Report on the March 11th, 2008 Eastern Soft Wheat FHB Meeting on Coordinated Projects, Shisler Center, OARDC, Wooster, OH
Report prepared by C. Sneller and M. Hall

Agenda

1 Welcome, Introductions, etc
2 The two coordinated projects (North and South) (Sneller and Murphy)
3 Success and failures (Ohm)
4 Data bases (Van Sanford, Mark Hughes)
5 Management + Breeding studies (Kolb)
6 Uniform testing and testing commercial lines (Sneller and Murphy)
7 Plans to understanding and utilizing native resistance (Griffey)
8 Sources of resistance by program (Griffey)
9 Coordination of forward and backcrossing (Harrison)
10 Coordinated mapping efforts, present, future (Ohm)
11 Sharing populations (Kolb)
12 Next year and beyond (summarize ideas, David, Paul, Clay)

This report was developed by Clay Sneller from notes provided by Marla Hall. I have tried to present all aspects of discussions. I have followed each agenda item with a section of possible actions. These come from either the discussions themselves or from my thoughts as I pondered all the notes, handouts, etc.

Item 1: Objective and attendance

The Eastern soft wheat breeders held a meeting on March 11th in Wooster Ohio to further coordination of their FHB breeding efforts in the VDHR research area and develop improved cultivars to increase the initiatives impact of growers. The meeting was attended by 41 people. This included 13 breeders and 2 pathologists from public institutions, 8 staff and post-docs and 4 graduate students. Also in attendance were 6 breeders from private companies, 5 representatives from the milling industry, and 3 wheat growers (2 from OH, 1 from VA). All provided input into agenda items.

Item 2: Coordinated Projects

Sneller summarized 10 years of data from the NUWWSN and PNUWWSN from 1998-2007. Progress has been made towards decreasing FHB index with 37% of all entries have an Index < than the index of Freedom and 48% have less DON. Little progress has been made to lower DON. Paul Murphy indicated similar results where the USFHB nursery started in 1999 and has grown from 20 entries to 52 entries in 2008. In 2007, 95% of the lines were at least as good as Ernie for severity. The size of the test has doubled over the years and the resistance has increased in general. For FY08, 6 states are collaborating. The southern nursery was the 1st to report haplotype data, the 1st to have a European collaborator, and used doubled haploids early in the process.

A general overview of the NWW and SWW CP were presented (see Tables 1,2, 3, and 4)

Table 1. Funding requests for the three VDHR coordinated projects (CPs) submitted to the USWBSI.

CP	Number of Proposals Submitted	Requested	USWBSI Cap	Request as % of Cap
Spring Wheat	23	$1,313,694	$783,075	168%
Northern Winter Wheat	12	$757,707	$646,650	117%
Southern Winter Wheat	7	$393,934	$348,514	113%

Table 2. Summary of the Northern and Southern Winter Wheat Coordinated Projects

CP	STATE	PI	TITLE
NWW	IL	Kolb, Frederic	Development of Scab Resistant Soft Red Winter Wheat Varieties and Scab Resistance QTL Mapping
NWW	IL	Kolb, Frederic	Fungicide x Variety Interaction Experiment
NWW	IL	Kolb, Frederic	Mapping FHB QTL in an IL97-1828 x Clark Derived RIL Population
NWW	MI	Lewis, Janet	Development of FHB Resistant Soft White and Red Wheat Varieties for Michigan and Similar Environments
NWW	MO	McKendry, Anne	Accelerating the Development of Scab Resistant Soft Red Winter Wheat
NWW	MO	McKendry, Anne	Mapping Fusarium Head Blight Resistance in Truman Wheat
NWW	IN	Ohm, Herbert	Improvement of Soft Winter Wheat that is Resistant to FHB and Adapted to Indiana
NWW	OH	Sneller, Clay	Mapping QTL for Type I and II FHB Resistance from CIMMYT Germplasm derived from a Synthetic Hexaploid
NWW	OH	Sneller, Clay	Uniform Nursery for SRWW and Development Scab Resistance Varieties for Ohio
NWW	NY	Sorrells, Mark	Genetics and Breeding of FHB Resistant Soft White Winter Wheat for the Northeastern U.S.
NWW	REGIONAL	Souza, Ed	Evaluation of Fusarium Nurseries for Milling and Baking Quality
NWW	KY	Van Sanford, David	Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties
SWW	MD	Costa, Jose M.	Development of Wheat with Resistance to Scab Adapted to the Mid-Atlantic
SWW	VA	Griffey, Carl A.	Breeding and Genomics of FHB Resistance in Soft Red Winter Wheat
SWW	LA	Harrison, Stephen	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast
SWW	GA	Johnson, Jerry	Enhancement of Scab Resistant Wheat Cultivars Adapted to the Southeast
SWW	AR	Milus, Eugene	Developing FHB-Resistant Wheat Cultivars for the Midsouth.
SWW	NC	Murphy, J. Paul	Enhancement of Fusarium Head Blight Resistance in the Southeastern US Germplasm Pool
SWW	REGIONAL	Murphy, J. Paul	Marker Characterization of Soft Winter Wheat Scab Screening Nurseries

