collection was presented for CAC review. some discussion of the plan occurred, but, in general, it was accepted after little debate.

The National Sweet Corn Breeders Association at American Seed Trade Association Meetings, December 7-10.

Presentations or seminars:

I presented a half-hour talk to the National Sweet Corn Breeders Association using a live computer demonstration of the maize database on PC-GRIN.

Numerous visitors and groups toured NCPRIS and learned procedures for maize curation. Among them were a group from the International Crop Science Congress and the LAMP principal investigators.

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

Miscellaneous:

We are charged with managing the data for GRIN3 from the LAMP project. A CD-ROM was prepared which included the LAMP, CIMMYT, Ag Canada, and GRIN data for distribution. This will serve as the major reference for LAMP data at this time.

The Specific Cooperative Agreement with Iowa State University's Seed Science Laboratory to create a computerized visual database for corn ears continued. The postdoc, S. Panigrahi, left for a permanent job. Dr. Misra and Dr. Shyy continue this work, with the Research Leader/Coordinator and myself representing the NCRPIS in the cooperative agreement.

Conclusions:

State of the program

In summary, we are keeping up with accession maintenance tasks, but just so. Additional tropical and rescue regenerations are necessary. Increased

effort to computerize old data and obtain better characterization data is required.

Strengths and weaknesses: what facilitated or hindered progress

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

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

Future plans:

Acquisition plans

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 procure this material in 1993, as budget allows.

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.

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

Many public maize breeding programs in the southern U.S. are disappearing. Further effort will be devoted to obtaining all the important inbred lines and old open pollinated varieties from this region. Maize from Texas, Louisiana, Mississippi, Alabama, and Florida are especially under-represented in the NCRPIS collection.

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 1993 will be similar to that in 1992. Hand pollinations of corn is one of the most demanding tasks for student hourly labor. One hundred and fifty to 250 accession increases are planned.

Fifty accessions will be increased by Northrup King on Kauai, Hawaii.

One hundred accessions will be sent to Puerto Rico for winter increase. These will be mainly the Benz collection from Mexico obtained from Wisconsin.

I hope to begin increasing the Crookham sweetcorn collection in 1993.

Characterization and evaluation work

Approximately 500 accessions will be initially screened for first generation corn borer resistance/tolerance by the entomology program.

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

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 1993. One or two other staff will also be needed.

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

I will probably attend at least one meeting in 1992 related to the. new GRIN3 software.

I will visit Hawaii to observe and review one or more of the several sites proposed for increase of tropically adapted materials.

The GRIN site meeting will be held in conjunction, with the PGOC meeting, regional technical advisory committee meetings, and NPGS research meeting in late June, 1993.

H. Beta-Spinacia,(P. Lundeen)

Beta:

Because of the few plants in the Logan increase plots, we transplanted 23 annual accessions of B. maritima to the plots in June. Drs. Bretting, Doney, Stander, and myself visited Logan for transplanting. The notes accompanying the harvested seed do not include stand counts, so a comparison of average stand counts is impossible. The success rate was sufficiently higher that we planned to transplant the biennial increases also. Thirty of the accessions were not transplanted in August as planned. They are overwintering and will be transplanted next spring. Thirty four accessions were transplanted for field overwintering. Test plots of 10 Beta accessions were planted in two locations around Pullman, Washington to evaluate this region as an alternate regeneration site.

We received 72 original seed lots in 1992, and 102 increase lots from Utah. Twenty six of the new accessions were collected by Dr. Doney in Egypt. Eighteen of the new accessions came from the Vavilov Institute. Forty-seven back-up samples were sent to NSSL in 1992, increasing the total samples duplicated there to 351. We plan to send the material that is difficult to germinate to NSSL as soon as possible. Of the total 1344 Beta accessions, 234 are available for distribution.

Germination percentages of the material recently regenerated are rising, as increase practices are improved. There is some concern about germination testing for the wild Beta species. The normal methods of germination testing are not effective, and long periods of scarification in sulfuric acid may be an added selection pressure. This year, we have started distributing, on a limited basis, hard-to-germinate accessions with 3000 seeds and no germination information.

The next CAC meeting will coincide with the ASSBT meetings in March. Among the topics to be discussed is a "red beet breeder" representative on the CAC, regeneration options for Beta, and the upcoming World Beta Network Meeting in August.

The 1146 observations recorded in GRIN during 1992 were from the I.991 growing season. The 1992 observations have not been loaded yet.

Spinacia:

There are currently 296 Spinacia accessions at NCRPIS. All but 39 are available for distribution, although only 12 accessions have distribution lots resulting from control-pollination.

All available distribution lots were germinated last year and, because no new seed was obtained, no germination tests occured 1992.

The Beta regeneration program in Logan is undergoing re-evaluation, so we have not investigated the potential of regenerating Spinacia there. Hopefully, regeneration of Spinacia will be considered together with potential changes to the Beta increase program. I plan to try growing seven Spinacia accessions in positive pressure cages this spring.

I. Computer Coordination (P. Lundeen)

Training:

ISU training

A number of staff members have attended mini-courses covering WordPerfect, Windows, and DOS. The university does not expect to offer WordPerfect for Windows, or Excel for Windows now. Excel for MacIntosh courses are recommended as a substitute for Excel for Windows,

Monthly computer meetings

Monthly computer meetings still serve as training sessions for basic computer topics instead of general discussion sessions. They apparently are well-received by those present, although many of the same topics must be repeated as staff members find topics that they skipped are now useful to them. Sessions are also 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. The different levels of expertise, and no standard computer hardware and software makes goal-oriented training necessary. Individual training has also helped to encourage staff to use computers.

Data entry

The part-time receptionist has been responsible for most of the data entered currently. More evaluation data arrive on diskette, and most of the curators have shifted orders, evaluation data, etc. to disk. The receptionist enters all the germination data, and any errors in data entry are generally corrected by the end of seed storage.

Documentation:

Operations manual

Order processing and Login procedures were summarized for the operations manual. We plan to update the full procedures to reflect recent changes,

ISU position information questionnaire

The recent re-classification of all Professional and Scientific (P & S) staff facilitated the documentation of position descriptions and duties.

