b. Texas Demonstration Sites

Phase II, Year 1 (2002-2003)
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General Introduction

Prior to the wheat-growing season in 2002, we contacted five growers in order to locate five suitable dryland winter wheat and alternative crop fields in the Texas Panhandle. Five farmers agreed to conduct the AWPM study in their fields. Two fields are situated south of the Canadian river, in Deaf Smith and Swisher Counties. The three remaining fields are located north of the Canadian river, in Moore, Hutchinson, and Ochiltree Counties (Figure 1 and Table 1).

After locating the five AWPM fields, soil maps of the fields were obtained from county soil survey maps. Four 100x100 ft benchmarks were established based on changes in soil type and slope in each field. These benchmarks were selected in order to represent the major soil conditions and other possible variations in the fields. Soil fertility and moisture samplings were taken within each of the four benchmark areas in the fields.

Coordinates from the corners of the benchmarks and the fields were taken with a pocket PC and GPS receiver using the SiteMate program. The wheat and sorghum fields were divided into 25 and 10 equally-sized quadrats using 5x5 and 2x5 grid patterns, respectively. Sampling points were located in the center of the quadrats using GPS in both sorghum and wheat fields. Each sampling point was marked by a flag to exactly locate the sampling points at subsequent sampling dates. Mini weather stations were placed in all fields to record temperature and rainfall. Recording time interval was set to 15 minutes. Volunteer wheat, associated insects, and weed surveys in wheat, sorghum, and adjacent fields were conducted in each field 0-14 days before planting and after harvest. Wheat sampling for aphids, predators, parasitoids, and weeds started and continued biweekly after wheat came up as long as the weather conditions permitted. Data collection in the sorghum fields began in mid-July.

Throughout this report we present maximum and total numbers of individual insects and weeds by adding field, berlese, and sweepnet counts for each sampling date. Maximum number is the highest number of species found at one of sampling points and total is number of individual species found at all study plots. This permits to gain general information on the situation in the fields throughout the growing season.

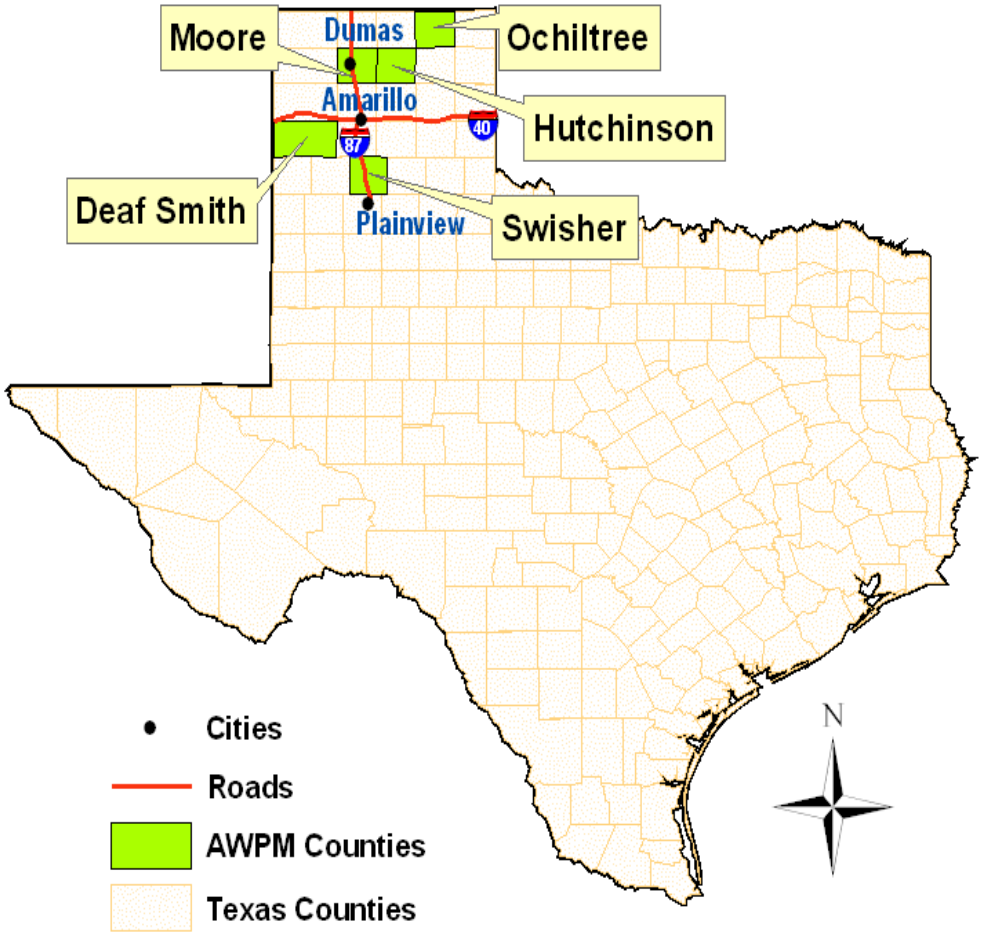


Figure 1: The locations of the AWPM counties where demonstration sites are located.

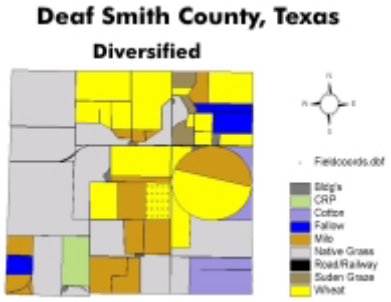
Although we hesitate to make blanket statements regarding this first year's results, it should be noted that the Texas Panhandle experienced sever drought and unusually high temperatures in 2002-2003. This is a continuation of a drought situation that seems to be continuing in 2003-2004. Although some fields received moisture during the year, these events were sporadic and rainfall was usually followed by long period of dry weather. We believe that this needs to be taken into account, and that this severe drought most likely had a significant impact on the data we collected. Hopefully data collected in subsequent years will all a better evaluation of the impact of the AWPM program if climatic conditions return somewhat to normal. We believe that extrapolations of this year's results are to be made with caution.

Table 1: Specific location, cooperator, crop practice, sampled crop and area of the AWPM fields.

