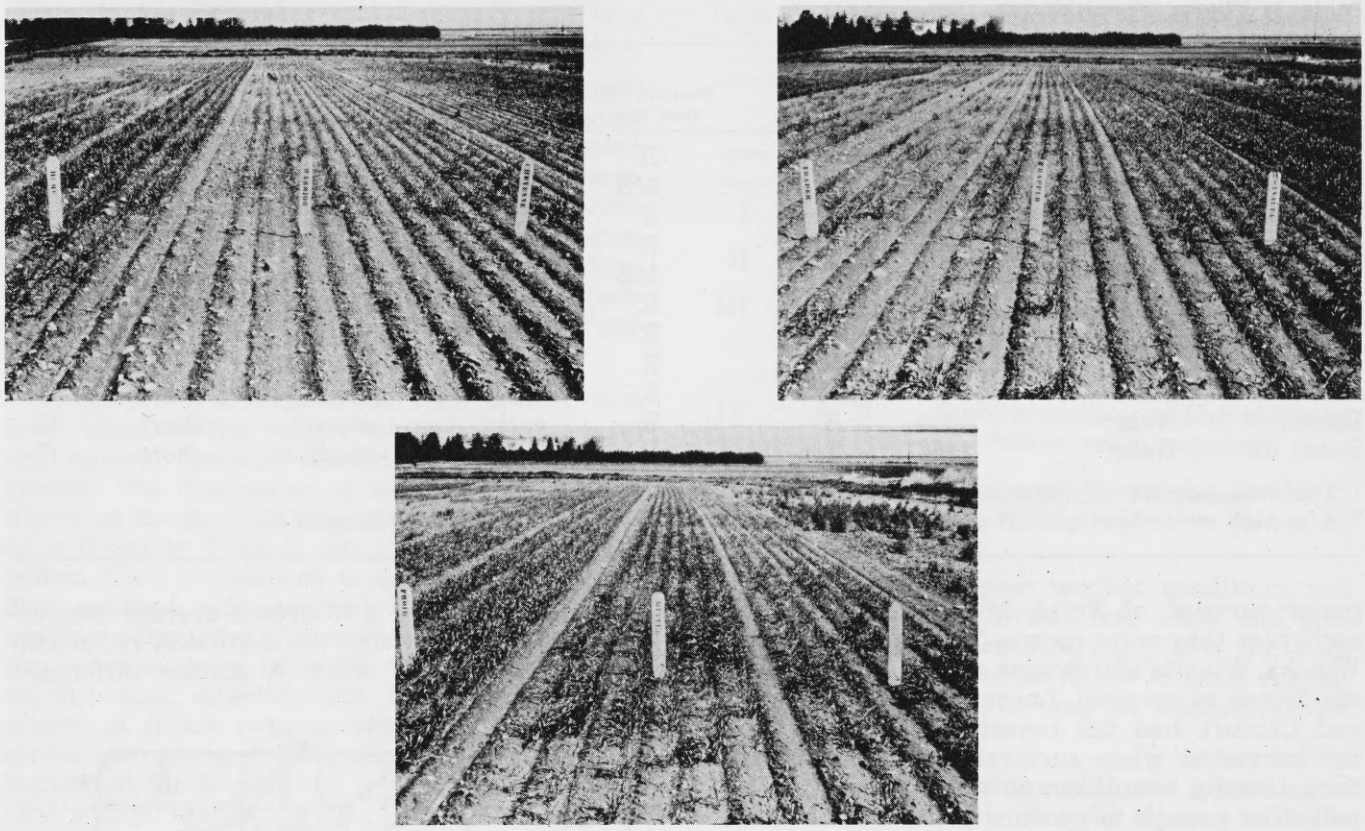

Figure 1. Winter wheat survival at Williston, 1971. (Each strip is 6 feet wide by 125 feet long with the variety name stake in the center.)

Winter Wheat Survival in North Dakota

John R. Erickson

Successful production of winter wheat in North Dakota requires the use of varieties with adequate winterhardiness and proper cultural practices. The level of winterhardiness that a variety possesses probably is the most important factor to consider in choosing which variety to grow. Winter wheat has survived with good stands in some areas of southwestern North Dakota in recent years and with good survival, excels spring wheat for yield.

