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Appendix 1B

PUBLICATIONS BY NC-7 RTAC REPRESENTATIVES, 1996-2001

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OHIO

Steve St. Martin

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David M. Francis

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Rich Pratt

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Kim Campbell

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Joe Scheerens

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Appendix 2

Table 7: CRIS Projects Utilizing Germplasm Resources in the NCR

Project Number	Project Title	Scientists/SY Time	State
KS287	INTRODUCTION, MULTIPLICATION, EVALUATION, UTILIZATION OF PLANT GERMPLASM	RIFE C	Kansas
ILLU-15-0325	PLANT GERMPLASM AND INFORMATION MANAGEMENT AND UTILIZATION	HYMOWITZ T	Illinois
ILLU-65-0350	INTRODUCTION, MAINTENANCE, EVALUATION AND UTILIZATION OF PLANT GERMPLASM	KLING GJ	Illinois
IND065014A	INTRODUCTION MULTIPLICATION EVALUATION PRESERVATION DOCUMENTATION ENHANCEMENT & UTILIZATION OF PLANT	JANICK J	Illinois
IOW03229	INDUCTION AND OPTIMIZATION OF BIOLOGICAL NITROGEN FIXATION IN TEMPERATE WOODY LEGUMES	GRAVES WR ISLES, JK	Illinois
IOW03703	PLANT GERMPLASM AND GENETICS FOR CROP IMPROVEMENT	LEE M HALLAUER AR BRUMMER EC FEHR WR GARDNER C ZIEGLER KEN	Iowa
MICL01222	PLANT GERMPLASM AND INFORMATION MANAGEMENT AND UTILIZATION	IEZZONI A SCHUTZKI R CAMERON A	Michigan
MO-PSSL0098	SOYBEAN AND TALL FESCUE IMPROVEMENT	SLEPER DA	Missouri
MO-PSSL0583	OVERCOMING OBSTACLES TO HANDLING WOODY PLANTS BARE ROOT	STARBUCK, CJ	Missouri

MIN-21-056	PLANT GERMPLASM AND INFORMATION MANAGEMENT AND UTILIZATION	PELLETT HM	Minnesota
NEB-12-072	INTRODUCTION OF COLLECTION, EVALUATION, ENHANCEMENT, MAINTENANCE & UTILIZATION OF PLANT GERMPLASM	ANDREWS, DJ VOGEL, KP BALTENSBERGER, DB	Nebraska
ND03622	PRODUCTION PRACTICES FOR SUNFLOWER AND MINOR CROPS	JOHNSON BL	N. Dakota
OHO00022	PLANT GERMPLASM AND INFORMATION MANAGEMENT AND UTILIZATION	FRANCIS DM	Ohio
SD00236-R	PLANT GERMPLASM AND INFORMATION MANAGEMENT AND UTILIZATION	BOE AA	S. Dakota
WIS03113	PLANT GERMPLASM AND INFORMATION MANAGEMENT & UTILIZATION	TRACY WF	Wisconsin
3611-21000-012-00D	ACQUISITION, MAINTENANCE, EVALUATION AND UTILIZATION OF SOYBEAN GERMPLASM	1.00 NELSON RANDALL L	Illinois
3611-21000-014-00D	NODULATION AND NITRATE METABOLISM EFFICIENCY OF LEGUMES	1.00 CLOUGH STEVEN J	Illinois
3611-21000-015-00D	MAIZE GENETICS COOPERATION - - STOCK CENTER	1.00 SACHS MARTIN M	Illinois
3602-21000-004-00D	IDENTIFICATION AND CHARACTERIZATION OF IMPORTANT DURING SEED DEVELOPMENT IN SOYBEAN	1.00 NIELSEN NIELS C	Indiana
3602-21220-007-00D	ENHANCING SOYBEAN SEED COMPOSITION PEST RESISTANCE	1.00 ABNEY THOMAS S 0.00 DUNKLE LARRY D	Indiana
3625-21000-028-00D	ENHANCING AGRONOMIC AND VALUE-ADDED TRAITS CORN GERMPLASM	1.00 POLLAK LINDA M 0.05 LEWIS LESLIE C	Iowa
3625-21000-029-00D	GENETIC CHARACTERIZATION, DEVELOPMENT AND HETEROSIS IN SOYBEAN GERMPLASM	1.0 PALMER REID G 0.05 LEWIS LESLIE C	Iowa
3625-21000-030-00D	DEVELOPMENT AND MAINTENANCE OF SOYBASE AND INTEGRATION WITH OTHER PLANT GENOME DATABASES	0.20 SHOEMAKER RANDY C 0.03 LEWIS LESLIE C	Iowa
3625-21000-031-00D	PLANT GERMPLASM AND INFORMATION MANAGEMENT	0.85 GARDNER CANDICE A 1.00 VACANT 1.00 BLOCK CHARLES C	Iowa