County	Section	Block	Crop Rotation	Area Owned by Cooperator (ac)	AWPM Field (ac)	Crop Practice	Wheat Sampled in 02 & 03 (ac)	Sorghum Sampled in 03 (ac)	Wheat being Sampled in 03 (ac)
Deaf Smith	2	7	Diversified	4500	192	w-s-w	102	89	129
Hutchinson	20	M16	Diversified	4480	282	w-s-w	109	173	
Moore	389	44	Simple	3630	319	w-f-w			
Ochiltree	930	43	Simple	640	325	w-f-w	152		173
Swisher	90	M8	Simple	5000	162	con w			162

w- wheat, s – sorghum, f – fallow, con w – continues wheat

Deaf Smith County Wheat and Sorghum Fields



Deaf Smith County is in the western part of the Panhandle of Texas The County consists of 964,480 acres or about 1,500 square miles. It is rectangular and about 50 miles long and 30 miles wide. Elevations range from about 4,450 feet on the western edge of the county to about 3,650 feet along Tierra Blanca Creek. The city of Hereford is the largest city in the county. Wheat and grain sorghum are the main crops. Most of the northwestern part of the county consists of ranches.

The climate of Deaf Smith County is semiarid. During periods of drought, dryland crops produced little or no yield. These droughts are followed by years when rainfall is sufficient for favorable yields. The average annual rainfall is about 18.04 inches. The average annual temperature is 57.2°F. The soil series in the AWPM field in Deaf Smith County are Drake (DrD), Olton (OcB), Pullman (PmA and PmB), and Zita (ZcB). The point coordinates of the southeast corner of the AWPM fields are -102.257 (longitude) and 35.089 (latitude) with an elevation of about 3,806.4 feet.

This field, total area of 320.53 acres, was divided into three adjacent areas. In 2002, winter wheat was planted in 102 acres and sampled during that growing season. One hundred and eight bags of TAM 110 wheat seeds were delivered to the cooperator prior to wheat planting in 2002. In the summer of 2003, sorghum was sampled in 89 acres. Winter wheat was planted in 129 acres and is being sampled in the fall of 2003. Eighty bags of TAM 110 wheat seed were delivered to the owner before wheat planting in 2003.

Field bindweed was found in the field. Johnsongrass, crested wheatgrass, jointed goatgrass, and brome were found at the field borders (Table 2). Table 2 contains sampling dates, wheat growth stages, and overall information about species found in this field. During the entire growing season, few greenbug, corn leaf aphid and birdcherry oat aphid were found. There was a high amount of Russian wheat aphid, nabid, spider, armyworm, and convergent ladybeetle in late April and May, 2003. Rice root aphid, brown wheat mite and seven spotted ladybeetle rarely occurred in this field.

Counts were taken in the sorghum field weekly during the entire growing season. Pigweed, field bindweed, and Johnsongrass were the common weeds in the sorghum field (Table 3). Corn leaf aphid was found during the entire growing season (Table 3). Density of corn leaf aphid reached the highest amount in August. Greenbug and fall armyworm were rarely found. Density of nabids, convergent ladybeetles, and orius was high during the early and mid-growing season while green lacewing was found mid season.

This field was closely monitored in 2002 and 2003 by taking imageries and aerial pictures using an Airborne Imaging Spectrometer for Application (AISA) with ground data collection (Figure 2). AISA mounted in a Cessna 172 three-passenger airplane was used to scan the surface. Spatial resolutions of the image collected over the research site ranged from 1x1 to 3x3 m and there were 50 bands ranging from 509 nm to 886 nm. Yield data were obtained from this field by providing a combine and support technician to the producer (Figure 3). Wheat was harvested using a John Deere 9500 combine and a GreenStar mapping system. Sorghum has not been harvested at the time this report is being written.

Table 2: Density dynamics of pests, predators, and weeds throughout the growing season in the Deaf Smith County wheat field in 2002 and 2003.

Sampling dates	Growth stages	Greenbugs		Corn leaf aphids		Birdcherry-oat aphids		Russian wheat aphids		Rice root aphids		Nabids		Spiders		Armyworms		Hippodamia convergens		Coccinella semptempunctata		Brown wheat mites		Field bindweeds	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
10.31.02	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11.13.02	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11.27.02	22	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3
12.09.02	22	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	4
01.13.03	23	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
02.10.03	29	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
03.10.03	29	6	17	.	.	1	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
03.24.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
04.11.03	32	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	8	.	.	.	.	.	10	19
04.24.03	50	4	7	.	.	3	6	.	.	.	.	.	.	4	49	.	.	20	1	.	.	.	.	10	21
05.13.03	78	3	10	.	.	.	.	6	19	8	8	14	141	11	87	9	59	6	20	3	4	5	5	10	14
05.29.03	91	.	.	.	.	.	.	46	715	.	.	4	20	3	31	10	88	1	10	.	.	.	.	10	30
06.17.03	93	.	.	.	.	.	.	.	.	.	.	1	2	2	13	1	6	1	4	.	.	.	.	.	.
06.30.03		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	14

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.
T - Total number of individual insects, mites, and weeds for the entire field.
. – Species were not found.

Table 3: Density dynamics of pests, predators, and weeds throughout the growing season in Deaf Smith County sorghum field in 2003.