Procedures & codes

Procedures were outlined for handling heterogenous accessions which are split into two or more accessions, receipt of new NSSL material, and updates to inactivation procedures.

GRIN3 planning has instigated evaluation and documentation of many site defined codes. Inventory ID's, IVPOLL codes, and other miscellaneous codes, have been updated.

Coordination & supervision:

Login--We received approximately 1,800 new accessions in 1992. Passport data on most of these accessions was entered manually.

Order processing--We received approvimately 800 order requests in 1992.

Purchasing and upgrades:

Purchases

We purchased eight new 386/486 PC's this year. Six of these are 486/33 PC'S, 2 Zenith and 4 Apex. Two 386SL laptops were also purchased: 1 Compaq and 1 Zenith.

Peripherals purchased to improve efficiency included network software, and two additional HP Laserjet printers. We purchased two bar code readers, plus adapters and software for printing (these have already been used for NSSL shipments). We have purchased and evaluated Netware 3.11, and Netware Lite, plus associated connection adapters.

We purchased software upgrades for Windows, and WordPerfect for Windows, for all PC's able to run these programs. We also purchased test copies of Excel 4.0, and Windows for Workgroups.

One Apex 386 has chronic (3 months to diagnose) motherboard problems, and two Apex 486's have acute hard disk problems. All three of these PC's were still under warranty.

Upgrades

We are continually shifting PC's, 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.

Network installation has increased the potential for our less powerful PC's. With minimal memory upgrades (at a cost of $80-$300), a PS/2 and other computers can be connected to a network, reducing problems with hard disk space, printer access and communication. There is greater need for virus protection, and uniform software, when using a network.

Two ***186*** PC's and 2 laptops without hard drives are in storage because there is no time to prepare them for use.

PC Cleaning

Cleaning of PC's during upgrades has been suspended until more time is available. Currently, cleaning only occurs when the user does so, or because of hardware problems.

Significant projects of 1992:

Networks

Progress on the campus and farm networks has been slow, but they are finally showing results. Both networks had problems, including insufficient PC memory to run network software, cabling difficulties, and software conflicts. The farm network now has three stations connected, and will hopefully be expanded to five stations within a month or so. Connecting the PC's on campus will be the next priority. The farm file server should consolidate procedures, code definitions, and other site information.

Common graduate student/research staff PC

Developing a method of protecting personal areas on a common PC was a real challenge. It required around 80 hours to develop security systems, allow individual environmental modifications, and develop default use of separate user areas. Use of DRDOS, a disk operating software obtained with Netware Lite, facilitated this process. Beta testing for this PC appears to be finished.

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. Although bar codes were created for NSSL back-up shipments, creating bar codes for inventory ID's (for germinations, and seed storage operations) has still not been possible.

PC & Software Tracking/Registration

With 36 PC's in use at NCRPIS, it was recommended that we start to record

software registrations. Currently, PC hardware registrations and most software versions are recorded on a summary file in Excel. Registration ID's for major software are recorded on the same, file along with PC hardware summary information.

Facilities:

The current space available for computer operations is cramped, Significant time is spent reorganizing the limited space 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.

High--Accounting program, Research Leader's requests, computer breakdowns, individual help, 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, -monthly training sessions, -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-=, loading observations, defining descriptors, PC cleaning & maintenance, general programming research, computer software evaluation, filing & project documentation.

J. Vegetables (K. Reitsma)

Activities--General Summary

Acquisition:

New accessions: **168**

Status: 5621 PI-numbers, 1125 Ames-numbers, 6746 total.
Significant progress: Only one accession was received as a PI this year. All other new accessions have Ames numbers.

Maintenance and distribution:

Three thousand seven hundred and seventy-three accessions (56%) available for distribution; 3151 packets (2199 accessions, 33% of collection) distributed; 2763 accessions (41%) duplicated at NSSL; 867 accessions (13%) regenerated; 917 (13%) tested for germinability/viability.

Activities--Specific Crop Summaries

ASPARAGUS

Acquisition:

New accessions received --One accession of Asparagus schoberioides was received in 1992.

Status: 146 PI-numbers, 11 Ames-numbers, 157 total.

Maintenance and distribution:

#/% available for Distribution--As of January 1993, 43 (28%) of 146 accessions are available for distribution.

#/% distributed--Only 2 packets (2 accessions, 1% of collection) were distributed in 1992 per a request for miscellaneous genera by a visiting Indian scientist.

#/% 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.

#/% regenerated--Asparagus has not been regenerated at Ames since 1956. Some perennial plantings existed around the farmstead, but the key to their location has been lost and most, if not all, of the plantings have been destroyed. 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 is difficult to maintain and it would be best if we could find a clonal repository for this collection (many accessions are male sterile). Greenhouse space 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: None, as there is no enhancement program in the vegetable crops at NCRPIS.

CICHORIUM

Acquisition:

New accessions received-- No new accessions of Cichorium were received in 1992.

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

Maintenance and distribution:

#/% available for distribution-- Forty-two (21%) of 200 accessions of chicory were available as of January 1993.

#/% distributed--In 1992, 41 packets (22 accessions, 11% of collection) were distributed. Four packets were distributed as domestic requests and 37 packets were distributed abroad.

#/% 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 1992, 40 Cichorium accessions (20% of collection) were started in the greenhouse for regeneration in summer biennial cages. Twenty accessions germinated for transplanting to field cages, and only ten accessions set mature seed for harvest. Thirty-four accessions will be regrown in 1993, and resulting seed increases will be bulked with the 1992 increases for distribution.

#/% tested for germinability/viability--Germinations will be performed on the 1992 increases when the seed has been processed.

Significant progress--An additional 21 accessions could be available as soon as PI-numbers are assigned.

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, The Leafy Vegetable CAC suggests we use the Lactuca descriptor list, approved at the 1992 CAC meeting, as a model for Cichorium. With the help of the Horticulturist I will attempt to develop a descriptor list to present to the CAC at the 1993 meeting.

Evaluation:

#/% evaluated and significant progress: None, as there has been relatively little interest in this crop, and we have received no evaluation data for Cichorium.

Enhancement:

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

CUCUMIS MELO

Acquisition:

New accessions received--We received only two accessions of Cucumis melo this year.

Status: 2406 PI-numbers, 259 Ames-numbers, 2665 total.