Table 3. Recent and upcoming release from Northern programs. Predicted (BLUP) Index and DON values are shown. Data was first standardized with each year and location so genotypes tested in different years could be compared. The standardization produced two new values, Y' and Y''.

Y' = (Genotype's trait value – Mean of the MR checks Ernie and Freedom)

Y'' = Y' / standard deviation of the trait in a given year and location

Source	Name	Year		INDEX (%) Y'	Y"	DON (ppm) Y'	Y"
IN	INW0731	2007	Licensing	0.75	0.05	-0.06	0.28
IN	INW0801	2008	Licensing	nt	nt	nt	nt
OH	OH02-12678	2008	Public	-3.08	-0.38	-2.03	-0.60
OH	OH02-13567	2007	Licensing	-5.63	-0.52	-0.84	-0.27
OH	OH02-7217	2008	Public	-5.31	-0.42	0.96	0.19
KY	Pembroke	2008	Public				
KY	KY96C-0769-7-3	?	?	nt	nt	nt	nt
KY	KY99C-1051-03-01	?	?	4.15	0.52	2.45	0.84
KY	KY00C-2152-04	?	?	nt	nt	nt	nt
IL	IL00-8061	2006	Licensing	-6.33	-0.56	-3.20	-0.70
IL	IL00-8109	2008	Licensing	-0.44	-0.06	-3.00	-0.78
IL	IL00-8530	2008	Licensing	-0.98	-0.19	-2.89	-0.57
IL	IL01-11934	2008	Licensing	-1.98	-0.23	-2.29	-0.60
IL	IL01-16170	2008	Licensing	-2.32	-0.13	-1.73	-0.76
IL	IL02-19463	2008	Licensing	1.11	-0.05	-0.92	-0.49
IL	IL99-15837	2008	Licensing	nt	nt	nt	nt
NY	CaledoniaReselect-L	2008	Public	-2.25	-0.17	5.40	1.13
NY	Jensen	2007	Public	2.40	0.43	2.21	0.50
	E2017	?	?	1.04	0.13	1.68	0.20
MO	MO 050699	?	Public	-2.56	-0.2	0.10	-0.03
MO	MO 040152	?	?	nt	nt	nt	nt
MO	MO 050197	?	?	-6.03	-0.63	-0.20	0.16
MO	Bess	2006	Public	-8.90	-0.80	-5.54	-0.76
"Res." Check	Truman	2004	Public	-9.63	-0.88	-1.25	-0.54
MR Check	Ernie			-4.53	-0.37	-0.09	-0.08
MR Check	Freedom			-2.85	-0.19	-0.60	-0.12
Sus Check	PIO 2545			11.34	0.89	5.39	1.30

Table 4. Summary of approximate FHB Nursery size and make-up for Northern programs.

