

Weeds in Cass County Crops, 1978-1983

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The relative severity of weed species varies from year to year in North Dakota cropland. Observed variation in weed severity could be caused by yearly environmental variations or a trend toward permanent modification of weed infestations. Limitations of human memory and visual observation make differentiation between yearly fluctuation and actual trends in weed infestations difficult.

Surveys were conducted to obtain information on weed populations in Cass County, North Dakota, over a six-year period. Information on weed populations are useful to determine the benefits and needs for herbicides, to plan weed science research and extension programs, to give early warning of developing weed problems, to assist in the development of weed prevention and control systems, and to provide a historical record for future reference.

The weed population surveys were conducted in June, July, and August of 1978, 1979, 1981, 1982, and 1983. A survey also was conducted in 1980, but the objectives of the 1980 survey were different from the other years and the data will not be presented in this report.

The 49 individual townships in Cass County were assigned consecutive numbers starting from northwest through northeast. A random number list was used to select the 39 townships for a single survey site in 1978. All townships had one survey site and 21 townships were randomly selected for a second survey site in 1979. All townships had two survey sites in 1981 and three survey sites in 1982 and 1983.

Survey sites within a township were selected in 1978 by beginning at Section 15 and visually inspecting adjoining sections in a clockwise manner from field edges until an acceptable field was located. An acceptable field for survey had to be at least 40 acres, accessible by road, and planted to a crop included in the survey. Surveyed crops were wheat, barley, oats, and flax in 1978 and wheat, barley, oats, flax, sunflower, and soybean in 1981, 1982, and 1983. Sections 8 and 28 were surveyed in 1979, Sections 11 and 29 in 1981, Sections 6, 16, and 26 in 1982, and Sections 18, 3, and 22 in 1983. Townships and fields which were atypical because of rivers, towns or other problems were

not surveyed, so the number of surveyed fields was lower than the intended number in some years. The section and field selection method was used so that surveyors did not need to randomize field selection and to reduce travel. Herbicide use was not a factor in field selection.

Weeds were counted in 0.25 square meter (0.3 square yard) quadrats at 20 locations in the selected field. Plant counts in sunflower or row planted soybean were in a 25 cm by 100 cm (10 by 39 inch) band over the row. The first count was 100 steps from a field corner and 100 steps into the field. The other counts were taken one every 20 steps in an "M" pattern with five samples on each line of the "M." Although some quadrats contained over 100 weeds, a maximum of 99 weeds per 0.25 square meter for an individual weed species was counted to save surveying time. The number of quadrats with no weeds also was recorded. The farm operators were interviewed to obtain production practices used on the surveyed fields in 1981, 1982, and 1983.

DEFINITION OF TERMS USED TO EXPRESS SURVEY RESULTS

Weed Frequency - The percentage of surveyed fields which contained the weed in one or more of the 20 0.25 square meter sample quadrats. "Weed Free" in the Weed Species column indicates that at least one quadrat within a field had no weeds.

Field Uniformity (All*) - The percentage of the 0.25 square meter sample quadrats which contained the specified weed based on all sampled fields.

Field Uniformity (Inf.*) - The percentage of the 0.25 square meter sample quadrats which contained the specified weed based only on infested fields where the weed occurred in one or more of the sample quadrats.

Weed Density (All*) - The average weed density per square meter based on all sample quadrats and all sampled fields.

Weed Density (Inf.*) - The average weed density per square meter based only on infested fields where the weed occurred in one or more of the sample quadrats.

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* Refers to brief headings used in tables.

Density Range - The lowest and highest density recorded for a specific weed within Cass County. The largest possible maximum density was 396 plants per square meter because counts were not made above 99 per 0.25 square meter.

Weed Index - A calculated value which gives an indication of the abundance of a particular weed and can be used to make comparisons between years and among crops. The formula used was:

$$\text{Weed Index} = \frac{\text{Weed Frequency} + (3 \times \text{Field Uniformity} - \text{All}) + (7 \times \text{Weed Density} - \text{All})}{3}$$

The ratio of Weed Frequency:Field Uniformity:Weed Density was 1:3:7 averaged over all weeds in all fields in a statewide weed survey in 1978. These numbers were used as multipliers so that all three factors would have approximately an equal effect on Weed Index.

Weed Index does not necessarily represent the losses in crop production caused by a weed because weeds vary greatly in competitive ability.

RESULTS AND DISCUSSION

The results of the weed surveys in Cass County averaged over all crops and all surveyed fields for 1978, 1978, 1981, 1982, and 1983 are given in Tables 1, 2, 3, 4, and 5, respectively.