Maintenance and distribution:

#/% available for distribution--As of January 1993, 1564 (59%) of 2665 accessions are available for distribution.

#/% distributed--In 1992, 949 packets (304 accessions, 26% of the collection) were distributed for 28 orders. Of the 949 packets distributed, 738 packets were shipped as domestic requests and 211 packets were shipped as foreign requests.

#/% duplicated at NSSL--This year 460 accessions of melons were sent to NSSL for duplication. Five accessions with cage seed regenerated from original seed were sent to replace OP seedlots already duplicated NSSL. The total number of melon accessions duplicated at NSSL is 1222 (46% of the collection).

#/% regenerated--Of the 495 accessions grown for cage increase in 1992, about 50% of the accession were new, 30% were grown for additional caged increases to be bulked with the 1991 increases, and 20% were grown because of low quantities in distribution lots.

#/% tested for germinability/viability--The 595 germinations were performed on 537 accessions with most of the accessions being 1991 increases.

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-- Ninety-nine percent of the accessions have country of origin specified on GRIN, and 54% of these accessions have an alternate "id" on GRIN. Each time an accession is regenerated the plants and fruits of the accession are characterized, and the fruits are photographed.

Significant progress--The SRPIS notes on GRIN are incomplete and, because the material is open-pollinated, these 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.

Evaluation:

#/% evaluated and significant progress: Unknown, but 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. Drs. M. Kyle and T. Zitter, Cornell University, Ithaca, NY, continue to evaluate the collection for gummy stem blight resistance,

Enhancement:

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

CUCUMIS SATIWS

Acquisition:

New accessions received-- We received 22 new accessions of cucumber this year (14 from VIR, two from USSR, one from Egypt, five from NSSL). The five accessions from NSSL are cultivars commonly requested as standard check varieties for evaluating cucumbers. (NSSL sent enough seed to make these accessions available without need of regeneration.) These five accessions have been assigned PIs.

Status

961 PI-numbers, 124 Ames-numbers, 1085 total.

Maintenance and distribution:

#/% available for distribution--As of January *1993,* 828 (76%) of 1085 accessions are available for distribution.

#/% distributed--In 1992, 691 packets or 566 accessions (52%) were shipped for a total of 23 orders. Of the 691 packets distributed 151 were sent as domestic requests, and 536 as foreign requests.

#/% duplicated at NSSL--This year 387 accessions of cucumber were sent to NSSL for back-up, so that 718 (66%) accessions are duplicated at NSSL.

#/% regenerated--Of the 94 accessions regenerated in summer increase cages, 48 accessions were grown for the first time. Plant performance and harvests were very poor due to the short growing season and the low total heat units accumulated during the summer.

#/% tested for germinability/viability--Ninety-one accessions were germinated in 1992. Most of these germinations were for the 1991 cage increases.

Significant progress--The cucumber collection is in relatively good shape, with the bulk of the regenerations being new accessions. 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) after the summer increases are harvested,

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--Only four accessions were distributed for evaluation this year, all to the Acting Plant Pathologist for use as standard check varieties in his evaluation program,

Significant progress--No new evaluations have been initiated. The 1989-1991 isozyme and multiple disease evaluation data sets from Staub et al. have all been loaded into GRIN.

Enhancement:

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

CUCUMIS species (wild Cucumis)

Acquisition:

New accessions received-- Only one accession of Cucumis metuliferus was received to add to the wild Cucumis collection.

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

Maintenance and distribution:

#/% available for distribution--As of January 1993, 110 (38%) of 286 accessions are available for distribution.

#/% distributed--In 1992, 253 packets (108 accessions, 38% of collection) were distributed in a total of 17 orders. Of the 253 packets shipped, 139 packets were sent as domestic orders and 114 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--Twenty-six accessions were regenerated in 1992 cages. All of the C. callosus and all unavailable C. metuliferus were grown. The C. metuliferus accessions failed to flower in the 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.

#/% 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, the notes may no longer characterize the accessions accurately. Complete notes will be taken 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 where 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: Unknown, but several accessions are included in Dr. M. Kyle's gummy stem blight evaluation work at Cornell University, New York.

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 51 Cucurbita accessions this year: 44 C. pepo, 4 C. maxima, and 3 unidentified Cucurbita. (All accessions were originally identified as C. pepo, but 7 Ames numbers have been tentatively re-identified as other species.)

Status: 783 PI-numbers, 157 Ames-numbers, 940 total.

Maintenance and distribution:

#/% available for distribution--As of January 1993, 566 (60%) of 940 accessions are available for distribution.

#/% distributed--A total of 247 packets (196 accessions, 21% of the collection) were shipped in a total of 12 orders. Of the 247 packets distributed, 122 were sent as domestic requests and 125 packets were distributed as foreign requests.

#/% duplicated at NSSL--Thirty-one accessions of Cucurbita were sent to NSSL for duplication. This brings the total number of accessions duplicated at NSSL to 410 (44% of the collection).

#/% regenerated--Of the 101 (11%) accessions grown for regenerations 74 were grown for the first time. Plant growth and fruit set were very poor. due to the short growing season, and the few heat units accumulated during the summer.

#/% tested for germinability/viability--Germinations were performed on the 58 accessions successfully increased in 1991.

Significant progress--We received 257 accessions from IBPGR in 1987. Many of these accessions had fewer than 20 original seed, and 76 were misidentified as to species and genus. In the 5 years since 1987 we received an additional 186 accessions. We can increase about 80 accessions each summer. Unfortunately, about 30 to 50 percent must be grown a second year due to poor plant performance, environmental stress, and other factors.

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 1970's. (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 thoroughly complete her review

of the taxonomy/identification of the NPGS Cucurbita collections. Laura will provide the Cucurbit CAC and each curator with a report concerning her findings by the 1993 CAC meeting in Fort Collins, CO in June.

Evaluation:

#/% evaluated and significant progress: None, but in 1991 M. Kyle at Cornell University began evaluating Cucurbita spp. for resistance to gummy

stem blight. No additional work has been done in 1992 (she is focusing on the Cucumis melo collection at this time.)

Enhancement:

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

DAUCUS

Acquisition:

New accessions received--We received a total of seven new accessions from the USSR in 1992.

