1977 Williston, North Dakota Agriculture Experiment Station

Remote Sensing Experiments

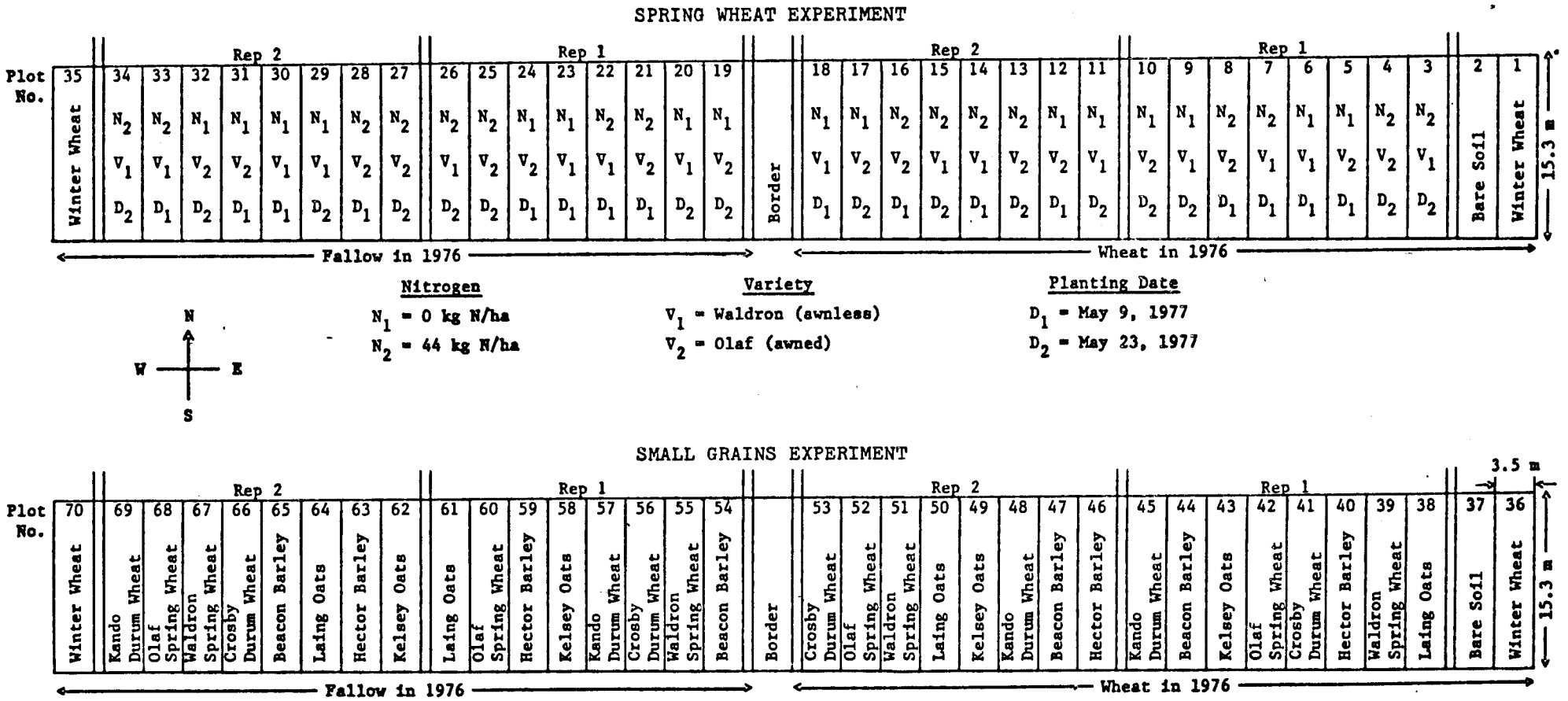


Figure 60.1 Design for 1977 Small Grain Experiment

Level of Factor Codes for

1977 North Dakota Agriculture Experiment Station

Remote Sensing Experiments

Experiment Name - Small Grain ND

Experiment Number - 77100212, 77104212

Factor Code	Factor Description	Level Code	Level Description
1:	Experiment	2:	Small Grain
2:	Soil Moisture	1:	Fallow
		2:	Recrop
3 & 4:	Species, Variety	11:	Spring Wheat, Waldron
		12:	Spring Wheat, Olaf
		21:	Durum Wheat, Crosby
		22:	Durum Wheat, Kando
		31:	Barley, Beacon
		32:	Barley, Hector
		41:	Oats, Laing
		42:	Oats, Kelsey
5:	Nitrogen Treatment	2:	39 lb/acre
6:	Planting Date	1:	May 9, 1977
7:	Block or Replication	1:	First Block
		2:	Second Block