Materials and Experimental Methods

Each year, trials comparing standard varieties and experimental lines of hard red winter wheat are conducted at most of the agricultural experiment stations in North Dakota. These trials are seeded on summerfallow with a plot seeder equipped with five-inch hoe drill openers. Each plot occupies 48 square feet and is repeated three times at each location. The trials are seeded in early September at a rate of 45 pounds of seed per acre. The per cent survival is evaluated in late April, when good plant growth has resumed. A visual estimate of the per cent surviving plants is recorded. Yield and disease data also are collected.

Agronomic traits of the varieties tested are described in Table 1.

Results and Discussion

The protective snow cover melted in late winter during 1970-71, 1971-72 and 1973-74, and the winter wheat plantings were exposed to low air temperatures. These conditions caused differential survival among varieties at several locations each year as listed in Table 2. All varieties survived completely at Minot in 1971 and 1973, Hettinger in 1973 and 1974, Casselton and Williston in 1973, and at Dickinson in 1974. Very little survival of any variety occurred at Langdon in 1971, 1972 and 1973, at Carrington in 1971 through 1974, and at Casselton in 1974.

The survival data obtained from these trials over a three-year period (Table 2) show the su-

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Table 1. Winter Wheat Variety Descriptions.

Variety	Origin	Year	Reaction[1] to Leaf Rust	Reaction[1] to Stem Rust	Maturity	Straw Strength	Height	Winter Hardiness Group[2]
Froid	Mont.	1968	S	R	late	weak	tall	A
Minter	Minn.	1948	S	MS	late	weak	tall	A
Sundance	Canada	1971	S	S	V. late	weak	tall	A
Hume	S. Dak.	1965	S	R	medium	strong	medium	B
Winalta	Canada	1961	S	MS	medium	medium	medium	B
Winoka	S. Dak.	1969	S	R	medium	medium	medium	B
Bronze	S. Dak.	1972	MS	R	medium	medium	medium	B
Trapper	Nebr.	1968	S	R	medium	medium	medium	C
Centurk	Nebr.	1971	MS	R	early	strong	short	C
Lancer	Nebr.	1963	S	R	early	strong	short	C
Scout 66	Nebr.	1966	S	R	early	medium	short	C

[1] *R = resistant; MS = moderately susceptible; S = susceptible.*
[2] *A = high winterhardiness; B = intermediate winterhardiness; C = low winterhardiness.*

perior survival of Froid, Minter and Sundance each year they were grown. The varieties Hume, Winoka, Winalta and Bronze exhibit an intermediate degree of survival. Lancer, Trapper, Scout 66 and Centurk had the lowest survival and were not harvested when survival was below 20 per cent. Usually a uniform 50 to 60 per cent stand will tiller enough to produce a near normal yield if weeds are controlled.

Figure 1 shows winter wheat survival in demonstration strips at Williston in 1971. These strips represent the degree of survival obtained in other trials, ranging from Froid with nearly complete survival to Trader and Warrior with very low survival.

Winter temperatures in North Dakota are warmest in the southwestern part of the state and became progressively colder toward the northeast corner. During January, the coldest month of the year, there is a 15 degree average temperature difference between the southwest and northeast corners of the state. A similar difference

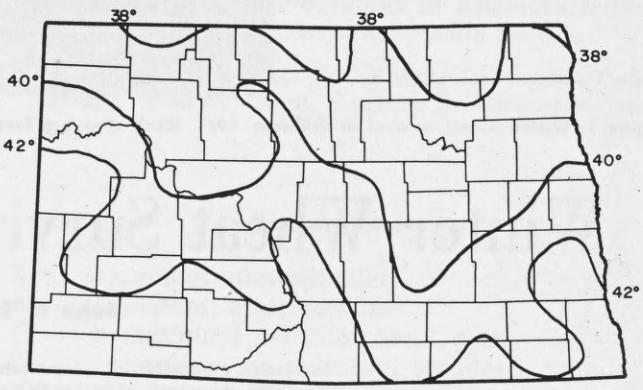

Figure 2. Annual mean temperatures in North Dakota (After Jensen, 7).