Status: 570 PI-numbers, 193 Ames-numbers, 763 total.

Maintenance and distribution:

#/% available for distribution--As of January 1993, 454 (60%) of 763 accessions are available for distribution.

#/% distributed--In 1992, 636 packets (427 accessions, 56% of the collection) were shipped for a total of 15 orders. Of the 636 packets distributed, 621 were sent as domestic requests and 15 packets as foreign requests.

#/% duplicated at NSSL--This year 123 accessions of Daucus were duplicated at NSSL. A total of 280 accessions (37%) is duplicated at NSSL. Many accessions could be duplicated, but the percent germination on all of the accessions is considered too low by NSSL's standards.

#/% regenerated--Fifty-nine accessions were planted in 1991 for regeneration in 1992 summer cages. Seed processing of the 1992 increases has not been completed. Many accessions did not begin flowering until late August and early September, so harvests were poor. Much of the harvested seed is green and immature due to the short growing season and few heat units accumulated during the summer. Ten accessions were sent to Roger Freeman, Sun Seeds, Brooks, Oregon for increase in 1992. Also, 5 accessions were sent to Larry Baker, Asgrow Seed, Sun Prairie, Wisconsin for increase in 1992. Forty-three accessions of Daucus were started in November 1992 for the 1993 summer increase cages.

#/% tested for germinability/viability--Eighty-one accessions were germinated in 1992. These accessions included 1991 regenerations, and newly received accessions having sufficient quantities to be tested.

Significant progress--We have received 159 accessions since 1987. They are primarily biennial and it may take three to four years, at 50 accessions per year, to harvest enough seed to make these accessions available.

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 1970's. (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 note field for the miscellaneous umbels to record complete notes for all of the accessions received since 1984 (the last large planting for carrot notes).

Evaluation:

#/% evaluated--We have received evaluation data for Alternaria dauci and horticultural characteristics from Dr. J. Strandberg, Florida and. P. Simon, Wisconsin. Some of these data were entered into GRIN.

Significant progress--Drs. P. Simon and A. MacGuidwin are evaluating the collection for resistance to southern root knot nematode, and Simon is collaborating with our computer personnel to enter his evaluation data on GRIN in 1993.

Enhancement:

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

OCIMUM

Acquisition:

New accessions received: None

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

Maintenance and distribution:

#/% available for distribution--As of January 1993, 41 (55%) of 75 accessions are available for distribution.

#/% distributed--In 1992, 81 packets (41 accessions, 55% of the collection) were shipped in a total of 4 orders. Three packets were distributed as domestic requests, and 78 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--We are trying to regenerate accessions with open-

pollinated parentage or with low germinations. In 1990 and 1992, wilt reduced the yields in the increase cages. The 1991 harvest also contained many moldy fruits.

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 the information for entering onto 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.

PETROSELINUM

Acquisition:

New accessions received --We received 2 accessions from VIR in 1992.

Status: 132 PI-numbers, 15 Ames-numbers, 147 total.

Maintenance and distribution:

#/% available for distribution--As of January 1993, 63 (43%) of 147 accessions are available for distribution.

#/% distributed--This year 66 packets (63 accessions, 43% of the collection) were sent in 2 foreign requests.

#/% 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.

#/% 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 the 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 --One accession of Origanum was received.

Status

Genera included: Calamintha, Dracocephalum, Mosla, Origanum. 10 **PI-**numbers, 10 Ames-numbers, 20 total accessions.

Maintenance and distribution:

#/% available for distribution--Four accessions (20% of collections in the "mints" site-crop) are currently available for distribution.

#/% distributed--Three accessions (packets) were distributed for 3 total orders in 1992. Two accessions of Origanum and 1 accession of Calamintha were distributed.

#/% 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, as there is no enhancement

program in the vegetable crops at NCRPIS.

UMBELS

Acquisition:

New accessions received-- We received the following 81 new accessions in the **NC7-umbels** sitecrop: 1 Ammi, 11 Anethum, 1 Bifora, 1 Bunium, 3 Carum, 49 Coriandrum, 1 Eryngium, 2 Ferula, 5 Foeniculum, 1 Pastinaca, 1 Pimpinella, 1 Schumannia, 1 Torilis, 3 unidentified-Apiaceae.

Status:

The **NC7-umbels sitecrop** has 205 PI-numbers, 203 Ames-numbers, 408 total accessions. Genera included: Ammi, Anethum, Astrodaucus, Bifora, Bunium, Carum, Caucalis, Chaerophyllum, Coriandrum, Cuminum, Ducrosia, Eryngium, Ferula, Foeniculum, Levisticum, Muretia, Pastinaca, Pimpinella, Schumannia, Sium, Torilis, Trachyspermum, unidentified Apiaceae.

Maintenance and distribution:

#/% available for distribution--As of January 1993, 58 (14%) of 408 accessions are available for distribution.

#/% distributed--Of 182 packets distributed (67 total accessions, 16% of the collection), 96 packets were shipped for domestic requests, 86 packets for foreign requests, and 8 packets for domestic observation requests. Anethum was the genus distributed most frequently.

#/% duplicated at NSSL--Only 30 accessions (7%) are duplicated at NSSL. Due to low germinations, few accessions of these genera are duplicated at NSSL.

#/% regenerated--Fifty-two accessions of coriander were direct seeded, using the two-row planter, into the field for cage increase in 1992. This procedure worked quite well and I will use it again in 1993 for regeneration of additional coriander accessions, as well as some of the other umbels.

#/% tested for germinability/viability: None

Significant progress--There has been an increased interest in the miscellaneous umbels included in this sitecrop. We are trying to regenerate the coriander collection and have it PI-numbered by 1994. 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 make the reidentifications ourselves.

Evaluation:

#/% evaluated and significant progress--All 52 available accessions of Anethum were grown for essential oil evaluation by Dr. J. Simon, Purdue University. We have not seen the results of his evaluation yet.

Enhancement:

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

Meetings attended:

American Society for Horticultural Science (ASHS), Honolulu, HI, August 1-7, 1992.

Root and Bulb Vegetable Crop Advisory Committee, ASHS, Honolulu, HI, August 2, 1992.

Leafy Vegetable Conference, Monterey, CA, September 14-16, 1992.