	Purdue	Ohio	Kentucky	Illinois	New York	Missouri	Michigan
No. of plots in nursery	5500	4800	5400	4800	1800	2500	2000
Nursery plots for variety development	4000 (73%)	3000 (63%)	2700 (50%)	3600 (75%)	630 (35%)	625 (25%)	1000 (50%)
New breeding lines in nursery per year	450	600	1300	330	120	300	600
No. of Crosses for FHB variety development	500	200	300	415	100	85 to 540	75
% tested breeding lines with "exotic" pedigree	80%	10%	10%	~5% now, 18% in HR	10%	2%	Large % now
~ No. entries in state's commercial cultivar test		65		~60	50	65 - 90	76

Item 3: Successes and Failures

Herb Ohm summarized success and failures

Successes

- Type II resistance screening in the field and greenhouse
- Deployment of native resistance
- Some but limited deployment of FHB1 in P25R54, P25R18, B990081, INW0411
- Higher proportion of higher yielding lines with moderate FHB resistance
- Most programs use MAS for those QTL that have been mapped

Failures

- No efficient evaluation for type I resistance.
- Little understanding type III and resistance to DON accumulation per se (Kolb has done some work)
- Undependable field evaluation (variation in the weather)
- Little work on mapping native resistance QTL
- Limited investment in resistance of related species
- Limited investment in new research ideas (so called orphan projects)

There was a consensus that we do not understand many details about the mechanisms of resistance and our progress is primarily through large-scale phenotyping that integrates multiple components of resistance. There is a pressing need to focus on DON independent of type II resistance. DON assay capacity may need to be increased and new equipment at VT with David Schmale will be helpful. McKendry and Milus suggest more focus on the rachis may be fruitful. Milus reported high DON levels in the rachis and McKendry says they always score the rachis and only cross to lines that do not have rachis involvement.

It is also unclear what if the value of our current QTL, and pyramids of these QTLs, as well as their effect on other traits. We also do not have an agreed upon level of acceptable resistance for release.

It is likely that many of the entries that now enter the uniform scab nursery have already been screened for FHB and for yield.

Ohm stressed that we need more research on relatives (example Qfhs.pur-7EL) that may have strong resistance.

Possible actions: Form teams to develop research projects to address these issues. Increase partnership with pathologists to dissect resistance mechanisms. Coordinate pyramiding of QTL and evaluation of resulting germplasm.

DVS: How many grow the nurseries in environments for performance data (yield data) and not just in a misted nursery for scab data?

Item 4: Databases

This item was presented by Van Sanford and Mark Hughes. This will not be a public database. The utility is in adding as much data as is needed and desired. Additional data can be added cheaply, easily (leaf rust, powdery mildew etc…). Non-FHB data should be included to assist in parent selection. This would also include haplotype information.

There was much discussion on what breeders would want from the database. Most indicated that they wanted flexible output that allows creation of relevant summaries by selecting the lines and test locations to include in the summary. Few were interested in data from a single location or line.

Uniform nursery coordinators should be the ones to submit the data and they need to develop uniform field descriptors so all nurseries are comparable.

Possible actions: Uniform nursery coordinators meet with Mark and discuss data and formats.

Item 5. Management/Breeding Studies

Presented by Fred Kolb: The objectives of the VDHR clearly state that management/breeding studies could be included. Most agree that there is no silver bullet for controlling scab so a combination of host resistance and management is required to get low DON when disease pressure is high. It remains unclear whether the VDHR group should fund such studies, or if they should be funded by MGMT.

There was some agreement that such studies should be done, but less on how to do them and who should do them. Those who felt they had merit were either interested in assessing one of the following:

1. Genotype x fungicide interactions
2. Demonstration of the combination of best genetics and best fungicide to control DON
3. Primary focus on assessing combinations of management options other than on host genetics (primarily being done in the MGMT group). Generally use 1-few cultivars. May or may not be inoculated/misted.

KY, OH and IL are both doing different management studies using current cultivars and/or advanced breeding lines with or without fungicide with objectives fitting #1 or #2 above. There was also varied option about doing these in an FHB nursery or not. It would very useful to assess grain quality from these studies.