Maturity Stages of Wheat

0 Pre-emergence

1 Seedling, one shoot

2 Tillering
- 2.1 Tillering begins
- 2.2 Tillers formed
- 2.3 Leaf sheaths lengthen
- 2.4 Leaf sheaths strongly erected

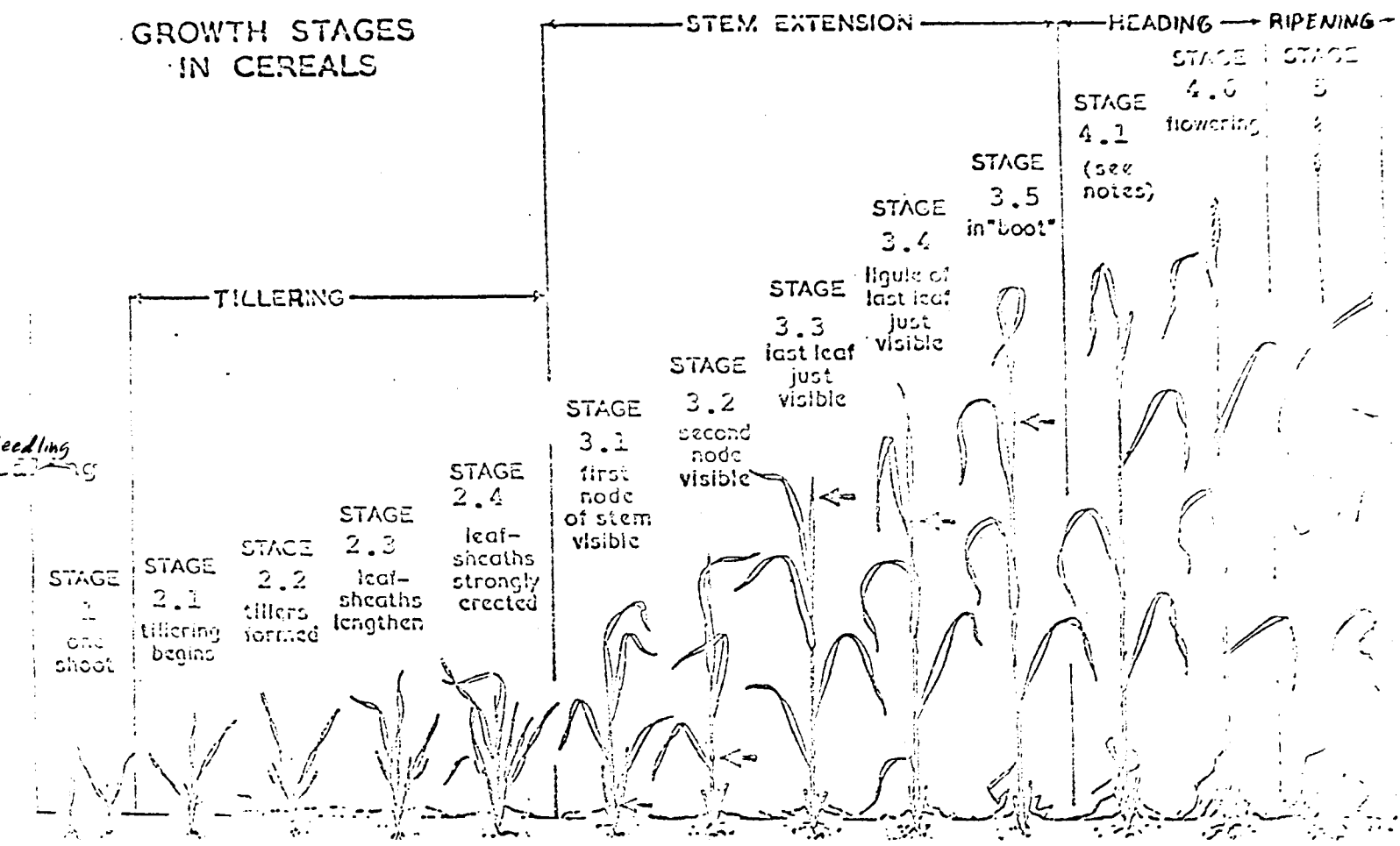
3 Stem Extension
- 3.1 First node of stem visible
- 3.2 Second node visible
- 3.3 Last leaf just visible
- 3.4 Ligule of last leaf just visible
- 3.5 Sheath of last leaf completely grown out; head swollen, but not yet visible (in boot)