Leafy Vegetable Crop Advisory Committee, Monterey, CA, September 16, 1992.

1992 Cucurbit Conference meetings included: National Cucumber Conference, Pickling Cucumber Improvement Committee, Pickle Seed Research Foundation, Cucurbit Genetics Cooperative, Cucumber Field Day (tour of cucumber research plots); Raleigh, North Carolina, September 20-23, 1992.

Cucurbit Crop Advisory Committee, Raleigh, NC, September 23, 1992.

Publications:

Widrlechner, Mark P., Larry D. Knerr, Jack E. Staub, and Kathleen R. Reitsma: "Biochemical evaluation of germplasm regeneration methods for cucumber, *Cucumis sativus* L." Plant Genetic Resource Newsletter, December 1991/March 1992, No. 88/89.

Other items:

In November of 1992, J. McCreight and J. Staub collected Cucumis germplasm in India. They collected 250 accessions of cucumbers, 400 + melon accessions, and a few accessions of Cucurbita, We have already received a few Cucurbita pepo accessions from them. I will attempt to increase all 250 cucumbers and 150 melons in the summer field cages. At the end of the summer, Staub and his students plan to visit the NCRPIS to complete characterization notes for the Indian material.

The Acting Plant Pathologist has continued researching bacterial disease in the melon collection. He, the Horticulturist, and I are writing a joint proposal with Dr. Aleš Lebeda of the Czech Republic to investigate this disease further.

Conclusions:

Seed cleaning of the 1992 harvest is progressing. I do not have counts of the successful increases for the year. I hope to start germinating the increase seed by April. I will need these data to determine which accessions to replant in 1993.

I plan to increase 650 Cucumis, 80 Cucurbita, 50 Daucus, 50 Coriandrum, 34 Cichorium, and 30 miscellaneous mints and umbels (to be paired with carrots in cages). This will be approximately 750 cages for this summer's field increases.

In general, the regenerations for 1992 were unsuccessful. The late frost on 26 May killed many of the Cucumis transplanted to the field. Total rainfalls of 0.92" in May, 0.73" in June, and over 12" in July did not allow the frost-damaged plants to recover (we irrigated cucurbits weekly in May and June). This was also the second coolest summer on record.

Bees were introduced to 78% of the cucumber cages, 35% of the melon cages, and 30% of the wild cucumber cages. Plants in all other Cucumis cages failed to produce female flowers or all of the plants died. Fruit production was late (August early September) with all of the cucurbits, and fruit set was poor on most accessions. The first frost was September 29, 1992.

We received several accessions of Cucurbita pepo that were misidentified. We will attempt to regenerate these accessions before we transfer them to the appropriate priority site.

K. Crucifers and Grasses (R. Luhman)

Acquisition:

In 1992 the NCRPIS logged into the GRIN database 144 new accessions of the site crops that I manage. The NCRPIS received Alyssum (1 from Kazakhstan), Brassica (2 from Canada, 1 from China, 2 from Denmark, 2 from Estonia, 1 from Germany, 1 from Honduras, 1 from Kenya, 1 from Sweden, 2 from Tanzania, 24 from the former Soviet Union, 3 from the Ukraine, and 2 from the United Kingdom), Echinochloa (1 from the former Soviet Union and 1 from the U.S.), Erysimum (1 from the U.S., 1 from Canada, 3 from Hungary, 1 from the former Soviet Union, and 2 from Germany), Iberis (1 from Kazakhstan), Isatis (1 from Germany), Lepidium (2 from Kazakhstan, 1 from Hungary, and 2 from Portugal), Linum (4 from Hungary, and 1 from Portugal), Matthiola (1 from Portugal), Panicum (1 from Portugal), Setaria (1 from Portugal), Sinapis (1 from Canada, 1 from Czechoslovakia, 2 from France, 1 from Soviet Georgia, 3 from Germany, 1 from Hungary, 1 from Portugal, 1 from Romania, 1 from Sweden, and 7 from the former Soviet Union), and Tridens (65 from the

U.S.). In 1992 we received 1000+ packets of Brassicaceae (mostly Brassica) seed from Dr. Paul Williams, University of Wisconsin. This material was collected by Dr. Paul Knowles in the 1970s and will be assigned local Ames numbers, or will be linked to current Plant Introduction numbers, after receipt of the original collection cards.

Maintenance and distribution:

Two 1982 quarantined Setaria accessions were given Plant Introduction numbers in 1992. These accessions originated from the University of Nairobi, Nairobi, Kenya.

About 50% of the accessions that I maintain have Plant Introduction numbers. 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 has been previously entered into the GRIN database, so seed and field comparisons are required to determine the validity of the information.

One thousand, eight hundred and forty-one packets of Brassica (1,028 accessions), 15 packets of Camelina (7 accessions), 416 packets of Crambe (106 accessions), 18 packets of Echinochloa (16 accessions), 128 packets of Eruca (122 accessions), 2 packets of Isatis (1 accession), 73 packets of Lepidium (50 accessions), 6 packets of Linum (6 accessions), 732 packets of Panicum (637 accessions), 739 packets of Setaria (715 accessions),and 59 packets of Sinapis (25 accessions) were distributed in 1992.

The 264 Crambe accessions received 1991 from the Crambe breeding program at New Mexico State University were transferred to the Crambe breeding program at North Dakota State University.

In 1992, duplicates of 61 Brassica accessions were sent to NSSL. At present, 33% of the total accessions and 65% of the PI'd accessions that this curator manages are duplicated at NSSL.

The 1992 Brassicaceae regeneration attempts totaled 131 accessions. We attempted to increase 119 Brassica accessions and 12 Lepidium accessions. One hundred and thirteen Brassica and 4 Lepidium accessions were harvested. An average of 168 plants per accession were planted in the greenhouse and 136 plants per accession were harvested. Seed parent contributions were equalized from 28 Brassica accessions. The 20 accessions that were not harvested either failed to germinate (Brassica) or failed to bolt (Lepidium). Those that failed to germinate may be inactivated.