Table 2. Per Cent Plant Survival in Experiment Station Trials.

Variety	1970-71 Casselton	1970-71 Williston	1970-71 Mean	1971-72 Hettinger	1971-72 Williston	1971-72 Minot	1971-72 Casselton	1971-72 Mean	1973-74 Williston	1973-74 Minot	1973-74 Mean	3-Year Mean
Froid	73	80	77	67	90	77	53	72	90	53	72	74
Winoka	60	27	44	53	70	70	21	54	87	20	54	51
Winalta	44	20	32	—	—	—	—	—	—	—	—	—
Lancer	9	8	9	63	27	37	2	32	73	15	44	28
Minter	70	77	74	80	90	83	20	68	87	53	70	71
Hume	63	63	63	90	83	80	57	78	—	—	—	—
Trapper	4	37	21	—	—	—	—	—	—	—	—	—
Scout 66	33	5	19	60	9	23	7	25	—	—	—	—
Bronze	30	50	40	83	73	53	3	53	60	34	47	47
Centurk	11	1	6	47	4	28	0	20	80	28	54	27
Sundance	—	—	—	90	90	73	60	78	83	33	58	—

exists during December and February and to a lesser degree during November and March (2).

Figure 2 shows the annual mean temperatures in North Dakota. The current commercial production of winter wheat is mainly in southwestern North Dakota south of the 42 degree isotherm. Data from experiment stations and some commercial production in locations near the 40 degree isotherm suggest that successful winter wheat production in this area is possible also if a combination of winterhardy varieties and good cultural practices is used.

Figure 3 is a map of the state divided into areas based on the variety winterhardiness level and cultural practices needed for successful production. The description of each area by variety winterhardiness group and cultural practices needed is found in Table 3. An alternate crop-fallow system often is practiced in areas I, II and III. A firm seedbed aids survival by preventing soil heaving during the winter from frost action and also provides more favorable moisture conditions for fall stand establishment. Firm seedbed preparation of fallow requires shallow tillage in late season operations. A rod weeder is an excellent implement for firming the soil and keeping moisture within seeding depth. The hoe drill gives

Table 3. Variety Winterhardiness Group and Cultural Practices by Area of Production.

Area	Variety Winterhardiness Group	Cultural Practices
I	A, B, C	Firm seedbed, hoe drill preferred
II	A, B	Firm seedbed, hoe drill preferred
III	A	Firm seedbed, hoe drill preferred plus flax strips on fallow desirable
IV	A, B	Stubble seeding or flax strips on fallow recommended
V	A	Production hazardous, stubble seeding only

better stands under poor seedbed conditions and the ridges between furrows trap snow and give protection to the overwintering plants (3). Flax strips should be seeded on fallow in early August to grow tall enough to trap an adequate snow cover (1).

Area IV has higher rainfall and more second cropping is practiced. Stubble seeding is bene-