Very important that the results of these studies reach growers and end-users. If these are to be done in the VDHR then the review committee should have some guideline as to how much such studies should cost. There can also be some effort to make them regional.

Possible Actions: Steering committee needs to find a mechanism to fund truly inter disciplinary research as each area appears reluctant to fully funds to such efforts. If a project bridges two areas then funds from both areas should be directed towards it. Efforts could be coordinated with a CP and with the MGMT effort. Connect projects to extension efforts.

Item 6: Uniform Testing and State Trials of commercial cultivars

Sneller and Murphy presented:

I. Uniform trials:

- There was discussion of retesting lines to get more data prior to release: The northern and southern trials operate differently. The southern has a procedure for re-testing while the northern lets breeder's make all decision on what goes into a trial. Both seem happy with what they do. Some discussion on how to analyze data from re-tested lines.
- Broad discussion on type of data to collect, particularly for Type I and DON. It was noted that few resources have been devoted to developing new screening techniques. Kolb discussed his type I method: measure incidence on a whole row giving a simple % rather than counting 100 heads.
- Could probably get more value from data through coanalysis of marker and phenotypic data
- Van Sanford suggested obtaining yield data from the nurseries, or from another test of the same material. Some seemed willing to do this. Sneller suggested gathering yield data from each cooperator's own extensive yield trial.
- Further coordination of yield and greenhouse screening could improve efficiency and information.

II. Commercial Testing

Many project report screening some or all entries in their state's commercial cultivar trial. This can take a great deal of effort and expense. Kolb states this is likely the most important FHB data he collects. Ways to minimize the effort were discussed including

- Just screen most popular cultivars, if this in known (appears to be generally unknown)
- Collect limited FHB data
- Do not screen cultivars whose reaction is well known
- Coordination of efforts and data bases. Entries must have exactly the same name in all states.
- FHB data must be included in the report to growers.
- Track pre-release screening data for a line to its released name
-

Duane Faulk (University of Guelph) described the Ontario program. The seed companies pay for FHB screening as part of their entry fee. Their charges are $40 per plot for yield testing and $150 for 3 inoculation tests for FHB and a DON screen per variety.

Possible actions: Direct USWBSI funds to develop better assays for Type I etc resistance. Require submission of non-fhb data collected by breeders in their yield trials to the Uniform coordinators so it can be included in the report, then database all the information. Encourage all coordinators to fund the screening of the commercial cultivar trial so it is less of a burden on the breeders and their VDHR funds. Connect projects to extension efforts.

Item 7 & 8: Understanding and Utilizing Native Resistance

Carl Griffey presented a summary of native resistance (see tables 5, 6,and 7). There was a very strong consensus that the resistance in native SWW is a very valuable resource and we need to further our understanding of it. Our knowledge of the genetics of this population is limited and haplotying alone is insufficient for determining to infer the genetics. For some QTL haplotyping may be diagnostic, in other it may be suggestive, and in others it may be useless.

Table 5. Released SWW cultivars with FHB resistance.

Name	Year of Release	Indicate FHB-Resistance Donor Source	Indicate Origin of FHB-Res. Donor Source e.g.Chinese, Native, etc.
25R18	1999	Sumai 3	Chinese
25R35	2003	Ning 8319	Chinese
25R42	2001	Sumai 3	Chinese
25R51	2005	Sumai 3	Chinese
25R54	2003	Sumai 3	Chinese
Bess	2005	Unknown	Native
Cecil	2004	Unknown	Native
COKER 9474	1994	unknown	Native
COKER 9511 (B980582)	2005	COKER 9474 sib	Native
Ernie	1994	Unknown	Native
Foster	1996	Unknown	Native
Freedom	1991	Unknown	Native
IL94-1653 (Exclusive)	2003	Unknown	Native
INW0304	2003	Ernie, Goldfield	Native
INW0411	2004	Freedom, Goldfield	Native
INW0412	2004	X117	Chinese
McCormick	2002	Amigo?	Native
NC-Neuse	2003	Unknown	Native
NY88046-8138	2005	Unknown	Native
OH02-12678	2008	Unknown	Native
OH02-13567	2007	Unknown	Native