The 1992 grass regeneration (410 accessions-381 field and 29 greenhouse) consisted mainly of Ames numbered material from India. We attempted to increase 166 Echinochloa, 186 Panicum, and 58 Setaria accessions. One hundred and fourteen Echinochloa, 130 Panicum, and 37 Setaria accessions were harvested. Weeds (18%), late flowering (5%), dead plants (2%), or no seed set (<1%) resulted in plots not being harvested. Poor vigor, weed

competition, European corn borer damage, and corn flea beetle damage contributed t,o a 47% stand reduction, resulting in an average of 45 plants per accession harvested. The accessions regenerated in the greenhouse included, in general, fewer than 5 plants per accession, Many of the accessions in the field were harvested after a killing frost, and seed may be immature.

The 1992 increase germinations and five year Brassica germinations were packaged during 1992. These germinations are currently underway and represent 1289 Brassicaceae inventories (1099 accessions) and 514 grass inventories (372 accessions).

Characterization/taxonomy:

For the 1992 Brassica increase, data were collected on flowering date, corolla color, silique arrangement, plant height, harvest date(s), and number of plants harvested. For the grass increase, data were collected on heading date, stem number, texture, and habit, leaf number and width, panicle length, width, and type, harvest date(s) and number of plants harvested.

The identifications of 78 Brassica herbarium specimens (68 accessions) were received in June 1992 from Dr. Neil A. Harriman, University of Wisconsin, Oshkosh. Update of GRIN records are proceeding. Forty-five accessions were given new species names, the identity of 16 accessions were verified, and updates for seven accessions are pending. Additionally, two new Plant Introduction numbers were received for accessions that were species mixtures.

A study (in cooperation with Dr. Richard Wilson-Research Entomologist) examined various pollinators for Brassica and revealed no significant differences in seed set by plants in cages with bees, flies, bees and flies, and no pollinators. The lack of significant differences may be attributed to a high degree of selfing and/or a lack of pollinator activity during the unusually cool summer of 1992. We will continue to investigate various Brassica pollinators in future years.

***Meetings** attended:*

I attended the Crucifer Crop Advisory Committee meeting (in conjunction with the Crucifer Genetics Workshop) at Oregon State University in February of 1992. The main points of the meeting were:

The Knowles subset Brassica collection will be transferred from the Crucifer Genetics Cooperative to the NCRPIS.

All crucifers should fall under the Crucifer Crop Advisory Committee.

Non-USDA Brassicaceae collections were discussed.

It was recommended that the USDA provide support for a post-doctoral position to work in Dr. Paul Williams's lab to help determine where gaps exist in the collection.

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

The need for crucifer evaluations was discussed and emphasis was placed on evaluations relating to biotic and abiotic stresses.

The next meeting will be held in Saskatoon, Saskatchewan in July of 1993.

I attended the Forage and Turf Grass Crop Advisory Committee meeting in Minneapolis, Minnesota in November of 1992. This meeting was in conjunction with the ASA-CSSA-SSA meetings. The main points of the meeting were :

The status of Arvid Boe's (South Dakota State University) Andropogon gerardii (big bluestem) collection was discussed.

It was decided that two Soil Conservation Service staff members should be members of the Forage and Turfgrass CAC.

Publications:

A poster titled Genetic Diversity for Development of Alternative Crops in Iowa was presented at the 1992 Leopold Center for Sustainable Agriculture Conference (in cooperation with Kathy Reitsma-Vegetable Curator and David Brenner-Amaranthus **Curator)** .

The 1993 winter/spring seed processing activities will include processing and storing the 1992 grass and Brassicaceae increase.

The 1993 field regeneration will include 250 Brassica accessions, as many as 500 grass accessions, and as many as 100 Crambe accessions. Forty-eight cages will be used for an experiment involving alternative Brassicaceae pollinators.

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

With appreciation for the capable, steady, and essential efforts of all four crew members: crew leader Todd Vens, Bradley Marcus, Sunil Magavi, Jeremy Aho, and Julia Grubbels. Important seed inventory assistance was provided by Lisa Burke.

AMARANTHUS: 3147 accessions

Acquisition and inactivation:

Fourteen accessions were acquired, including seven pollen sterile accessions developed at the NCRPIS. Ninety-five accessions were inactivated due to duplication within the collection.

Maintenance and distribution:

1992	#	% of collection
Accessions available for distribution	1176	37
Seed orders	44	NA
Packets distributed	877	NA
Accessions distributed	400	13
Accessions duplicated at NSSL	556	18
Accessions regenerated in 1992	239	8
Accessions germinated	123	4

More greenhouse space was available than in other years because the sunflower project was inactive. However, as in other years, shortage of greenhouse space was the main limit to the number of seed increases achieved.

Our greenhouse methods were improved and expenses lowered by omitting the peat pots from plastic flats. Water dispersal is now more uniform. Larry Lockhart first suggested this improvement.

The field plantings grew well despite dry weather after transplanting on **May 29.** Seed dormancy in 12 A. cruentus accessions from Africa resulted in low population sizes.

An experimental planting of five A. hypochondriacus accessions was evaluated for the percentage of successful plants using the bagged head (SELF) pollination control method. Late blooming is the main difficulty. One accession had more than 90% of individuals with good yields. Four accessions had fewer than 60% of plants with good yields. On the basis of this information, I will continue to plant A. hypochondriacus in the field if there is ample original seed. In some cases, poorly-adapted accessions should be left in the field and not harvested because any harvest would under-represent the late blooming individuals. The SELF pollination method is well suited to A. cruentus accessions; each of eight accessions had high yields from more than 90% of individuals.

An experimental test of our greenhouse pollen isolation tents was performed using the green seedling stem genetic marker. Green-stemmed PI 482049 was planted with red-stemmed PI 477914 on three sides. The harvest from the green-stemmed accessions had 0.042 percent red stems, compared with 6.98 percent when the accessions were planted together in the same tent. This small percentage of contamination suggests that these methods effectively isolate Amaranthus accessions.

Characterization/taxonomy/evaluation:

A set of three overlapping test arrays were selected for frequent distribution, These arrays are: 37 grain accessions, 30 vegetable accessions, and 61 taxonomically diverse accessions. These test arrays include most the plant types in the collection, and therefore may be a representative sample for screening projects.

Dr. Richard Spjut of the USDA taxonomy lab in Beltsville, Maryland prepared a new key to the species of Amaranthus. His species concepts differ from those previously used. I will wait for a his treatment's publication before applying his taxonomic ideas.