Sampling Dates	Growth stages	Corn leaf aphids		Greenbugs		Nabids		Spiders		Hippodamia convergens		Coccinella semptempunctata		Coccinella larvae		Scymnus loweii		Green lacewings		Brown lacewings		Lacewing larvae		Orius		Fall armyworms		Johnsongrasses		Field bindweeds		Pigweeds	
		M	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**	**M**	**T**
07.15.03	2	16	16	.	.	3	15	1	1	4	4	.	.	.	.	1	1	.	.	.	.	.	.	19	71	.	.	.	.	.	.	.	.
07.22.03	2	142	376	.	.	2	6	1	1	8	25	.	.	.	.	1	1	.	.	.	.	.	.	10	29	.	.	.	.	.	.	.	.
07.28.03	3	675	2337	.	.	1	1	.	.	4	16	.	.	.	.	2	2	.	.	.	.	.	.	33	61	.	.	.	.	.	.	.	.
08.06.03	4	415	1996	.	.	2	3	1	1	4	19	1	1	2	3	.	.	.	.	.	.	.	.	5	19	.	.	.	.	.	.	.	.
08.13.03	4	260	1533	.	.	3	9	1	1	8	42	.	.	1	1	3	6	2	2	1	1	1	1	1	1	.	.	10	15	.	.	1	1
08.18.03	5	67	320	.	.	1	1	1	1	5	16	.	.	1	1	.	.	1	1	.	.	.	.	1	1	.	.	10	33	.	.	.	.
08.25.03	5	42	139	1	1	1	2	.	.	6	27	.	.	1	1	.	.	5	8	.	.	.	.	1	1	.	.	10	34	.	.	.	.
09.03.03	6	182	502	4	10	1	1	.	.	4	18	.	.	1	1	1	1	4	15	.	.	1	1	.	.	.	.	10	33	.	.	10	12
09.10.03	6	47	165	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	1	.	.	.	.	10	37	.	.	10	11
09.17.03	6	105	268	.	.	.	.	.	.	2	3	.	.	.	.	.	.	1	1	.	.	1	1	.	.	.	.	10	26	.	.	3	5
09.24.03	7	120	298	.	.	.	.	.	.	2	3	.	.	.	.	1	1	5	7	.	.	1	1	.	.	1	3	10	23	10	10	10	11
10.01.03	7	173	483	.	.	.	.	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	3	10	27	.	.	1	1
10.07.03	8	120	458	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	10	50	.	.	10	14
10.14.03	8	46	277	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	10	50	.	.	.	.
10.20.03	9	117	293	.	.	.	.	.	.	2	2	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	10	37	.	.	.	.
10.27.03	9	150	296	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	46	.	.	.	.
11.03.03	9	105	436	64	77	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	40	.	.	.	.
11.11.03	9	127	379	14	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	1	1	.	.	.	.	.	.	.	.

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.
T - Total number of individual insects, mites, and weeds for the entire field.
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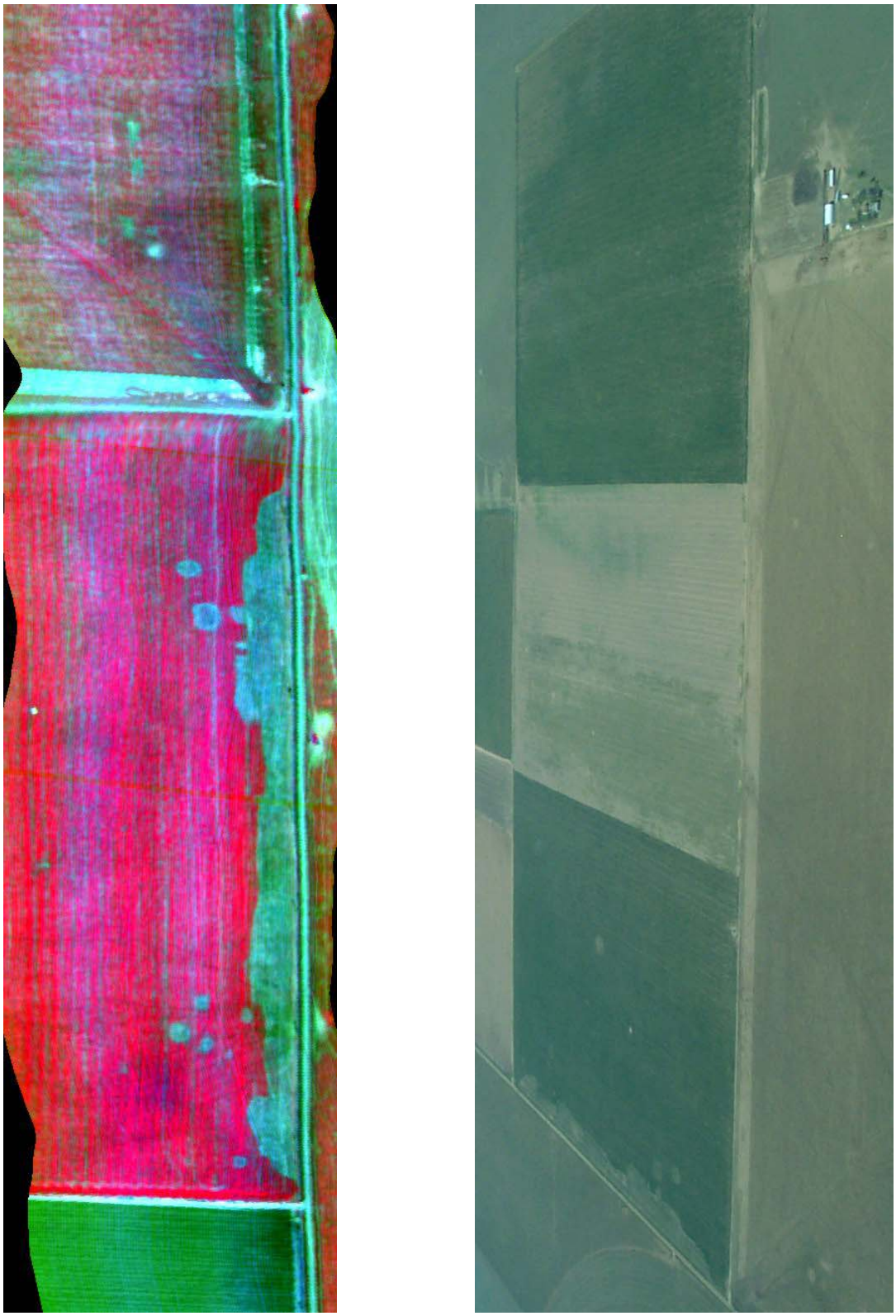


Figure 2: False color composite image (left) and aerial picture (right) of the Deaf Smith County wheat field.

