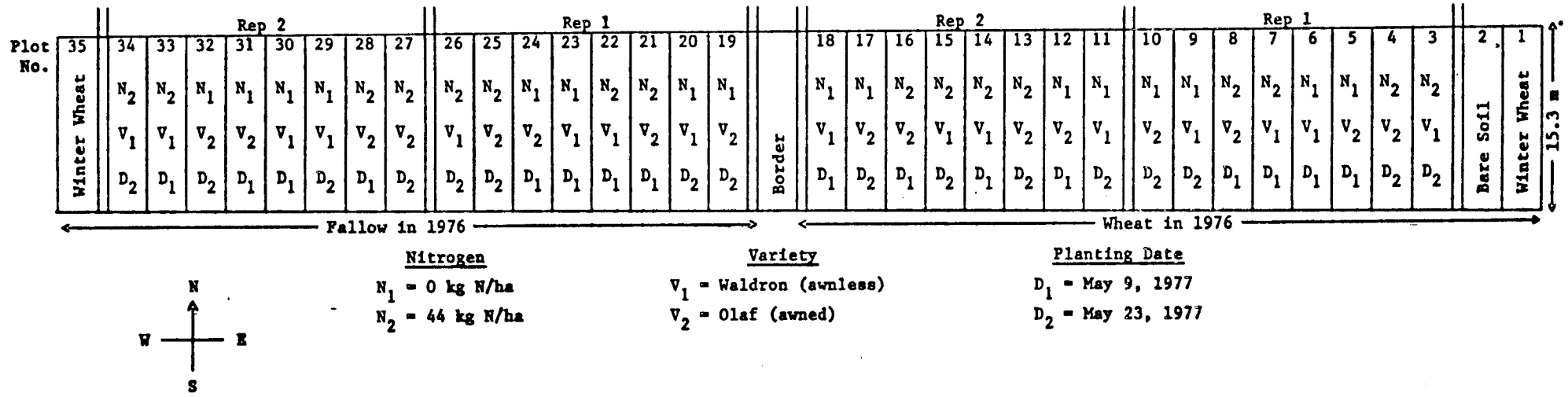
1977 Williston, North Dakota Agriculture Experiment Station

Remote Sensing Experiments

SPRING WHEAT EXPERIMENT



Nitrogen

N_1 = 0 kg N/ha

N_2 = 44 kg N/ha

Variety

V_1 = Waldron (awnless)

V_2 = Olaf (awned)

Planting Date

D_1 = May 9, 1977

D_2 = May 23, 1977

SMALL GRAINS EXPERIMENT

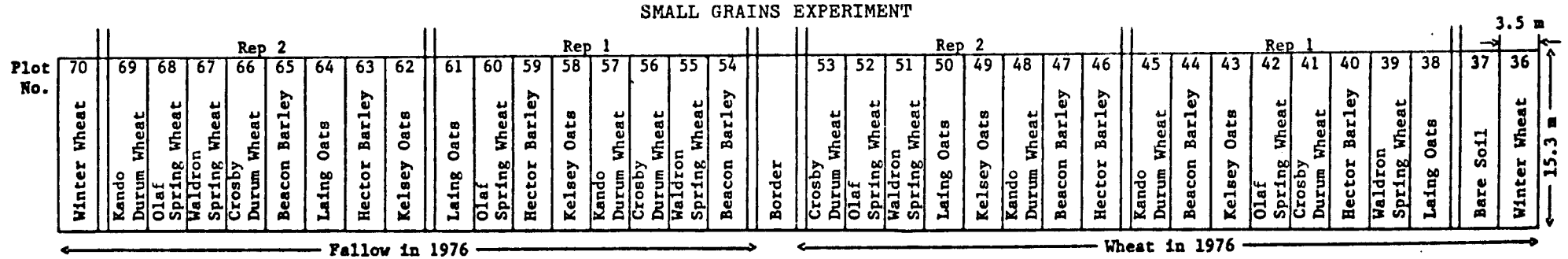


Figure 61.1 Design for 1977 Spring Wheat Experiment

Level of Factor Codes for

1977 North Dakota Agriculture Experiment Station

Remote Sensing Experiments

Experiment Name - Spring Wheat ND

Experiment Number - 77100213, 77104213

Factor Code	Factor Description	Level Code	Level Description
1:	Experiment	1:	Spring Wheat
2:	Soil Moisture	1:	Fallow
		2:	Recrop
3 & 4:	Species, Variety	11:	Spring Wheat, Waldron
		12:	Spring Wheat, Olaf
5:	Nitrogen Treatment	1:	None Applied
		2:	39 lb/acre applied
6:	Planting Date	1:	May 9, 1977
		2:	May 23, 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