Enhancement and/or utilization:

A new source of pollen sterility was identified that could be used to produce well-adapted F, hybrids. Unlike our other male sterile accessions, these pollen steriles are from a temperate adapted cultivar (K343). Seven pollen-sterile lines (Ames 20090 to 20096) were selected from a planting of black seeds. These accessions have mixed seed colors. The pollen sterility was expressed in the following generation at approximately 10%. The next steps are to look for cytoplasmic inheritance, and to make crosses with the male steriles that result in useful hybrids.

Preliminary crosses were attempted to develop grain types with reduced shattering (D. Brenner and H. Hauptli 1990 Legacy 3:2-3). Plants of the F_2 generation did not have the reduced shattering that was expected. The F_2 and F_3 generations will be further evaluated with larger population sizes.

Promising accessions:

Ames 18058 A. cruentus was collected in a backyard in Ames, Iowa but originated in Kerala, India. This vegetable landrace is vigorous, mild flavored, and has very intense red coloring.

Plans:

I will edit the third issue of Legacy which will be published in the spring of 1993.

I am seeking an automated greenhouse watering system that is more sophisticated than the present system of soaker hoses. The new system should be adjustable at individual flats.

CELOSIA 19 accessions

Acquisition: None

Maintenance and distribution:

1992	#	% of total number of accessions
Accessions available for distribution	5	26
Seed orders	1	NA
Packets distributed	9	NA

Accessions distributed	9	47
Accessions duplicated at NSSL	0	0
Accessions regenerated in 1992	14	14
Accessions germinated	2	11

Four accessions set seed successfully in cages with bee pollination. One accession (Ames 14960) grew vigorously, but flowered too late to mature seed. Nine accessions had poor germination.

Correspondence with the Ornamentals CAC resulted in a seed order from Pan-American Seed Co. They will plant most of our collection to search for novel ornamental types.

Plans:

Viable Ames numbered accessions should be assigned PI numbers. The three Celosia accessions misidentified as Amaranthus should be corrected,

CHENOPODIUM (134 accessions)

Acquisition: Four accessions from Mexico, India, and the United States were acquired.

Maintenance and distribution:

1992	#	% of total number of accessions
Accessions available for distribution	25	19
Seed orders	10	NA
Packets distributed	41	NA
Accessions distributed	28	21
Accessions duplicated it NSSL	23	17
Accessions regenerated in 1992	6	4
Accessions germinated	0	0

Of six accessions planted, four did not germinate or germinated rarely.

Delayed seed maturity in the cool (winter) greenhouse could be attributed

to ammonium-based Osmocote fertilizer. In cool temperatures, below 70° F, microbes can not convert ammonium fertilizer to a form that plants can use. We will secure nitrate based fertilizer for use in cool greenhouse conditions.

Sarah Ward, a graduate student at Colorado State University has new unpublished data on wind dispersal of C. quinoa pollen. The pollen does not disperse as far as expected. Based on her information and some compatible advice from Dr. N. Simmonds, we could remove only the tops of amaranth pollination tents and improve ventilation, and still control pollen flow adequately.

Characterization/taxonomy/evaluation: Dr. H. Wilson, at Texas A&M University will identify four accessions.

CORONILLA, **DALEA,** GALEGA, and **MARINA** (156 accessions)

Acquisition:

Three accessions were acquired, including 2 wild annual Coronilla

Maintenance and distribution:

1992	#	% of total number of accessions
Accessions available for distribution	57	37
Seed orders	12	NA
Packets distributed	38	NA
Accessions distributed	23	15
Accessions duplicated at NSSL	3	2
Accessions regenerated in 1991	1	1
Accessions regenerated in 1992	15	10
Accessions germinated	3	2

Nine Coronilla accessions planted in 1990 yielded very well under open pollinated conditions. Most seed production came from June flowers, although blooming continued until frost. Two previous years of controlled pollination resulted in inconsequential yields.

The 1990 field plantings of four perennial D. enneandra accessions were open pollinated in 1992, and seed set was low. This follows two years of unsuccessful controlled pollination. We might lack a specialized pollinator or some other requisite for good seed set. We will open-pollinate again in 1993, with the hope that conditions will improve. It might not be possible to regenerate this germplasm, but it can be recollected in Nebraska.

A **G.** orientalis perennial planting suffered greatly from leaf hoppers. Flowering was better than in other years, and we harvested a few seeds.

Characterization/taxonomy/evaluation:

Missing passport data for nine Dalea accessions was recovered from the herbarium at the University of Arizona, Tucson, where the collector, Dr. H.S. Gentry, had deposited records.

Plans:

We will try pollinating the C. varia in early June with honey bees in cages. This might improve the late season pollination that was not successful in 1990.

MELILOTUS (793 accessions)

Acquisition:

Twenty-three new accessions, mostly of wild material, were acquired from USDA collections by Dr. Mel Rumbaugh of USDA/ARS at Utah State University.

Maintenance and distribution:

1992	#	% of total number of accessions
Accessions available for distribution	508	64
Seed orders	6	NA
Packets distributed	151	NA
Accessions distributed	121	15
Accessions duplicated at NSSL	228	29
Accessions regenerated in 1991	50	6
Accessions germinated	39	5

No Melilotus accessions were planted in October, 1992 for harvest in 1993. Skipping a year of seed increases allows me to spend time organizing this collection. The seeds from Herman Gorz must be integrated into the collection before I can choose what to plant. Organizing the collection is the highest priority for 1993. It will require approximately three week's labor.

I am writing a short paper about pollination and maintenance of Melilotus germplasm for the Plant Genetics Newsletter.

Characterization/taxonomy/evaluation:

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

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

PERILLA (17 accessions)

Acquisition: One accession was acquired.

Maintenance and distribution:

1992	#	% of total number of accessions
Accessions available for distribution	15	88
Seed orders	0	NA
Packets distributed	0	NA
Accessions distributed	0	0
Accessions duplicated at NSSL	12	71
Accessions regenerated in 1991	1	6
Accessions aerminated	0	0

Characterization/taxonomy/evaluation:

Seventeen accessions were grown in a randomized field planting to secure vegetation samples for an aromatic compounds study by Dr. James Simon of Purdue University. I also recorded maturity: eight accessions matured seeds before frost, and nine did not.