4 Heading and Flowering
- 4.1 Heads just visible, excading through split of sheath
- 4.2 1/2 of heads emerged from sheath
- 4.3 All heads emerged from sheath
- 4.4 Flowering
- 4.5 Kernel 1/4 filled
- 4.6 Kernel 1/2 filled
- 4.7 Kernel 3/4 filled
- 4.8 Kernel completely filled, kernel watery

5 Ripening
- 5.1 Milk stage
- 5.2 Soft dough, contents of kernel soft, but dry
- 5.3 Hard dough, kernel hard
- 5.4 Ripe, straw dead

6 Harvesting
- 6.1 Swathed
- 6.2 Combined

A Modification of the Feekes Scale for LACIE Field Measurements



77100212, 77104212

Illumination Conditions for Spectral Data Collection

Date	Day of Year	Time Period (GMT) Start	Stop	Solar Zenith Angle Range (degrees) max-min-max	Solar Azimuth Angle Range (degrees)	Cloud Cover (%)
6/18	169	16:48	21:14	35 - 25 - 37	123-240	1-30
6/23	174	19:43	20:03	26 - 28	204-214	?
7/4	185	15:45	16:04	46 - 43	106-110	3-5
7/14	195	18:25	22:50	27 - 26 - 52	162-261	15-10
7/20	201	19:50	20:09	29 - 31	204-212	20-15
8/5	217	15:52	22:00	49 - 31 - 48	112-245	10
8/8	220	16:36	17:59	43 - 34	125-153	30

Dates Data Collected:

Number of Observations Collected

Plot	5/31	6/18	6/19	6/28	7/1	7/4	7/14	7/22	8/5
38		1	-	-	1	-	2	2	
39	2	1	-	-	1	-	1	3	-
40	1	2	-	-	2	-	2	2	-
41	1	1	-	-	1	-	1	2	-
42	1	1	-	-	1	-	1	2	-
43	2	-	-	-	1	-	2	2	-
44	1	-	-	1	2	-	1	2	-
45	1	-	-	1	1	-	1	2	-
46	1	-	-	1	1	-	1	2	-
47	2	-	-	2	1	-	2	2	-
48	1	-	-	1	2	-	1	2	-
49	1	-	-	1	1	-	1	2	-
50	1	-	-	1	1	-	1	2	-
51	2	-	-	2	2	-	1	3	-
52	1	-	-	1	2	-	1	1	-
53	1	-	-	1	1	-	1	1	-
54	2	-	-	2	1	-	1	2	-
55	1	-	-	1	1	-	1	1	-
56	1	-	-	1	1	-	1	1	-
57	1	-	-	1	2	-	1	1	-
58	2	-	-	2	1	-	1	1	-
59	1	-	1	1	1	-	1	1	-
60	1	-	1	1	1	-	1	1	-
61	1	-	2	1	2	-	1	1	-
62	2	-	1	2	1	-	1	1	-

Dates Data Collected (cont.)

Plot	5/31	6/18	6/19	6/28	7/1	7/4	7/14	7/22	8/5
63	1	-	1	1	1	-	1	1	-
64	1	-	1	1	1	-	1	1	-
65	1	-	2	1	2	-	1	1	-
66	-	-	1	2	1	-	1	1	-
67	-	-	1	1	1	-	1	1	-
68	-	-	1	1	1	1	1	1	-
69	-	-	2	1	2	1	1	1	-

Dates Spectral Data Collected:

Plot Number	Number of Observations Collected						
	6/18	6/23	7/4	7/14	7/20	8/5	8/8
38	4	2	2	8	2	-	-
39	4	2	2	8	2	6	4
40	4	2	2	8	2	-	-
41	4	2	2	8	2	8	4
42	4	2	2	10	2	8	4
43	6	2	2	10	2	-	-
44	6	2	2	10	2	-	-
45	6	2	2	10	2	8	2
46	6	2	2	10	2	8	2
47	6	2	2	10	2	-	-
48	6	2	2	10	2	8	2
49	6	2	2	10	2	-	-
50	6	2	2	10	2	-	-
51	6	2	2	10	2	6	4
52	6	2	2	10	2	6	4
53	6	2	2	10	2	6	4
54	6	2	2	10	2	8	4
55	6	2	2	10	2	8	4
56	6	2	2	10	2	8	4
57	6	2	2	10	2	8	4
58	6	2	2	10	2	8	4
59	6	2	2	10	2	8	4
60	6	2	2	10	2	8	4
61	4	2	2	10	2	-	-
62	4	2	2	10	2	8	4
63	4	2	2	10	2	8	4
64	4	2	2	8	2	-	-
65	6	2	2	8	2	-	-
66	6	2	2	8	2	8	4
67	6	2	2	8	2	8	4
68	6	2	2	8	2	8	4
69	6	2	2	8	2	8	4