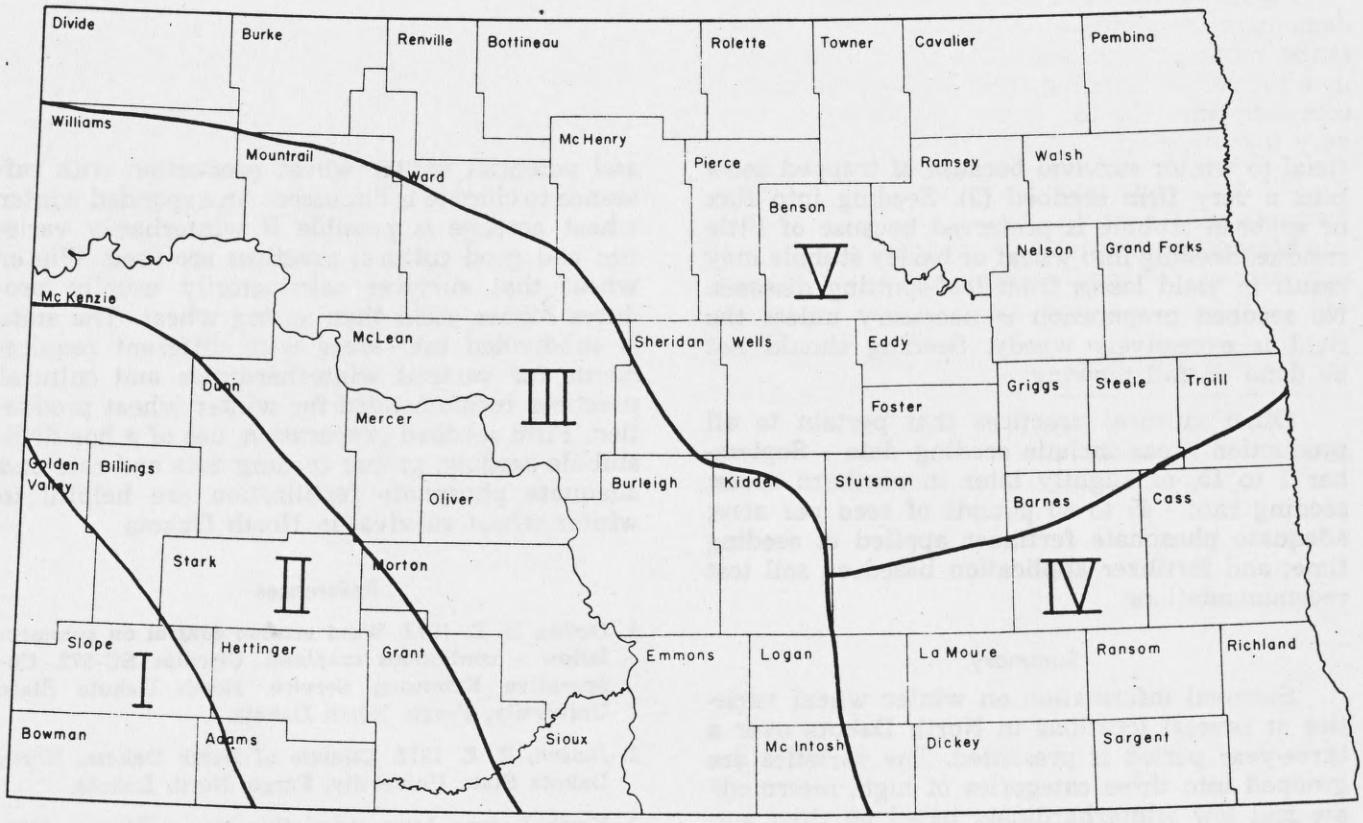

Figure 3. Areas of suitability for winter wheat production (Area I most favorable, Area V least favorable.)

ficial to winter survival because of trapped snow plus a very firm seedbed (3). Seeding into flax or soybean stubble is preferred because of little residue. Seeding into wheat or barley stubble may result in yield losses from leaf-spotting diseases. No seedbed preparation is necessary unless the field is excessively weedy. Seeding should not be done on fall plowing.

Other cultural practices that pertain to all production areas include seeding date - September 1 to 15, or slightly later in southern areas; seeding rate - 45 to 60 pounds of seed per acre; adequate phosphate fertilizer applied at seeding time; and fertilizer application based on soil test recommendations.

Summary

Survival information on winter wheat varieties at several locations in North Dakota over a three-year period is presented. The varieties are grouped into three categories of high, intermediate and low winterhardiness based on their survival in these trials. Froid, Minter and Sundance had the best survival. The distribution of present and potential winter wheat production with reference to climate is discussed. An expanded winter wheat acreage is possible if winterhardy varieties and good cultural practices are used. Winter wheat that survives satisfactorily usually produces higher yield than spring wheat. The state is subdivided into areas with different requirements for varietal winterhardiness and cultural practices recommended for winter wheat production. Firm seedbed preparation, use of a hoe drill, stubble seeding, proper seeding date and rate and adequate phosphate fertilization are helpful to winter wheat survival in North Dakota.

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