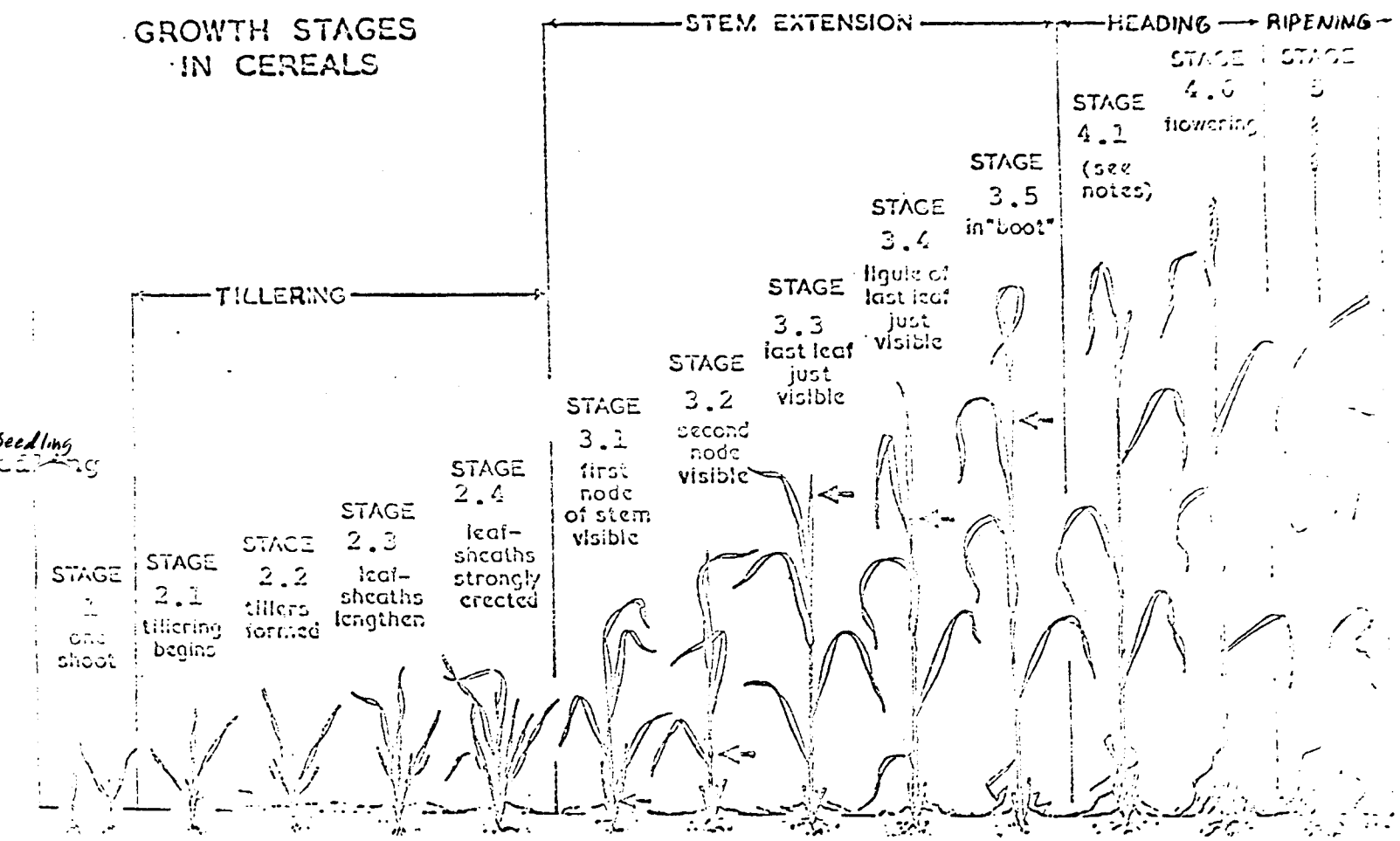
3 Stem Extension
- 3.1 First node of stem visible
- 3.2 Second node visible
- 3.3 Last leaf just visible
- 3.4 Ligule of last leaf just visible
- 3.5 Sheath of last leaf completely grown out; head swollen, but not yet visible (in boot)