		1.00 WIDRLECHNER MARK P	
3625-21000-032-00D	QUANTITATIVE GENETICS AND GRAIN QUALITY OF CORN	1.0 LAMKEY KENDALL R 1.00 SCOTT MARVIN P 0.07 LEWIS LESLIE C	Iowa
3625-21000-036-00D	ENHANCING AGRONOMIC AND VALUE-ADDED TRAITS OF CORN GERMPLASM	1.0 VACANT 0.15 GARDNER CANDICE A	Iowa
3635-21000-009-00D	BREEDING SELECTION AND MOLECULAR CHARACTERIZATION FOR IMPROVED SUGARBEET GERMPLASM	1.00 MCGRATH J M 1.00 SAUNDERS JOSEPH W 0.10 HOSFIELD GEORGE L	Michigan
3635-21220-002-00D	TECHNOLOGIES FOR IMPROVED SELECTION AND EVALUATION OF RESISTANCE TO SUGARBEET DISEASES	1.00 HALLOIN JOHN M	Michigan
3635-21430-006-00D	IMPROVEMENT OF DRY BEAN FOOD QUALITY THROUGH TRADITIONAL PLANT BREEDING AND MOLECULAR TECHNOLOGIES	0.50 HOSFIELD GEORGE L	Michigan
3640-13210-002-00D	DEVELOP ALFALFA TO ENHANCE NITROGEN CYCLING AND PROTECT WATER QUALITY	0.40 LAMB JOANN F 0.30 RUSSELLE MICHAEL 0.15 VANCE CARROLL P 0.20 SAMAC DEBORAH A	Minnesota
3640-21000-015-00D	WILD RICE BREEDING AND GERMPLASM IMPROVEMENT	0.02 VANCE CARROLL P	Minnesota
3640-21000-017-00D	WHEAT GENETICS AND IMPROVEMENT	1.0 GARVIN DAVID F 2.0 0.20 VANCE CARROLL P 0.10 RINES HOWARD W	Minnesota
3640-21000-017-00D	WHEAT GENETICS AND IMPROVEMENT	1.00 GARVIN DAVID F 0.20 VANCE CARROLL P 0.10 RINES HOWARD W	Minnesota
3640-21000-018-00D	GERMPLASM EVALUATION AND GENETIC IMPROVEMENT OF OATS	0.90 RINES HOWARD W	Minnesota
3640-21220-015-00D	FORAGES FOR NEW USES, ENHANCED QUALITY, & STRESS TOLERANCE THROUGH GENOMICS AND GENETIC IMPROVEMENT	0.80 SAMAC DEBORAH A 0.60 LAMB JOANN F 0.10 JUNG HANS JOACHIM	Minnesota
3640-21220-016-00D	HOST RESPONSE GENE	1.00 BUSHNELL WILLIAM R	Minnesota

	EXPRESSION IN RUST, POWDERY MILDEW, AND FUSARIUM HEAD BLIGHT OF CEREALS	0.05 VACANT	
3640-21220-017-00D	POPULATION GENETICS OF CEREAL RUST FUNGI IN RELATION TO RACE-SPECIFIC AND NON-SPECIFIC RESISTANCE	1.00 KOLMER JAMES A	Minnesota
3622-21000-013-00D	LOTUS SPP. WITH IMPROVED PERSISTENCE	1.00 BEUSELINCK PAUL R	Missouri
3622-21000-016-00D	BREEDING FOR REDUCED LODGING AND SNAPPING, EVALUATION OF FOOD-GRADE CORN PERFORMANCE	0.55 DARRAH LARRY L 0.30 WILLMOT DAVID B	Missouri
3622-21000-019-00D	GENETIC MECHANISMS AND MOLECULAR GENETIC RESOURCES FOR CORN	1.00 MCMULLEN MICHAEL D 0.50 WILLMOT DAVID B	Missouri
3622-21000-020-00D	MODIFICATION OF SEED COMPOSITION FOR FOOD, AND INDUSTRIAL USES OF SOYBEANS	1.0 MIERNYK JAN A 1.00 KRISHNAN HARI B	Missouri
3622-21000-021-00D	ENHANCEMENT OF SOYBEAN SEED VALUE BY IMPROVEMENT OF PROTEIN, OIL, AND/OR NUTRITIONAL CONTENT	0.15 DARRAH LARRY L 1.00 VACANT 1.00 VACANT	Missouri
3622-21220-003-00D	HOST-PLANT RESISTANCE, BIOLOGICAL AND ECOLOGICAL STUDIES OF INSECT PESTS OF CORN	1.00 HIBBARD BRUCE E 0.30 DARRAH LARRY L 0.20 WILLMOT DAVID B	Missouri
5440-21000-016-00D	GENETIC IMPROVEMENT OF SORGHUM FOR FEED QUALITY AND AGRONOMIC FITNESS	1.00 PEDERSEN JEFFREY F 1.00 VACANT 1.00 VACANT	Nebraska
5440-21000-017-00D	GENETIC IMPROVEMENT AND EVALUATION OF WINTER WHEATS AND OATS	1.00 GRAYBOSCH ROBERT A	Nebraska
5440-21220-010-00D	DEVELOPING MGT STRATEGIES AND PLANT GERMPLASM TO IMPROVE GREAT PLAINS AND MIDWESTERN GRASSLANDS	1.00 VOGEL KENNETH P 1.00 VACANT	Nebraska
5440-21220-019-00D	GENETIC CONTROL OF VIRUS RESISTANCE IN WHEAT	1.00 STENGER DRAKE C 1.00 FRENCH ROY C	Nebraska
5442-21000-018-00D	SUNFLOWER GERMPLASM IMPROVEMENT THROUGH THE	1.0 VICK BRADY A 1.0 JAN CHAO C	North Dakota