Name	Year of Release	Indicate FHB-Resistance Donor Source	Indicate Origin of FHB-Res. Donor Source e.g.Chinese, Native, etc.
OH02-7217	2008	Unknown	Native
Patton	1998	Unknown	Native
Roane	1998	Unknown	Native
Tribute	2002	Amigo?	Native
Truman	2003	Unknown	Native
Wesley	1999	Unknown	Native
X00-1079	2005	Unknown	Native

Table 6. Potential SWW releases with FHB resistance.

Name	Potential Year of Release	Indicate FHB-Resistance Donor Source	Origin of FHB-Res. Donor Source e.g.Chinese, Native, etc.
CaledoniaResel-L	2006	Unknown	Native
GA951395-3E25	2006	Unknown	Native
IL00-8061	2006	Unknown	Native
IL00-8641	?	Unknown	Native
IL97-3632	2006	Unknown	Native
KY97C-232-2	2008	Unknown	Native
MO 011174	?	Unknown	Native
MO 980829	2006-7?	unknown	Native
NE01643	2006	Unknown	Native
NY03179FHB-12	2006	Unknown	Chinese
NY03180FHB-10	2007	Unknown	Chinese
NY87048W-7388	2005	SuMei3	Chinese,Native
NY88046-7088	2006	Unknown	Native
P992137A2	2007	F201R, N7840	Rom, China
P99608C1	2006	F201R	Romania
VA02W-713	2007	Ning7840,Roane	Chinese,Native
X00-1017	2006	Unknown	Native

Table 7. Relevant SWW gemplasm.

Name	FHB-Resistance Source	Origin of FHB-Res	Known QTL
VA00W-38	Unknown	Native	3BS-Gwm493A 5AS-Barc56A 5AS-Barc117C
VA01W-476	W14,Roane	Chinese,Native	5AS-Barc56A 3BS
VA04W-433	Ning7840	Chinese	5AS-Barc56A 5AS-Barc186A 3BS
VA04W-474	W14,Roane	Chinese,Native	3BS-Gwm493A 3BS-Xcfd79 5AS-Barc56A 5AS-Barc117C
MD27-37	Unknown	Native	
NC03-11465	Ning7840	Chinese	3BS-Gwm533.1 3BS-Barc133
ARGE97-1022-5-1	Catbird	CIMMYT	Unknown
ARGE97-1042-4-5	Catbird	CIMMYT	Unknown
ARGE97-1043-6a-5	Catbird	CIMMYT	Unknown
ARGE97-1033-3-5	Catbird, Freedom	CIMMYT, native	Unknown
ARGE97-1033-10-2	Catbird, Freedom	CIMMYT, native	Unknown
ARGE97-1064-13-5	Freedom, Super Zlatna	native, Eastern Europe	Unknown
ARGE97-1008-3-3	Er-Mai-9	Chinese	Unknown
ARGE97-1048-3-6	Sha-3, Catbird	CIMMYT	Unknown