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



77100213, 77104213

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 (%)
6/1	152	16:11	23:25	41 - 26 - 59	115-269	0
6/18	169	16:18	20:44	40 - 25 - 33	114-230	1-10
6/23	174	19:02	19:26	25 - 25	183-196	?
7/3	184	16:44	17:52	37 - 28	121-146	5-15
7/4	185	15:08	16:50	52 - 36	98-123	3-30
7/7	188	17:17	17:32	33 - 31	132-138	?
7/14	195	14:48	21:53	56 - 26 - 43	94-248	5
7/20	201	16:48	21:03	38 - 28 - 37	124-232	20-40
8/5	217	15:22	21:37	54 - 31 - 44	105-239	0-10
8/8	220	16:09	18:16	47 - 33	117-160	30

Dates Data Collected:

Number of Observations Collected

Plot	5/31	6/18	7/1	7/3	7/4	7/13	7/14	7/20	8/5	8/8
3	1	1	2	-	1	-	1	1	1	-
4	1	1	1	-	1	-	1	1	1	-
5	1	2	1	-	1	-	2	1	1	-
6	1	1	1	-	1	-	1	1	1	-
7	1	1	2	-	1	-	1	1	1	1
8	1	1	1	-	1	-	1	1	1	1
9	1	2	1	-	1	-	2	1	1	2
10	1	1	1	-	1	-	1	1	1	1
11	1	1	2	-	1	-	1	1	1	1
12	1	1	1	-	1	-	1	1	1	1
13	1	2	1	-	1	-	2	1	1	2
14	1	1	1	-	1	-	1	1	2	1
15	1	1	2	1	1	-	1	1	1	1
16	2	1	1	1	1	-	2	1	1	1
17	1	2	1	1	1	-	2	1	1	2
18	1	1	2	1	1	-	3	1	1	1
19	2	1	1	1	-	-	1	1	1	2
20	1	1	1	1	-	-	1	1	1	1
21	1	1	1	1	=	=	1	1	2	2
22	1	2	2	1	-	-	2	1	1	1
23	2	1	1	1	-	-	1	1	1	1
24	1	1	1	1	-	-	1	2	1	1
25	1	1	1	1	-	-	1	2	2	2
26	1	2	2	1	-	-	2	2	1	1
27	2	1	1	1	-	-	1	2	1	1
28	1	1	1	1	-	-	1	1	1	1

Dates Data Collected (cont.):

Number of Observations Collected

Plot	5/31	6/18	7/1	7/3	7/4	7/13	7/14	7/20	8/5	8/8
29	1	1	1	1	-	10	1	1	2	2
30	1	2	2	1	-	9	2	2	1	1
31	2	1	1	1	-	9	1	1	1	1
32	1	1	1	1	-	9	1	1	1	1
33	1	1	1	1	-	-	1	1	2	2
34	1	2	2	1	-	-	2	2	1	1

Dates Spectral Data Collected:

Plot Number	Number of Observations Collected										
	6/1	6/18	6/19	6/23	7/3	7/4	7/7	7/14	7/20	8/5	8/8
3	16	8	2	2	4	4	2	10	6	10	4
4	16	8	2	2	4	4	2	10	6	10	4
5	16	8	2	2	4	4	2	10	6	10	4
6	16	6	2	2	4	4	2	10	6	10	4
7	16	6	2	2	4	4	2	10	6	10	2
8	16	6	2	2	4	4	2	10	6	10	2
9	16	6	2	2	4	4	2	10	6	10	4
10	16	6	2	2	4	4	2	10	6	10	4
11	16	6	2	2	4	4	2	10	6	10	4
12	17	6	2	2	4	4	2	10	6	10	4
13	16	6	2	2	4	4	2	10	6	10	4
14	16	4	2	2	4	4	2	10	6	10	4
15	16	4	2	2	4	4	2	10	6	10	4
16	16	4	2	2	4	4	2	10	6	10	5
17	16	4	2	2	4	4	2	10	6	10	6
18	16	4	2	2	4	4	2	10	6	10	6
19	12	4	2	2	4	2	2	12	4	10	4
20	12	6	-	2	4	2	2	12	4	10	4
21	12	6	-	2	5	2	2	12	4	10	4
22	12	6	-	2	4	2	2	12	4	10	4
23	12	6	-	2	4	2	2	12	4	8	4
24	12	6	-	2	4	2	2	12	4	8	4
25	12	6	-	2	4	2	2	12	4	8	4
26	12	6	-	2	4	2	2	12	4	8	4
27	12	6	-	2	4	2	2	12	4	8	4
28	12	6	-	2	4	2	2	10	4	8	4
29	12	6	-	2	4	2	2	10	4	10	4
30	12	6	-	2	4	2	2	10	4	10	4
31	12	6	-	2	4	2	2	10	4	10	4
32	12	6	-	2	4	2	2	10	2	10	4
33	12	6	-	2	4	2	2	10	2	10	4
34	12	6	-	2	4	2	2	10	2	10	4