	USE OF WILD SPECIES & CYTOGENETIC & BIOCHEMICAL TECHNIQUE	1.00 SEILER GERALD J 1.00 VACANT	
5442-21000-019-00D	ENHANCING WHEAT GERMPLASM THROUGH IMPROVED DISEASE RESISTANCE, QUALITY, AND AGRONOMIC PERFORMANCE	1.00 MILLER JAMES D 0.05 EDWARDS MICHAEL C 1.00 FARIS JUSTIN D 1.00 VACANT	North Dakota
5442-21000-021-00D	SUGARBEET ROOT MAGGOT BIOCONTROL GERMPLASM ENHANCEMENT & DISEASE RESISTANCE SELECTION STRATEGIES	1.00 CAMPBELL LARRY G 0.10 SUTTLE JEFFREY C	North Dakota
5442-21000-023-00D	GENOMIC RELATIONSHIPS AND GERMPLASM ENHANCEMENT OF WHEAT BY CLASSICAL AND MOLECULAR TECHNIQUES	1.0 JAUHAR PREM P 0.05 EDWARDS MICHAEL C	North Dakota
5442-21220-020-00D	DEVELOPMENT OF GENETICALLY DIVERSE, DISEASE RESISTANT SUNFLOWER GERMPLASM	1.00 MILLER JERRY F 1.00 GULYA JR THOMAS J	North Dakota
5442-21440-003-00D	OAT QUALITY IMPROVEMENT FOR FOOD, FEED, AND VALUE-ADDED APPLICATIONS	1.00 DOEHLERT DOUGLAS C 0.05 EDWARDS MICHAEL C	North Dakota
5445-21000-007-00D	DEVELOPMENT OF INTEGRATED AND SUSTAINABLE FORAGE-LIVESTOCK SYSTEMS FOR THE NORTHERN GREAT PLAINS	0.50 HANSON JONATHAN D 0.80 HENDRICKSON JOHN 0.30 LIEBIG MARK A 1.0 KARN JAMES F 0.20 KRUPINSKY JOSEPH 0.20 MERRILL STEPHEN D 1.00 BERDAHL JOHN D 0.20 TANAKA DONALD L 1.00 FRANK ALBERT B	North Dakota
3607-21000-006-00D	DEVELOPMENT OF SOYBEAN GERMPLASM AND SYSTEMS FOR HIGHYIELD & DROUGHT PRONE ENVIRONMENTS	1.00 COOPER RICHARD L	Ohio
3655-21000-024-00D	INTRODUCTION, CLASSIFICATION, MAINTENANCE, EVALUATION, DOCUMENTATION & UTILIZATION OF SOLANUM	1.00 BAMBERG JOHN B 0.10 SIMON PHILIPP W	Wisconsin
3655-21000-026-00D	POTATO GENETICS, CYTOGENETICS & PREBREEDING/ENHANCEMENT UTILIZING WILD & CULTIVATED SPECIES	1.0 HANNEMAN JR ROBERT E 0.05 SIMON PHILIPP W 0.00 HAVEY MICHAEL J	Wisconsin

3655-21000-027-00D	ALLIUM, CUCUMIS AND DAUCUS GERMPLASM ENHANCEMENT, GENETICS AND BIOCHEMISTRY	0.80 SIMON PHILIPP W 1.00 HAVEY MICHAEL J 1.00 STAUB JACK E	Wisconsin
3655-21430-006-00D	ANALYSIS AND CONTROL OF GENE EXPRESSION IN BARLEY TO INFLUENCE QUALITY AND PATHOGEN RESISTANCE	1.00 SKADSEN RONALD W 0.05 PETERSON DAVID M	Wisconsin
3655-21530-001-00D	IMPROVING THE NUTRIENT AND PHYTONUTRIENT STATUS OF OATS AND BARLEY	0.85 PETERSON DAVID M 1.00 VACANT	Wisconsin
3655-21630-002-00D	INTEGRATED CROPPING SYSTEMS AND NUTRIENT MANAGEMENT ON DAIRY FARMS	0.70 GRABBER JOHN H 0.40 SATTER LARRY D 0.28 MARTIN NEAL P 0.40 VACANT 1.00 VACANT	Wisconsin
IOW03703	PLANT GERMPLASM AND GENETICS FOR CROP IMPROVEMENT	LEE, MICHAEL HALLAUER, ARNEL BRUMMER, CHARLES FEHR, WALT GARDNER, CANDICE ZIEGLER, KENNETH	Iowa
IOW03229	INDUCTION AND OPTIMIZATION OF BIOLOGICAL NITROGEN FIXATION IN TEMPERATE WOODY LEGUMES	GRAVES, WILLIAM ISLES, JEFFERY	Iowa
MO-PSSL0583	OVERCOMING OBSTACLES TO HANDLING WOODY PLANTS BARE ROOT	STARBUCK, CHARLES	Missouri
NO-PSSL0098	SOYBEAN AND TALL FESCUE IMPROVEMENT	SLEPER, DAVID	Missouri
ND03622	PRODUCTION PRACTICES FOR SUNFLOWER AND MINOR CROPS	JOHNSON, BURTON	North Dakota