Name	FHB-Resistance Source	Origin of FHB-Res	Known QTL
ARGE97-1047-4-2	Ning 7840	Chinese	Unknown
IL96-6472	Unknown	Native	
IL97-1828	Unknown	Native	
IL97-6755	Ning7840	Chinese	3BS -Barc147 3BS-Gwm493
IL97-7010	Ning7840	Chinese	
IL99-27048	Unknown	Native	
IL96-24851-1	Ning7840	Chinese	
IL00-8061	Unknown	Native	
IL99-20756	Unknown	Native	
OH902 and OH904	Freedom, ZM10782 (Chinese line with a "Ning" 3BS haplotype)	Chinese, Native	3BS, 2AS
OH903	Ning 7840, native	Chinese, Native	3BS
P0128A1-22	N7840, F201R, Goldfield	Chinese, European, Native	3BS, low incid: 2B-Barc200 2B-Gwm210 7B-Gwm344 1B-Barc8 3A-Gwm674
P97397E1-11	Freedom, Goldfield	native	2AS-Gwm296 2B-Barc200 2B-Wmc149
NY87048W-7387	SuMei3	Chinese	3BS-Gwm493A 3BS-Barc133B
NY91017-8080	U1266-4-11-6	Native,T.tauschii	None
GA941318E22	Unknown	Native	
GA941320E24	Unknown	Native	
GA941470E18	Unknown	Native	
GA941523E21	Unknown	Native	
GA991109-6E8	Ernie	Native	3BS-Barc133 5AS-Barc117 5AS-Ggwm156 2A-Barc18
GA941521	Unknown	Native	3BS-Gwm533a 3BS-Barc133 5AS-Gwm156 5AS-Barc177 2A-Barc18
NE02465	Unknown	Native	Perhaps 3BS
KY98C-1161-03	Unknown	Native	
KY98C-1169-06	Unknown	Native	
KY98C-1542-01	Unknown	Native	
MO 011175	Unknown	Native	Unknown
MO 010719	Unknown	Native	Unknown
MO 000926	Unknown	Native	Unknown
X00-1058	Unknown	Native	
B960208	Unknown	Native	
B961378	Unknown	Native	
B980416	Unknown	Native	
B011066	COKER 9474	Native	possible gwm 493
B011117	YMI 6	Chinese	possible gwm 493

While initial focus of the discussion was on mapping and haplotying the germplasm, it was also noted that there is ample success without MAS. Anne Mckendry was queried on her success without MAS. McKendry stated that they are just now getting to the point where we have our screening methods down. They focus 1st on the greenhouse type II screening. If it doesn't have type II then it gets dropped. The field nursery is small because of this. They use little exotic material due to performance. They were fortunate that they good levels of resistance when they got hit with scab in the early 1990's. Selections are done out of F5's. They discard lines based on performance and the

selections go into the scab nursery. They now want to do more mapping work to answer some of the questions with the diversity of sources.

All recognize the value of traditional breeding and phenotyping in this population. We are making gains, much as we do for any quantitative trait and RxR crosses can lead to lines with better resistance than Truman. We also recognize the gains in efficiency we could realize if we knew the genetics better. There has been some effort to map using Freedom, Ernie, and Goldfield. Efforts for Truman and IL97-1828 are being initiated. There are also two efforts to do association analyses in the SWW germplasm (Sneller, Brown-Guedira), though neither has the funds to scan the entire genome of a large set of lines. There are plans to map using Harus (NY), E2017 (MI), IL94-1653 & IL97-1828 (IL), MD01W233-06-1 (MD), Renwood 3260 (VA), Tribute (VA) as sources of native resistance (see Item 10 as well).

Possible Actions. Establish database for FHB resistant SWW germplasm that includes phenotype and haplotype data. This would include material from the uniform test as well as other lines from breeding programs. Refine the haplotyping to develop more informative markers. Develop project for a population-based or family-based association analysis of FHB resistance in SWW. Meeting to discuss efficient mapping.

Item 9: Coordination of Crossing

Steve Harrison sent out a survey and the results were shared.

- Focus on Native resistance
- Database for parents being used and their properties (sources of resistance, haplotype, etc), crosses being made. Entry of data must be centralized
- There was a divergent opinion on the number of recurrent parents to use as some wanted a few and some wanted many.
- Divergent opinions on whether BCing should be centralized, or assigned to certain project, or remain decentralized.
- Seems many projects have started to use MAS in F1s from 3-way crosses or during BCing.
- Recognize that it is very difficult to coordinate perfectly among so many independent programs

There was considerable discussion on how material should be distributed and intellectual property. It is likely that each pair of institutions in an exchange would set their own rules. Seems unlikely that any USWBSI policy would usurp these rules. Also simple MTAs can be used to share materials.