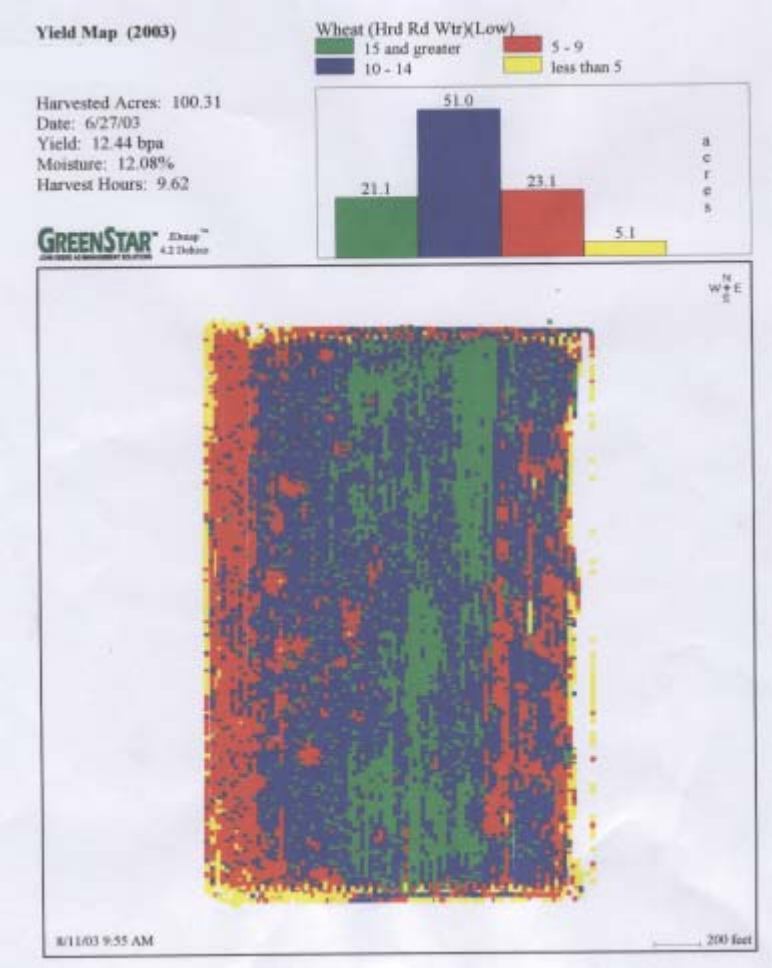
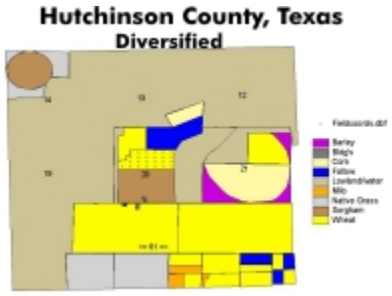


Figure 3: Yield map of the Deaf Smith County wheat field.

Hutchinson County Wheat and Sorghum Fields



Hutchinson County is located in north-central portion of the Texas Panhandle. It covers an area of about 583,040 acres or 911 square miles. The city of Stinnett is the county seat and Borger is the largest city in the county. About 74 percent of the Hutchinson County is used for range. Wheat is the main crop in Hutchinson County. The average annual rainfall is about 20.7 inches, and the average annual temperature is 58°F. The elevation above the sea level ranges from 2,750 to 3,400 feet. The soil series in AWPM field in Hutchinson County are Sherm (ShA) and Sunray (SuB) series.

The point coordinates of the southwest corner of the AWPM fields are -101.595 (longitude) and 35.967 (latitude) with an elevation of about 3,227.4 feet. This field, total area of 282.3 acres, was divided into two adjacent areas In 2002, winter wheat was planted in 109 acres and sampled during that growing season. Eighty nine bags of TAM 110 wheat seeds were delivered to the cooperator prior to the wheat planting in 2002. In the summer of 2003, sorghum was sampled in 173.4 acres. Sorghum fields were sampled weekly beginning in mid-July. However, aphid and beneficial insect population begin to decline in late August, 2003 in sorghum field. Thereafter counts were taken in the sorghum field biweekly. Yield data for both sorghum and wheat were obtained from the producer (Figure 4 and 5). A John Deere 9500 combine and a GreenStar mapping unit were used for harvesting and yield mapping, respectively.

Crested wheatgrass, Johnsongrass, and brome were found at the field borders. Brome was the only species found in wheat field (Table 4). Sampling dates, growth stages, overall density dynamics of the species found in this field were presented in Table 4. Few greenbug and birdcherry oat aphid were found in early March and continued being found in the field until harvest. Russian wheat aphid first appeared in early May and reached the highest amount just before harvest. There were high numbers of nabids, spiders, armyworms, and convergent ladybeetles during the late growing season. Mummies, carabids, *Scymnus loweii*, seven-spotted ladybeetles, green lacewings, and brown wheat mites were found once. In mid May, there were some green lacewing larvae.

Volunteer wheat, pigweed, crested wheatgrass, and Johnsongrass were found at the sorghum field borders. No weeds were found in the sorghum. The corn leaf aphid population fluctuated somewhat throughout the sorghum season. Density of corn leaf aphid was the highest on July 20. Aphid's natural enemies were high in late July and the first week of August. Green lacewings were found during the entire season.

Table 4: Density dynamics of pests, predators, and weeds throughout the growing season in the Hutchinson County wheat field in 2002 and 2003.

Sampling dates	Growth stages	Greenbugs		Birdcherry oat aphids		Russian wheat aphids		Nabids		Spiders		Hippodamia convergens		Coccinella semptempunctata		Coccinella maculata		Coccinellid larvae		Green lacewings		Lacewing larvae		Scymnus loweii		Black mummies		Armyworms		Carabids		Brown wheat mites		Bromus spp	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
11.07.02	24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11.19.02	24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.03.02	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.12.02	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01.27.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	13
02.12.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	20
03.07.03	34	2	4	1	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	31
04.01.03	38	11	64	11	69	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	10	13
04.16.03	40	2	5	1	1	.	.	.	.	.	.	10	88	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	47
05.07.03	68	1	15	1	1	5	23	5	33	21	213	10	186	1	2	3	15	2	24	1	1	3	10	3	9	.	.	3	21	1	1	25	567	10	20
05.23.03	85	1	3	.	.	1	2	8	73	5	31	10	74	.	.	.	.	.	.	.	.	19	19	.	.	.	.	3	23	.	.	.	.	10	16
06.09.03	92	.	.	.	.	27	269	1	1	2	12	1	3	.	.	1	1	.	.	.	.	.	.	.	.	.	.	3	26	.	.	.	.	4	4

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.

T - Total number of individual insects, mites, and weeds for the entire field.

. – Species were not found.

Table 5: Density dynamics of pests and predators throughout the growing season in Hutchinson County sorghum field in 2003.