Appendix 3

**Table 1: Number of Accessions Distributed 1996-2001, Grouped by Curator
2001^a**

Sitecrop	1996	1997	1998	1999	2000	2001^a
Amaranth	238	186	1782	2482	451	603
Celosia	6	2	2	17	8	11
Legumes	7	19	16	32	13	7
Melilotus	654	18	154	254	554	49
Perilla	10	18	0	20	21	22
Quinoa	112	16	90	163	149	173
Spinach	218	253	309	332	348	354
Umbels	85	183	37	85	82	93
Asters	13	21	67	13	40	7
Sunflowers- cultivated	963	1025	903	1087	740	766
Sunflowers - wild	358	353	405	421	588	879
Flax - cultivated^b	0	0	62	163	118	223
Flax - wild	11	0	19	16	0	19
Brassica	765	941	1182	1123	862	405
Crucifers	308	280	134	227	66	268
Echinochloa	16	0	46	8	149	33
Grasses	1	4	9	1	0	6
Panicum	10	32	34	7	49	650
Setaria	164	224	51	26	757	19
Maize	2595	3060	2094	2684	10618	4386
Maize relatives	175	160	90	111	375	151
Chicory	72	18	39	115	52	175
Cucumis - cucs	911	456	175	1176	608	477
Cucumis - melo	761	995	627	806	603	397
Cucumis - wild	109	11	46	100	24	48
Cucurbita	12	29	99	135	363	156
Daucus	253	196	525	235	209	211
Ocimum	67	46	45	88	75	79
Parsnips	0	13	0	8	0	0
Cuphea	102	363	18	98	89	483
Euphorbia		11		2	37	1
Mints	11	18	46	8	35	42
Ornamentals	117	273	235	268	282	366
Totals:	9124	9224	9341	12311	18365	11559

^a as of Dec 6, 2001

^b Flax collection transferred to NCRPIS-1998

Table 2: NCRPIS Project Funding History
(in thousands)

Fiscal Year	Federal Funds	Regional Funds	In-kind ISU Funds	Total Funds	Fixed Costs Budget**	Disc.* Bud.
2001	1,668	532	327	2,528	1,714	814
2000	1,451	517	318	2,286	1,546	740
1999	1,300	495	312	2,106	1,506	600
1998	1,391	492	324	2,117	1,423	694
1997	1,134	478	319	1,931	1,399	532
1996	1,135	474	317	1,927	1,331	596
1993	1,272	449	265	1,986	1,158	828

Table 3: NCRPIS Research Support Agreement and Staffing History

Fiscal Year	No. Federal Employees	No. State Employees	No. RSA* FTE Employees	RSA Amount
2001	18.6	13	24.0	365,473
2000	15.6	12	16.6	300,000
1999	16.6	11	16.5	300,000
1998	17.1	12	22.0	302,203
1997	17.1	11	22.2	310,501
1996	17.4	11	20.8	286,198
1993	18.5	12	24.0	310,059

* RSA = Research Support Agreement; FTE= full-time equivalents (hourly labor)

Table 4: Plant Exploration Expeditions Involving NC-7 Personnel or Crops, 1996-2001.

Year	Country	NC-7 Crops	Collaborators
2001	Portugal*	Daucus, other	P. Simon, Univ. of Wisconsin T. Kotlinska, Poland
2000	Australia	Wild perennial Glycine	T. Hymowitz, Univ. of Illinois L. Craven, Australia
2000	Turkmenistan	Spinacia	D. Mamedor, Turkmenistan M. Dourikov, Turkmenistan D. Brenner, NCRPIS
2000	United States	Helianthus	M. Brothers, USDA, NCRPIS G. Seiler, USDA-ARS, Fargo, ND
1999	Ukraine	Ornamentals	M. Widrlechner, USDA, NCRPIS R. Shutzki, Michigan State Univ
1999	Greece, Turkey, Syria, Poland	Daucus, Cucurbita, Cucumis, Pastinaca	P. Simon, Univ. of Wisconsin T. Kotlinska, Poland
1998	Russia	Malus, Prunus	A. Iezzoni, Univ. of Michigan P. Forslin, USDA-ARS, Geneva, NY
1997	Taiwan, Quemoy Island	Wild perennial Glycine	T. Hymowitz, Univ. of Illinois L. Craven, Australia
1997	Russian Far East	Ornamentals	H. Pellet, Univ. of Minnesota G. Gates, Chicago Botanical Gardner D. Michener, Univ. of Michigan T. Yates, Holden Arboretum
1996	Australia	Wild perennial Glycine	T. Hymowitz, Univ. of Illinois A. Brown and J. Grace, Australia
1996	Kazakhstan	Malus, ornamentals	H. Pellett, Univ. of Minnesota P. Forslin, USDA-ARS, Geneva, NY

* Exploration Originally Planned for Portugal, Spain, and France, but denied access to Spain and France.