Plans:

We will perform a 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 a course during the fall semester at Iowa State University: HORT 332 Greenhouse Management and Structures.

I edited the 1992 issue of Legacy, the official newsletter of the Amaranth Institute.

I assisted the Amaranth Institute by serving as recording secretary at board meetings, and by arranging for the printing of "Amaranth is coming..." bumper stickers.

Professional meetings attended:

Clover and Special Purpose Legume, Crop Advisory Committee meetings with the 12th Trifolium Conference in Gainesville, Florida, March 25-27, 1992, and with the American Society of Agronomy, Minneapolis, Minnesota, November 1, 1992

1992 Amaranth Institute Annual Meeting, Fargo, North Dakota, August 21-22, 1992

New Crops, Crop Advisory Committee meeting with The Association for the Advancement of Industrial Crops, St. Louis, Missouri, October 4-6, 1992

Publications and presentations:

Brenner, D. The Plainsman Story. 1992. Legacy 5(1):12-13.

Brenner, D. Perilla Germplasm at the North Central Regional Plant Introduction Station. Poster presented at the meeting of the Association for the Advancement of Industrial crops, October 4-6, 1992.

Luhman, R. K. Reitsma, and D. M. Brenner. Genetic diversity for development of alternative crops in Iowa. Poster presented at The Annual Conference of the Leopold Center for Sustainable Agriculture, February 18-19, 1992.

Germplasm Botany of Fruit Crops in Northern Pakistan. Presented in the Iowa State University, Botany Department seminar series, February 21, 1992.

Perilla Uses and Genetic Resources in: Proceedings of the second National Symposium on New Crops (manuscript accepted for publication)

Brenner, D. and Monlin Kuo. Fiber and Pulp Properties of an Amaranth. Amaranth Newsletter (manuscript accepted for publication)

M. 1992 Seed Storage report (L. Burke)

Calendar:

1/2/92 The inventory of maize that Delbert Lutjen and I started in November of 1991 was continued.

1/6/92 We stored **maize** and started inventorying original Melilotus seed received from H. Gorz. The curator, Dave Brenner, and I decided to postpone the inventory of the seed until the documentaion was complete and the main collection of Melilotus was examined and seed increases stored.

1/16/92 We started storing increase **maize.**

2/3/92 Teresa Greenwood started working, 20 hours per week, in seed storage.

2/19/92 ISU anthropology class toured the greenhouses and seed storage facilities.

3/9 - 3/20 In cooperation with Dr. Roath and Bill Van Roekel, Cuphea seed was stored. Concurrently, the entire collection was reviewed, and seed removed for germination testing and duplication at the NSSL.

3/23/92 - 6/4/92 **We** started to store Brassica and remove seed for germination testing and to be duplicated at the NSSL. **We** began to clean and inventory old lots not previously reviewed. Rick Luhman composed computer sheets with all the pertinent information for storage of increase lots and disposal of old lots. These sheets made seed storage easier and his presence was not required, except to answer **some** questions.

6/4/92 - 6/9/92 We stored Celosia, Dalea, Perrila amd Coronilla, and removed seeds for germination testing and for duplication at NSSL.

6/10/92-7/6/92 We stored Beta in cooperation with Peter Lundeen. We reviewed the entire collection and removed seed for duplication at NSSL and for germination testing.

7/7/92-7/20/92 We stored Cucurbita pepo, in cooperation with Kathy Reitsma, and removed seed for duplication at the NSSL. We worked on original amaranth seed packets not previously inventoried. We sent the Tetragonalobus collection for study.

7/31/92 Teresa Greenwood's last day working at NCRPIS.

7/21/92-8/10/92 We stored Cucumis sativus, and seed for NSSL.

8/13/92-11/17/92 Kathy Reitsma worked with the Cucumis melo collection. She reviewed the entire collection, and removed seed to grow, test germinability and duplicate at NSSL.

8/24/92-9/27/92 The Daucus collection was reviewed for the first time since 1989. We removed seeds for most of the collection for germination testing and for duplication at NSSL.

9/14/92 Susan Day started working, 20 hours per week, in seed storage.

9/28/92-10/1/92 We stored Chenopodium, and removed seed for germination testing and for duplication at NSSL.

10/2/92 We started work with the amaranth collection. We stored the PI number increases and inventoried the uninventoried original germplasm received in 1984. We removed seed for germination testing and for duplication at NSSL.

10/29/92-11/4/92 We logged in the Martinson corn collection.

11/4/92 Susan Day's last day of work at NCRPIS.

11/16/92 Shane Love started working, 20 hours per week, in seed storage.

11/19/92 Kathy Reitsma started work with the Cucumis sp. collection.

Summary:

Approximately 1500 accessions were sent to NSSL for duplication. Most accessions were new to NSSL, but a few were sent to replace open pollinated lots currently at NSSL.

More than 1600 new accession lots, original seed, or seed increased elsewhere, were cleaned, inventoried and entered into GRIN.

Almost 600 seed orders (more than 15,000 packets) were filled by seed storage personal or by the curators, under certain circumstances, (orders for seed that has not yet been stored). Also, accessions for the inactive file were processed and deactivated.

During 1992, three staff members (part-time) were trained to fill seed orders, clean seed, and work with GRIN.

Irv Larson was also familiarized with GRIN while storing amaranth and maize

germination orders. There were several processes that occurred in seed storage in 1992 that were new to me. During the last several years, back-up seed had not been reviewed and sent to NSSL because they were building the new unit. So, removing and packing back up seed were new processes to me and, because Delbert Lutjen was not here, I relied on the curators for help. We also started entering the NSSL seed orders directly onto GRIN through order processing, which was not done in previous years. We also started to enter germination orders that were removed in seed storage onto GRIN directly, instead of just giving them to the curators.

Mark Millard printed shipping labels and bar code labels for the material for NSSL. Bar code labels will eventually be used regularly in seed storage.

I have been moving the crops from the old cold storage rooms into the new cold storage unit. The maintenace crew finished the shelves in the new cold storage unit so there will be plenty of room for the crops now located in the older units.