Sampling dates	Growth stages	Corn leaf aphids		Nabids		Spiders		Hippodamia convergens		Coccinella semptempunctata		Coccinella maculata		Coccinellid larvae		Green lacewings		Brown lacewings		Lacewing larvae		Scymnus loweii		Orius	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
07.16.03	3	550	1379	6	13	1	2	18	80	4	5	3	9	7	10	1	2	1	1	2	3	2	5	2	7
07.21.03	4	565	2363	3	9	3	10	21	105	1	2	2	9	21	25	13	22	5	7	3	6	3	12	4	5
07.29.03	5	318	923	5	9	2	4	20	83	1	2	2	4	2	3	5	13	1	1	1	1	3	7	1	3
08.05.03	6	9	9	1	1	1	2	9	14	1	1	2	2	2	3	1	3	2	4	.	.	1	1	4	10
08.12.03	7	40	70	.	.	3	5	2	2	.	.	.	.	.	.	9	12	1	1	.	.	1	1	.	.
08.18.03	7	200	200	1	1	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	1	1	2	1	1
08.25.03	8	12	12	.	.	1	1	.	.	.	.	.	.	.	.	2	5	.	.	.	.	.	.	.	.
09.10.03	8	1	1	.	.	.	.	2	2	.	.	.	.	.	.	3	6	.	.	.	.	.	.	.	.
09.29.03	9	350	515	.	.	1	1	1	2	.	.	.	.	.	.	2	3	.	.	1	1	.	.	1	1

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.
T - Total number of individual insects, mites, and weeds for the entire field.
. – Species were not found.

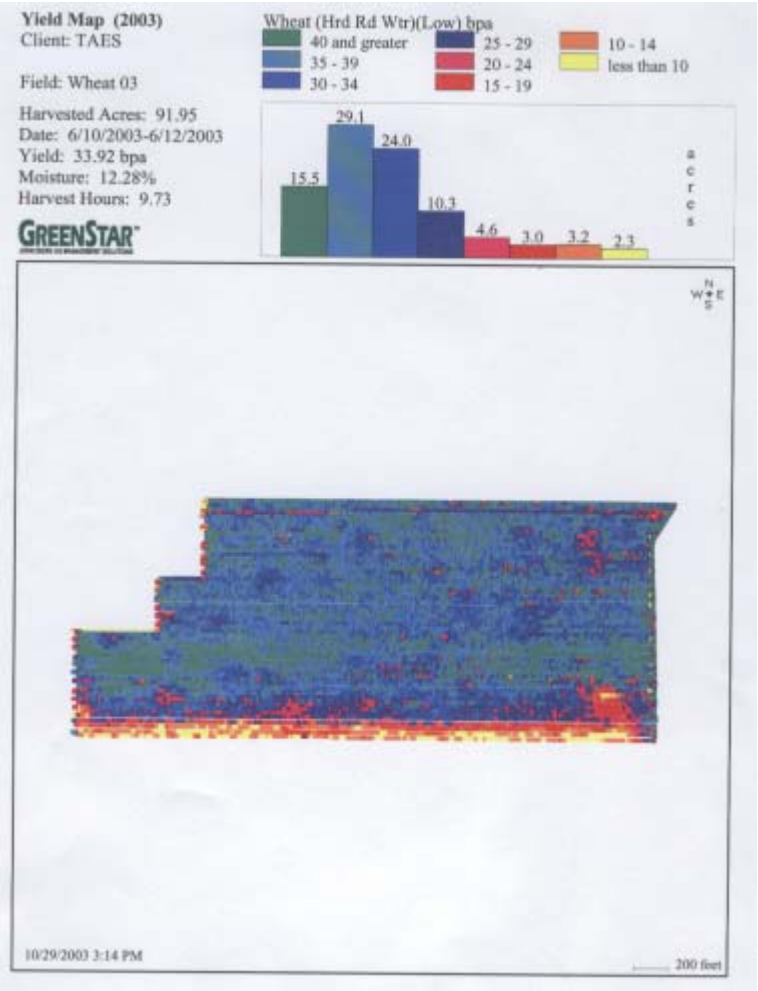


Figure 4: Yield map of the Hutchinson County wheat field.

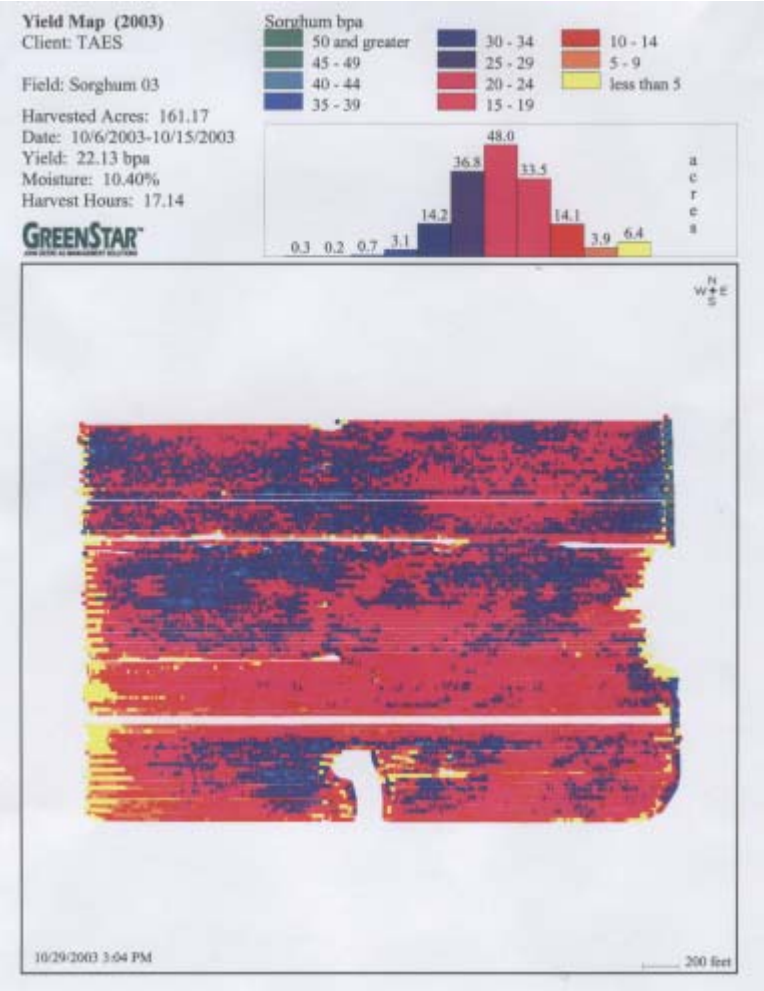
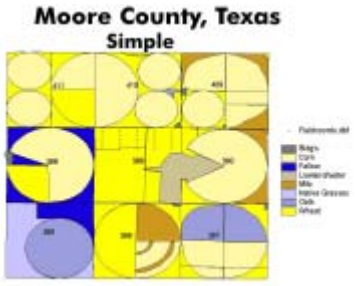


Figure 5: Yield map of the Hutchinson County sorghum field.