**Figure 1: Access to Plant Genetic Resources
for NPGS Plant Explorations (courtesy of Karen Williams, NGRL)**

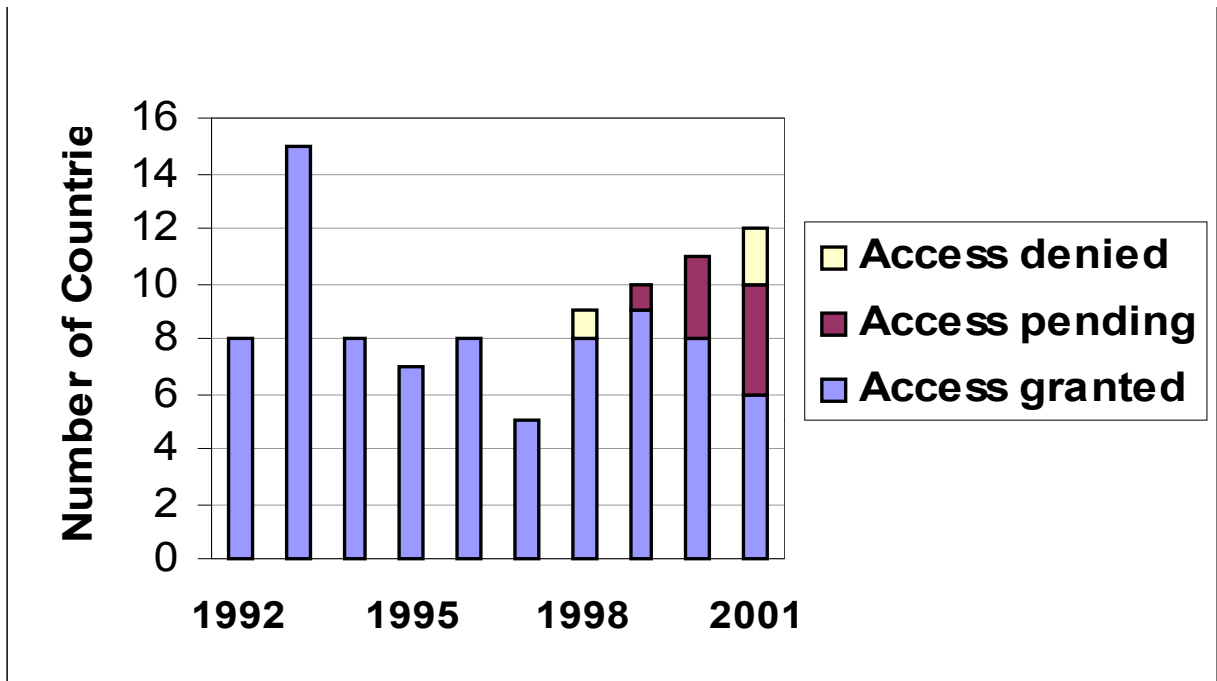


Table 5: NCRPIS Staffing Plan, 2001

Employee	Position	Funding Source
Brenner, David	Curator II (Amaranth)	Regional
Bruner, Stephanie	Field-Lab Tech II (Brassica)	Regional
Clark, Cindy	Field-Lab Tech II (Vegetables)	Regional
Crim, Gaylan	Field-Lab Tech II (Maize)	Regional
Crim, Lloyd	Equipment Operator III	Regional
Larry Lockhart	Farm Superintendent	Regional
Luhman, Richard	Curator II (Brassica)	Regional
Millard, Mark	Curator II (Maize)	Regional
Minor, Linda	Clerk III	Regional
Reitsma, Kathy	Curator II (Vegetables)	Regional
Schuermann, Jerry	Field-Lab Technician II	Regional
Reinhart, John	Farm Equipment Operator (1/2)	ISU
Golder, Nick	Computer Support Intern (1/2)	RSA
Arnold, Mary	Temp Biol Science Tech (Seed Storage)	Federal
Block, Charles	Plant Pathologist	Federal
Brother, Mary	Geneticist (Sunflower)	Federal
Burke, Lisa	Biol. Science Lab Tech (Seed Storage)	Federal
Gardner, Candice	Research Leader/Coordinator	Federal
Hanlin, Steve	Entomologist	Federal
Kovach, David	Biol. Science Tech (Physiology)	Federal
Larsen, Irvin	Biol. Science Tech (Sunflower)	Federal
McClurg, Sharon	Agri Sci Res Tech (Entomology)	Federal
McCutcheon, Cindy	Office Automation Clerk (1/2)	Federal
Ovrom, Paul	Agri Sci Res Tech (Ornamentals)	Federal
Pfiffner, Lisa	Temp Biol Science Tech (Maize)	Federal
Stebbins, Robert	Germplasm Program Assistant	Federal
Van Roekel, Bill	Agri Sci Res Tech (Pathology)	Federal
Widrechner, Mark	Horticulturist	Federal
Wilson-Voss, Lori	Supervisory Program Assistant	Federal
Winter, Stacey	Office Automation Clerk	Federal
Vacant	Biol Science Tech (Germination Testing)	Federal
Duvick, Susan	Plant Biologist (GEM Quality Traits Lab)	Federal
Shen, Mack	Acting GEM Data Manager	RSA
Vacant	GEM Geneticist/Coordinator	Federal
Vacant	Agri Sci Res Tech (GEM)	Federal