Discussion on a centralized BCing effort:

- Wheat workers code of ethics? How many BC's allowed?
- Sharing of populations
- Choice of recurrent parents
- Would be based on markers and not gh phenotyping
- Some intellectual property issues will need to be discussed

Possible Actions: The information provided by Carl should be the foundation for a database that would be updated annually. Additional opportunities for sharing of perplasm can be made available

Item 10: Mapping Efforts

Herb Ohm presented the following populations that focus on native resistance

1. :NY has two populations (Harus, NY91017-8080 resistance)
2. VA has 2 populations (Becker/Massey, Ernie/MO94-317) and 4 doubled haploid populations (Renwood3260/Pioneer26R46, Tribute/Pioneer26R46, and ?Roane & Truman)

3. MO has 1 population from Truman?MO94-317)
4. Gina Brown-Guedira has 1 population (Nuese)
5. IL has 1 population (IL97-1828 x Clark)

USWBSI has funded mapping in several of these (Becker/Massey, Ernie/MO94-317, IL97-1828/Clark, Truman/MO94-317, NY91017-8080 /??). There was no discussion if these were the best parents or the best approach to mapping the resistance in the SRWW. It was noted that mapping efforts for items 3 and 5 above involve phenotyping in multiple states. Ohio and Michigan are cooperating on mapping resistance from a CIMMYT line.

Possible action: Have a break-out meeting at the next FHB forum to focus on understanding the genetics of native resistance, the best sources, and best mapping methods.

Item 11: Sharing Bulk Populations

Discussion lead by Fred Kolb: Most seem amenable to sharing populations and this is another way to show that there is coordination between the programs. The devil is in the details though. Issues that need to addressed include what generation, intellectual property, reciprocity, amount of seed, number of populations, etc. A plan was proposed featuring:

- Nursery coordinators serve as a clearinghouse
- Submit F3 or higher at least 750 grams (maybe 500 grams)
- Distribute 50 g/pop/request at 750 grams this would be enough for 15 requests.
- Breeder who deposits 10 pops can request an unlimited # per year
- Acknowledge the source of the pop if variety results

Mechanism #2

Select a limited # of pop from various programs
Distribute a sample of each pop to whoever is interested.

Some suggested that only a "shopping list" of populations be generated and letting breeders browse and select what they want. Breeders would provide a general description of the population. Example: This population also segregates for leaf rust, powdery mildew etc..

Possible action: Establish a database of segregating populations that are available. The database would have a description of the parents, segregation, generation, amount of seed available, and IP considerations.

Item 12: Major Conclusions

Many of the conclusions are presented by item. The region consist of 13 independent programs organized into two CPs. Some activities in each can not be coordinated across the region due the specific germplasm and methods each must use to meet the local needs. Most programs have strong ties to 2-4 other programs, but not to all programs. The challenge is to expand our connections via communication.

1. A common theme was the possible role of databases to improve this communication. Items that could be in a database include:

- Uniform test results
- Non-FHB traits for entries in uniform tests
- Germplasm developed in the two CPs with FHB resistance
- Sources of resistance in germplasm and cultivars
- Results from trials of commercial cultivars, including VS, S, MS, MR and R ratings
- Populations that could be shared

- Development of mapping populations
- Crossing plans

A database is only as good as the information that goes in. The USWBSI may need to require some reporting of information so the data base can meet the needs listed above. The USWBSI could develop a database that is compatible across all classes of wheat to serve the entire FHB community.

2. Much of the discussion revolved around the native resistance in SRWW. It is clear this is a very valuable resource and that most felt they knew little about it. There is considerable mapping will be proposed in the next few years. It may be very useful to coordinate these efforts to be sure that mapping resources go to the best populations and/or best mapping strategy, are integrated into many breeding programs, and meet breeder's needs. A discussion of the balance of mapping and phenotypic selection may also be useful as mapping can take resources from breeding.

3. The USWBSI needs to clarify funding of projects that lie in the seams between the main area. It seems each specific area is reluctant to pick them up.

4. Breeder's need better information and screening techniques for non-Type II resistance, especially mechanisms releated to decreased DON A coordinated effort between breeders, pathologists, and molecular biologists may be needed to make progress for Type I and Type V (resistance to DON accumulation per se) resistance.