Moore County Wheat Field



Moore County is situated in north-central part of the Texas Panhandle (Figure). It covers an area of about 584,960 acres or 914 square miles. About 42 percent of the Moore County is used for crop production. The major crops are wheat and grain sorghum, lesser acreages of soybean, silage, corn and vegetable. Dumas is the largest city and county seat. Moore County has a dry, steppe climate. The average annual temperature is about 57.5°F. The average annual rainfall is 18.95 inches but varies from 8 to 27 inches. There are periods of drought in which dry-farmed crops produce little followed by years that are wet enough to produce profitable crops. The soil series in the AWPM field are Sherm (ShA) and Conlen (CoB) series.

The point coordinates of the northwest corner of the AWPM fields are -102.068 (longitude) and 35.967 (latitude) with an elevation of about 3,629.3 feet. In 2002, winter wheat was planted in the field and 189.6 acres was sampled (Figure). One hundred and nine bags of TAM 110 wheat seeds for the 189.6 acres were delivered to the owner of this field prior to the wheat planting in 2002. This field was grazed by cattle about one and a half months during the late winter and early spring in 2003. Yield data were obtained from this field by providing a combine and support technician to the grower (Figure 6). Wheat was harvest using a John Deere 9550 STS combine and a GreenStar mapping unit.

Weed species found at the field borders were Johnsongrass, brome, crested wheatgrass, and jointed goatgrass. Pigweed, barnyardgrass, and field bindweed were found in wheat field (Table 6).

Table 6 contains sampling dates, growth stages, and overall information about pests and their natural enemies. Like the Hutchinson County wheat field, few greenbug, birdcherry-oat aphid, and Russian wheat aphid were found during the entire season. Nabids, spiders, convergent ladybeetles, and armyworms were found starting from late April to harvest. English grain aphids, *C. maculata*, green lacewings, and brown lacewings were found in low numbers.

Table 6: Density dynamics of pests, predators, and weeds throughout the growing season in the Moore County wheat field in 2002 and 2003.

Sampling dates	Growth stages	Greenbugs		Birdcherry-oat aphids		Russian wheat aphids		English grain aphids		Nabids		Spiders		Hippodamia convergens		Coccinella maculata		Coccinellid larvae		Green lacewings		Brown lacewings		Lacewing larvae		Armyworms		Field bindweeds		Amaranthus spp		Barnyardgrasses	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
11.05.02	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	616	1	10	10	46
11.14.02	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	553	.	.	.	.
11.18.02	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	222	.	.	.	.
12.11.02	28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01.27.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
03.12.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
03.26.03	33	2	9	3	5	.	.	.	.	.	.	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	184	.	.	.	.
04.15.03	35	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	574	.	.	.	.
04.30.03	65	2	4	2	11	2	6	1	3	2	6	13	163	2	17	1	2	3	10	1	2	1	1	1	1	1	1	10	540	.	.	.	.
05.20.03	83	2	9	.	.	2	13	.	.	3	10	6	55	1	1	.	.	.	.	.	.	.	.	.	.	4	23	10	591	.	.	.	.
06.02.03	91	.	.	.	.	12	10	.	.	2	11	5	60	1	2	.	.	.	.	.	.	.	.	.	.	12	136	10	575	.	.	.	.
06.18.03	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	628	10	173	.	.

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.

T - Total number of individual insects, mites, and weeds for the entire field.

. – Species were not found.

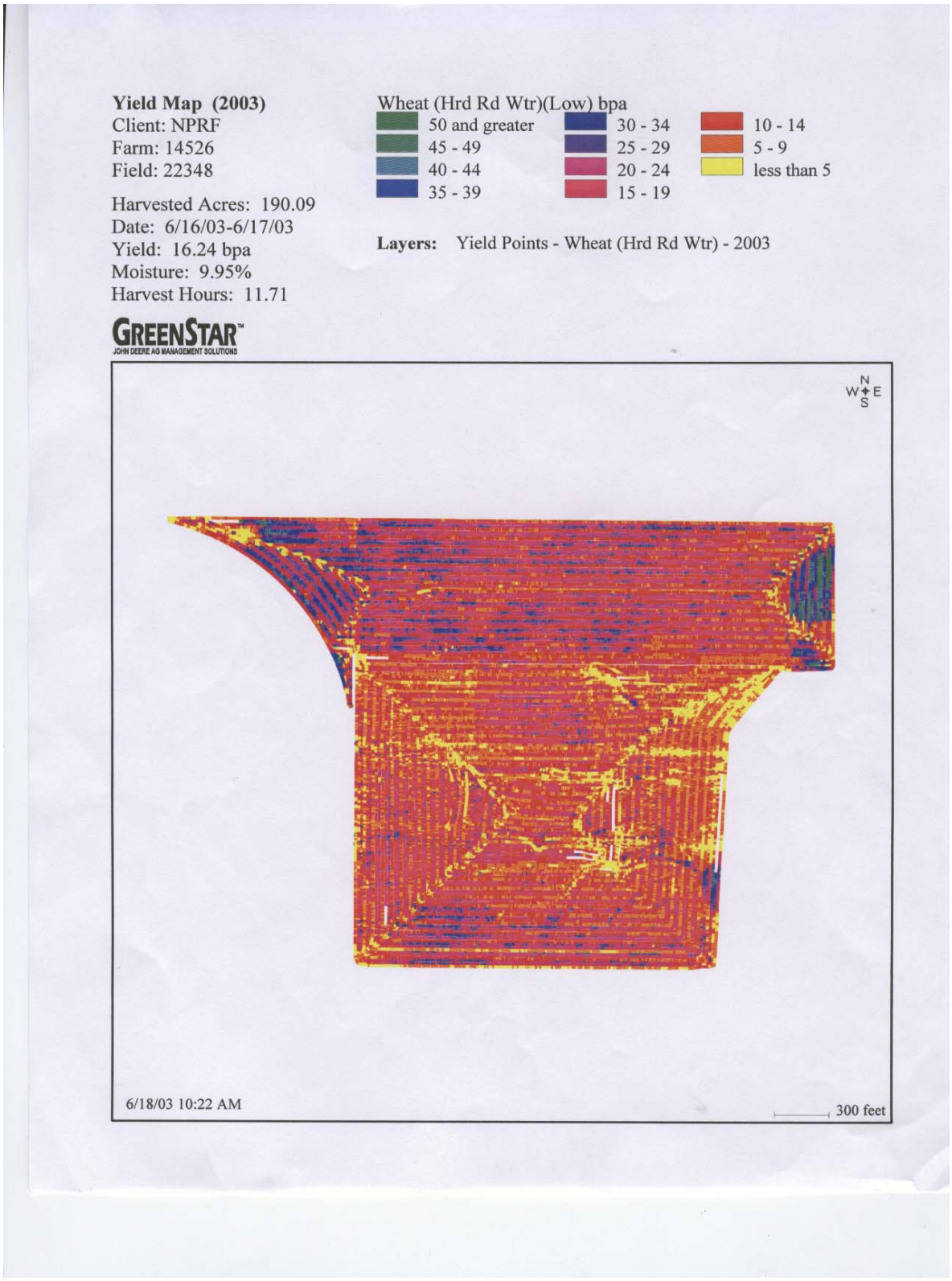
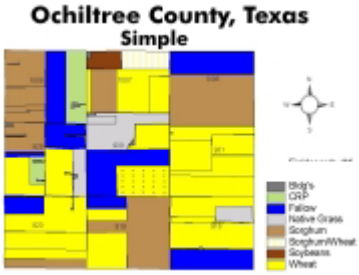