Table 6: Greenhouse Resource Needs Summary

Crop	Backlog No. Accessions	Sq Ft Required Per Accession	Sq Ft Needed Annually for 10 Yrs	Current Sq Ft Available
Amaranth curation	0	6	600	
Amaranth research/breeding	0	180	240	
Legumes	130	11	1560	
Celosia	20	6	120	
Melilotus	240	6	2880	
Umbels - annual	140	2	280	
Umbels- biennial	230	2	460	
Umbels - perennial	140	6	1680	
Subtotal			7820	2000
Pathology	0		1100	
Subtotal			1100	1200
Maize- temperate	1900	50	4400	
Maize - tropical	1400	85	14000	
Maize- teosintes	165	85	6800	
Subtotal			25200	1800
Ornamental - woody NC7 Trials	0	13	675	
Ornamental - woody	1350	13	1890	
Ornamentals - herbaceous/med.	630	2	126	
Ornamentals - Rumex/Thalictrum	50	10	55	
Subtotal			2746	2000
Sunflower - cultivated	20	260	520	
Sunflower - perennial	470	65	7050	
Sunflower - wild	500	150	100	
Sunflower - Vernonia	175	2	1170	
Subtotal			8840	700
Vegetable - Chicorium	15	400	800	
Vegetable - Cucumis	1400	100	14000	
Vegetable - Cucurbita	160	900	16000	
Vegetable - Daucus	700	16	1610	
Vegetable - Ocimum	15	350	800	
Vegetable - Pastinaca	80	3	240	
Subtotal			33450	2100
Millet	296		150	
Brassica	373		750	
Crucifers	455		375	
Wild Flax	139		232	
Subtotal			1507	1200
Cuphea	170		1020	
Euphorbia	80		240	
Subtotal			1260	400
Entomology	0		1100	
Subtotal			1100	200
Grand Total			81763	11200

Appendix 4

Report to the
United States Department of Agriculture
Agricultural Research Service

Program Review
Of the

NORTH CENTRAL REGIONAL PLANT INTRODUCTION STATION

Ames, IA

April 11-13, 2001

Introduction

This report presents the findings and recommendations of the 5-member team assembled to conduct an on-site program review of the North Central Regional Plant Introduction Station (NCRPIS) Ames, Iowa, April 11-13, 2001. The review was aided by the presence of resource personnel representing USDA – ARS, Iowa State University (ISU), as well as key administrators from ISU. We appreciated that the ARS scientists, curators and technical staff of the NCRPIS participated throughout the entire review process, from presenting overviews, to being available to answer questions and provide further insights. For reference, members of the review team, resource persons and participating ISU administrators are listed in Appendix I.

For those less familiar, the mission of the NCRPIS is to conserve plant genetic diversity efficiently and effectively, and to encourage the use of that diversity in basic scientific inquiry and crop improvement. The mission statement of the NCRPIS involves germplasm acquisition, maintenance, characterization, evaluation and enhancement, focused around specific collections. The NCRPIS is a principle component of the National Plant Germplasm System (NPGS) as a site for collections of cross pollinated germplasm, most of which require controlled pollination.

The statements made by key ISU administrators during the review made it clear that the NCRPIS is a valued program activity that interfaces well with many on-campus research activities. This view is reinforced by the high level of support that the university provides for NCRPIS in the form of offices, laboratories, land and other in-kind support.

The review team was provided with an overall review and analysis of all elements of the NCRPIS program, including an evaluation of the staffing, space and land limitations/concerns, and a technical overview of the individual collections that are located at this site. Given the magnitude and scope of the program at the NCRPIS, the review and preparation of the exit report in the allocated timeframe proved to be a challenging task for the team. We chose, however, not to review or focus directly on the individual collections and the curatorial activities, leaving that to the Crop Germplasm Committees (CGC's), who by their very nature are more intensively involved with the collections. This is a task best left to the CGC's. The team instead used its time to address what it considers the larger, more global issues that face the NCRPIS in the hopes of being able to focus on issues that will require attention and commitment in both the short and long term, and to be able to do so in a candid fashion. It is our intent to assist the NCRPIS address critical issues that will require the attention of USDA National Program Staff, ISU administrators and the regional research directors. We hope our recommendations will assist the NCRPIS to continue to grow and meet its goals and missions.

The review team was impressed with the many strengths and positive aspects of the NCRPIS. Clearly, the NCRPIS makes many valuable and lasting contributions to ISU, and to the regional collaborating universities and scientists in both the public and private sector worldwide. The educational opportunities provided by NCRPIS for undergraduates at ISU are a major contribution. We appreciated hearing from the leadership team of the College of Agriculture, the Vice Provost for Research, and affiliated department chairs and unit leaders of the importance of the NCRPIS to the programs they direct. Each indicated an understanding of the mission and goals of the NCRPIS and its expressed value. Having said this, some concentrated effort should

be given to attempting to catalogue the long-term value to campus programs, as a result of having ready access to this collection. The benefits of the NCRPIS collections to research and the region's economic development may be difficult to characterize but should be investigated to the extent possible.

We would also like to thank the ISU College of Agriculture and the Iowa Agricultural and Home Economics Experiment Station for their verbal commitments to the long range land use agreements that allow the NCRPIS access to farm resources. Without this commitment, the NCRPIS would find it difficult to meet its stated mission and goals.

We also want to applaud the ARS scientists, curators and technical staff at NCRPIS for their commitment to excellence and quality. Without hesitation the entire staff expressed and demonstrated this commitment. Uniformly, the review team applauded the effort to achieve the highest quality of service throughout the mission of the center, from acquisition, maintenance, and preservation to enhancement of the collections. Such dedication is difficult to find today. We also note the concern that the staff faces as they attempt to better understand the reality of needing to increase the level of perceived scholarship in the face of the stated mission and goals of the unit. While expressing the need to find this balance, there is still a total commitment to the mission. We recommend that the leadership at ISU recognize fully this strong commitment to service and its impacts to programs on campus and beyond, and note this in words and action.

Special recognition is due the curators. Each of these individuals is clearly devoted to the mission of the NCRPIS. Their dedication is clear and unwavering. Each is to be applauded for their participation and leadership in the CGC's and for seriously implementing CGC recommendations. We would, in light of this commitment, like to encourage the curators to think more seriously about seeking to be recognized for their contributions as co-authors in the work of scientists that use the collections. As a review team, we believe that most scientists would look favorably toward recognizing the curators for their role in research efforts where there has been a clear intellectual contribution and collaboration. We also would like to recommend that every effort be given to assisting in every possible manner the travel needs of the curators so that they can work to enhance the collections through collaborations and collection activities.

While on the subject of the curators, we would like to make mention of IT activities within the NCRPIS. The station has made major investments in IT. This commitment to IT must remain a priority. We also applaud the effort to integrate the IT responsibilities among the curators.

We would also like to recognize the NCRPIS for the strong internal mentoring and collaborative efforts. It was evident that the ARS scientists, curators and technical staff work as a team, sharing ideas, always seeking the means to improve the functionality of the station and hence the collections, while meeting an ever expanding mission. The ownership that the entire staff exhibits toward the mission of the NCRPIS should be applauded.

As a review team we would also like to encourage the campus to consider the collections in the same fashion you recognize the library, that is, a valued resource for students and scholars. The NCRPIS is a working collection that underpins and adds strength and resources to the plant sciences, genomics, plant breeding, and further value adding/utilizing efforts on campus and

beyond. The impact on programs is enormous. Several of the departments / centers on campus would be enormously hindered in their work if they did not have access to this collection. Conversely, many do not utilize or fully recognize the value of the collections in expanding their work. We encourage those who are in positions of authority to fully grasp the unique nature of the NCRPIS, which by its very nature is involved in descriptive work, work that is considered as service, but is critical to the full exploitation of the plant science research agenda that is shaping the campus.

Lastly, the review team believes that the NCRPIS can and will play an increasing role in Iowa's and the region's economic future as the biotech industry grows. These industries should find the unique germplasm in the collections invaluable. As Iowa focuses more attention on the expanding economic development in the direction of biotechnology, the uniqueness of the NCRPIS should be highlighted and exploited.

Issues and Recommendations

I. Program

A. Collection Regeneration

Seed regeneration is a vital component of plant germplasm maintenance and utilization. NCRPIS regenerates mostly outcrossing and heterogeneous species. It has been a tremendous effort to bring the number of the accessions available to nearly 70% of the current holdings (47,000). There are two types of regeneration: insect-mediated pollination and labor intensive, artificial pollination. It is known that the cost of pollination varies according to species and some can be quite expensive (>\$300 in case of insect-mediated pollination). As new accessions are acquired, more regeneration work will be required.

Recommendations:

- The NCRPIS should seek to acquire the resources required to remove the regeneration backlog for all species that it maintains.
- The station should participate at all levels to achieve the inter-institutional collaborations that will help alleviate the regeneration backlog. This is especially important for germplasm that is not adapted to the NCRPIS regeneration site.
- Where possible, regeneration costs for each species should be estimated so that long-term maintenance costs will be understood.
- Priority should be given to continuing research into efficient methods of regeneration that maintain the fidelity of the accession.

B. Germplasm Enhancement of Maize (GEM)

Germplasm enhancement of maize (GEM) is a public and private cooperative effort to utilize elite sources of Latin American maize germplasm for increasing U.S. maize crop production and genetic diversity. GEM utilizes industry proprietary lines and elite exotic germplasm sources to create new germplasm sources that are enhanced for direct and indirect uses by U.S. breeders. It has championed a modern germplasm enhancement strategy involving the user community. GEM has been coordinated through the USDA-ARS Corn Insects and Crop Genetics unit of

ARS. GEM has already generated an impact on the corn breeding community in the U.S. It also has tried to create new allies with other international participants. At this stage, the coordination role of GEM will be transferred to NCRPIS.

Recommendations:

- The review team believes that the moving of the GEM project to NCRPIS is appropriate due to potential synergies in the coordination of GEM and the NCRPIS mission of active corn germplasm management and utilization from a long-term perspective.
- The review team is, however, concerned that the GEM activity not have a negative impact on the resources needed for NCRPIS to continue its primary and longstanding mission and, therefore, urges that GEM be funded at a level that fully meets its needs.

C. Molecular Characterization Data and Germplasm Management:

A consistent concern among the curators and scientists is the impact that molecular tools can have on germplasm characterization, enhancement and utilization. Molecular tools have considerable potential for use in germplasm screening and/or characterization aiming at germplasm enhancement and use. They are powerful tools to collection management in many ways, through maintaining the genetic fidelity of the accessions and finding duplicates within the collection(s). The dilemma faced by the NCRPIS is that of obtaining useful molecular information has a reasonable economic cost, and depending on how the characterization is accomplished, may result in another demand on the curator's time.

Recommendations:

- Molecular approaches should be implemented when it is clear that the information will be useful for specific management objectives and germplasm utilization. The expectation of the stakeholders in using the technologies should be carefully analyzed through a cost-benefit analysis, considering the genetics of the crop concerned.
- The review team recommends not hiring a molecular biologist at the current time, but rather we recommend a multifaceted approach be used in the gathering of molecular characterization data on the collections. We also recognize that there are different models and approaches that NCRPIS is using and can use to obtain this type of data. The multi-faceted approach that we suggest might include some or all of the following approaches.
 1. Partnering with academic sector scientists who are involved with molecular characterization work on specific germplasm of interest to the NCRPIS. This is now occurring with the *Daucus* and *Cucumis* collections.
 2. Partnering with industry scientists with similar interests in the germplasm collections.
 3. Partnering, for example, with ISU molecular biologists interested in high throughput technologies and genomics.
 4. At times the desired data may not be available through partnerships, such as those described above. In these cases we recommend that NCRPIS staff expertise in marker technology could be used to characterize collections. It is important that negative effects on any curatorial efforts be minimized.