Figure 6: Yield map of the Moore County wheat field.

Ochiltree County Wheat Field



Ochiltree County is in the northwestern part of Texas, at the northern edge of the Texas Panhandle (Figure) . The county is about 30 miles square and has a total area of about 580,480 acres or about 907 square miles with an average elevation 2930 feet. Perryton is the county seat. About 70 percent of the county is cropland and the remaining 30 percent is rangeland. Most of the cultivated acreage is dryland. The major crops in this county are wheat and grain sorghum.

The climate of the county is sub-humid. The average annual rainfall is about 21.13 inches and the average annual temperature is about 57°F. The soil series in AWPM field in Ochiltree County are the Pullman (PmA and PmB), and Randall (Ra) series. The point coordinates of the southeast corner of the AWPM fields are -100.693 (longitude) and 36.348 (latitude) with an elevation of about 2,791.7 feet. This field, total area of 515 acres, was divided into four adjacent areas, two of which are subject to wheat – fallow - wheat rotation each year. Parts of the field are 152, 173, 100, and 90 acres, respectively. In 2002 and 2003, 152 acres of the field was sampled. One hundred seventy three acres are being sampled in the fall of 2003. This field is not subject to grazing by cattle. The cooperators harvested this field without notifying us and therefore no yield data were obtained.

Field bindweed and brome were found in the field (Table 7). Brome, crested wheatgrass, jointed goatgrass, and Johnsongrass were found at the field borders.

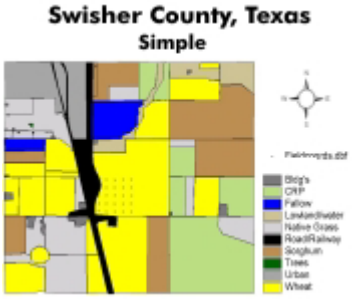
Sampling dates, growth stages, population dynamics of species found in this were given in Table 7. Greenbug and birdcherry oat aphid were found for the first time in late February, 2003, and stayed in the field during the rest of the season. There were high numbers of Russian wheat aphids, nabids, spiders, and convergent ladybeetles from late April to harvest. Seven-spotted ladybeetles, green lacewings, brown lacewings, *Scymnus loweii*, mummies, armyworms, carabids, and brown wheat mites were rarely found in this field.

Table 7: Density dynamics of pests, predators, and weeds throughout the growing season in the Ochiltree County wheat field in 2002 and 2003.

Sampling dates	Growth stages	Greenbugs		Birdherry oat aphids		Russian wheat aphids		Nabids		Spiders		Hippodamia convergens		Coccinella semptempunctata		Coccinellid larvae		Green lacewings		Brown lacewings		Scymnus loweii		Black mummies		Armyworms		Carabids		Brown wheat mites		Amaranthus spp		Bromus spp	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
11.08.02	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11.20.02	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.04.02	28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.16.02	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2
01.28.03	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	3
02.21.03	30	2	3	7	7	.	.	.	.	.	.			.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	1	3
03.13.03	30	.	.	1	1	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	3
04.07.03	32	14	61	17	126	.	.	.	.	.	.	2	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	4
04.17.03	32	1	2	3	8	.	.	.	.	.	.	5	11	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	1	1
05.12.03	75	1	7	4	11	2	3	4	12	8	58	6	39	1	1	1	1	.	.	1	1	1	1	.	.	.	.	1	3	4	9	.	.	1	1
05.28.03	87	1	1	1	1	2	12	6	56	7	63	7	58	.	.	.	.	2	9	.	.	.	.	.	.	4	33	.	.	.	.	.	.	.	.
06.12.03	92	.	.	17	78	54	386	6	26	3	23	7	35	1	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
07.01.03		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	13	.	.

M - Maximum number of individual insects, mites, and weeds at one of the sampling points.
T - Total number of individual insects, mites, and weeds for the entire field.
. – Species were not found.

Swisher County Wheat Field



Swisher County is in the south central part of the Texas Panhandle (Figure). The county has a total area of 573,440 acres or about 896 square miles. Tulia is the county seat. This county is a nearly level, playa-pocked, short-grass prairie. Elevation ranges from about 3,250 feet in the eastern part to 3,700 feet in the northwestern part. The climate of Swisher County is dry steppe. The average annual rainfall is about 17.24 inches and the average annual temperature is about 59.1°F.

Development of the county has depended on farming. About 80 percent of the county's land area is cultivated, and most of this is irrigated. The major crops are grain sorghum, wheat, cotton, and soybean. About 20 percent of the county is in native range that is grazed by cattle. The soil series in AWPM field in Swisher County are Pullman (PmA) series.

The point coordinates of the southwest corner of the AWPM fields are -101.838 (longitude) and 34.721 (latitude) with an elevation of about 3,506.9 feet. This field is 541 acres. Data for AWPM project were collected in 161.8 acres of the field. This field was grazed year round by cattle during the wheat-growing season in 2002 and 2003. The southwest corner of the field where sampling grids and points were located was grazed heavily in the spring of 2003. Therefore, no wheat was left to sample at 20 of the 25 sampling points. Data are being collected in this field for 2003 and 2004. Like the field in Deaf Smith County, this field was also closely monitored in 2002 and 2003 (Figure 7).

Common weed species found in this field were field bindweed and brome (Table 8). At the field borders, Johnsongarss, crested wheatgrass, brome, and jointed goatgrass were found.

Sampling dates, growth stages, population dynamics of species found in this field were given in Table 8. Greenbug and birdcherry-oat aphid were found in March, 2003, and they disappeared shortly. Thereafter some Russian wheat aphids were found in May. Nabids, spiders, mummies, and armyworms rarely occurred in this field. Convergent ladybeetles were found from late April to harvest.

Table 8: Density dynamics of pests, predators, and weeds throughout the growing season in the Swisher County wheat field in 2002 and 2003.

Sampling dates	Growth stages	Greenbugs		Birdcherry oat aphids		Russian wheat aphids		Corn leaf aphids		Nabids		Spiders		Hippodamia convergens		Coccinellid larvae		Mummies		Armyworm		Bromus spp		Field bindweeds		Amaranthus spp	
		M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T
11.04.02	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	10	279	3	5
11.18.02	25	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	3	6	10	181	.	.
12.02.02	26	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	13	10	126	.	.
12.17.02	28	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	8	10	59	.	.
01.22.03	29	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	19	.	.	.	.
03.11.03	29	1	3	10	38	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	19	3	3	3	3
03.27.03	30	45	334	21	171	.	.	.	.	.	.	.	.	6	15	3	3	6	16	.	.	3	28	10	95	.	.
04.14.03	33	.	.	.	.	.	.	.	.	.	.	.	.	7	45	.	.	.	.	.	.	3	13	10	191	.	.
04.28.03	65	1	2	2	6	.	.	.	.	12	40	6	18	5	14	.	.	.	.	.	.	1	2	10	16	.	.
05.14.03	85	.	.	.	.	1	1	.	.	2	3	1	1	1	1	.	.	.	.	1	1	.	.	3	18	.	.
05.30.02	93	.	.	.	.	13	41	.	.	.	.	.	.	1	1	.	.	.	.	2	5	.	.	10	46	.	.
06.17.03	95	.	.	.	.	.	.	.	.	1	2	2	4	.	.	.	.	.	.	.	.	.	.	10	80	.	.
06.25.03		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	203

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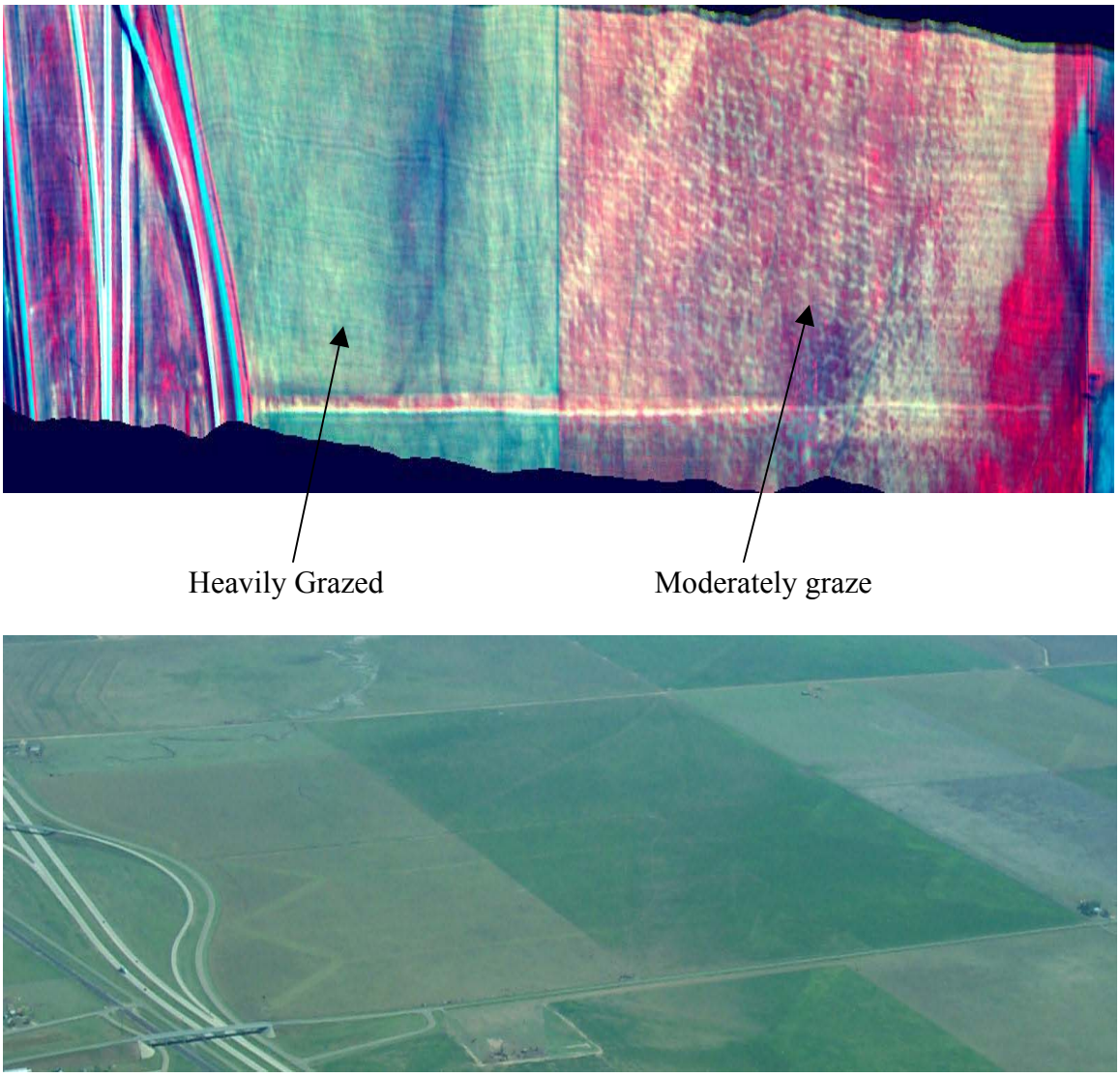

Figure 7: False color composite image (top) and aerial picture of the Swisher County wheat field.