5. As a last resort, there may be occasions where it may be cost effective to purchase or contract for the molecular characterization data.

In any event, the NCRPIS staff should be opportunistic in its approaches to capturing molecular data on the collections.

D. Entomology

The review team made note of the fact that the category one entomologist recently retired. The team stresses the importance of entomology research to the mission of NCRPIS, but did not think that it was a priority, given other needs, to fill this position in the near future. We believe that there are other opportunities that will allow the NCRPIS to meet its entomological needs as they relate to the collections.

Recommendations:

- The review team recommends that entomology expertise be gained by partnering and collaborating with ISU entomologists, the USDA-ARS Corn Insects and Genetics Unit, or entomologists in the private sector.

E. New Crops - Nutraceuticals:

The review team recognized the current efforts in curating and enhancing species with potential as new crops and crops with pharmaceutical properties. We perceive this as adding invaluable crop genetic resources to NCRPIS.

Recommendation:

- The review team recommends that the NCRPIS capitalize on its leadership position and available expertise to continue these efforts.

F. Partnerships and Collaborations:

The review team believes that the NCRPIS is an important resource for the plant sciences at ISU. Likewise, expertise on campus can assist the NCRPIS in meeting its mission and goals. Efforts to expand the collaborations should receive a high priority.

Recommendations:

- As a team, we strongly endorse the efforts of the NCRPIS staff to increase collaborations with ISU faculty and the USDA-ARS Insect and Crop Genetics Unit. This effort should be extended to the ISU Plant Science Institute and the Centers that comprise the Institute.
- To increase collaboration, the review team recommends that the NCRPIS staff at all levels become more active in the academic life of the University and whenever possible showcase NCRPIS resources and accomplishments.

II. Facilities

The number of available accessions in the various crop collections continues to increase. In several crops the major impediment to regeneration is the serious lack of adequate greenhouse facilities to handle the unique requirements for regenerating accessions. Without additional greenhouse space that will allow the curators to address the regeneration issue, the possible loss of the accessions could result. Additionally the seriousness with which future additions to the collections can be undertaken will be limited. Current projections, in the case of some of the collections, suggest that it will with the current limitations take up to 25 years to regenerate and make the whole collection available in a steady state mode.

Recommendations:

- The review team recommends that priority be given to development of a strategy to secure additional greenhouse space. Reducing the regeneration backlog will free up time for the curators to move on to other curatorial and enhancement priorities in their respective crops.
- The historical partnership between the Plant Introduction Station, NC-7 and ISU has been of mutual benefit to all concerned. The sharing of physical and fiscal resources has resulted in a premier plant germplasm facility. ISU provides the land for the PI Station operations. As the PI Station grows in the future, the need for additional land for the expanding collections will have to be addressed. The review team recommends that options be explored with ISU and the College of Agriculture regarding long-term land and facilities needs and establish a MOU at the appropriate time.
- Members of the NCRPIS staff should continue to foster a collaborative relationship by actively interacting with the faculty of the ISU Department of Agronomy. The PI staffs housed on campus are encouraged to utilize those facilities to fullest extent, and should take full advantage of their proximity to the Department to fully participate and interact with the ISU academic faculty.

III. Outreach

There are many outreach activities occurring at the NCRPIS that are beneficial to showcasing the value of their work and encouraging the full utilization of the resources at the station. The review team notes that the station has done an excellent job, both at the farm location and on-campus, of taking the time and effort to showcase their work. Increasingly there are a large number of visitors that come through the facility annually. Visitors are local, national, and international. The tour through the facility is fascinating and extremely educational. We hope this and other types of outreach activities continues and expands.

Recommendations:

- The review team recognizes the importance of outreach and public relations efforts to the survival of any organization. We recommend that the NCRPIS take every opportunity to promote its efforts within the campus structure, the local community, with the regional research directors, and beyond. Assistance could come from a number of sources. ARS information staff could help with stories by promoting the station's accomplishments and getting the message to the public. The USDA-ARS Area Office might assist through assigning or inviting a staff writer to spend time at the station and catalogue activities and impacts. We also suggest that the station

consider a newsletter or other local outreach organ, such as ISU Information Staff, to report and disseminate newsworthy stories on a regular basis. Additionally, we believe that the entire staff at the station should be encouraged to be as creative as possible in finding ways to obtain higher visibility for the station.

- We would also encourage the NCRPIS to seek out opportunities with campus departments for further partnerships and collaborations. There have been good working relationships between the faculty and PI staff in the past and this should be furthered explored and strengthened. Improving the visibility of the PI station within the ISU campus is needed.
- Lastly, we believe that the station should attempt to characterize the impacts of their work and the germplasm utilized by other scientists in both the public and private sector by attempting to characterize the realized or potential tangible and intangible returns that result from the utilization of this material. Each of the curators could take on this responsibility for their particular crop.

Appendix I

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