Weed frequency indicates the percentage of fields in which a weed species was found. For example, a weed frequency of 85 percent for green foxtail in 1981 indicates that green foxtail was found in at least one of the 20 sam-

ple quadrats per field in 85 percent of the 1981 surveyed fields. The "Weed Free" entry in Tables 2, 3, 4, and 5 means that at least one quadrat in the surveyed field had zero weeds. For example, a Weed Frequency of 70 percent for weed free in 1983 indicates that 70 percent of the fields surveyed in 1983 had at least one of the 20 sample quadrats per field which was weed free.

Green foxtail was the weed most likely to be found in surveyed fields in all years with Weed Frequencies from 79 to 100 percent. Wild oats was found in 59 to 82 percent of the surveyed fields. Several of the less common weed species were found in only 1 to 3 percent of the surveyed fields.

Field Uniformity indicates the percentage of the sample quadrats which contained the weed species. Field Uniformity was averaged over all surveyed fields (All) and over fields which were infested with the weed (Inf.). For example, a Field Uniformity-All of 23.7 percent and a Field Uniformity-Inf. of 32.9 percent for wild oats in 1982 indicates that 23.7 percent of all surveyed quadrats contained wild oats and 32.9 percent of the survey quadrats in infested fields contained wild oats in 1982. Green foxtail infestations were more uniform than with other weed species in all years. Field Uniformity-All of green foxtail was from 40.0 to 67.3 percent. Field Uniformity-All of wild oats was from 16.1 to 23.7 percent. Several of the less uniformly distributed weeds were found in only 5 percent of the survey quadrats in the infested fields and in less than 0.5 percent of the survey quadrats in all fields.

Weed Density is the number of plants per square meter for each weed species averaged over all surveyed fields (All) or over fields which were infested with the weed (Inf.). For example, the Weed Density-All of green foxtail was from 4.7 to 17.2 plants per square meter and the Weed Density-All of wild oats was from 0.9 to 2.5 plants per

Table 1. Cass County weed infestations based on 39 surveyed fields, 1978.

Weed species	Weed Frequency (%)	Field Uniformity (%)		Weed Density (Plants/m ²)		Density Range (Plants/m ²)		Weed Index
		All ^a	Inf. ^b	All ^a	Inf. ^b	Low	Hi	
Green foxtail	100	67.3	67.3	4.7	4.7	1.4	16.8	111.5
Redroot pigweed	85	50.0	59.1	3.4	4.1	0.8	6.8	86.2
Yellow foxtail	59	24.1	40.9	2.0	3.3	0.4	28.8	48.4
Wild oats	82	18.1	22.0	0.9	1.2	0.2	3.8	47.6
Common lambsquarters	69	12.4	18.0	0.7	1.0	0.2	4.4	37.2
Kochia	74	8.7	11.7	0.4	0.6	0.2	4.2	34.5
Ragweed	59	10.5	17.8	0.6	1.0	0.2	5.4	31.6
Russian thistle	49	5.6	11.6	0.4	0.8	0.2	10.2	22.8
Wild buckwheat	8	1.2	15.0	0.1	1.0	0.2	2.6	3.9
Marshelder	3	0.8	30.0	<0.1	1.8	1.8	1.8	1.8
Common milkweed	3	0.1	5.0	<0.1	0.2	0.2	0.2	1.0
Volunteer sunflower	3	0.1	5.0	<0.1	0.4	0.4	0.4	1.0
Garrison creeping foxtail	3	0.1	5.0	<0.1	0.2	0.2	0.2	1.0

^a All surveyed fields.

^b Surveyed fields which were infested with the weed.

square meter. The density range is the lowest and highest density recorded for a specific weed. The greatest average Weed Density for any weed was 302.2 plants per square meter for green foxtail in 1981. The greatest average Weed Density of wild oats was 68.8 plants per square meter in 1982. Average Weed Densities reported may be slightly lower than actual because a maximum of 99 weeds per 0.25 square meter quadrat was counted for an individual weed species even though some quadrats contained more than 99 weeds.

The weeds are listed in order in Tables 1 through 5 by Weed Index (see formula), with the most abundant weed listed first. Weed Index includes Weed Frequency, Field Uniformity-All and Weed Density-All and can be used to compare the relative abundance of weeds among years, weed species, or other factors which may influence weed abundance. Green foxtail, yellow foxtail, wild oats, wild buckwheat, redroot pigweed, and common lambsquarters

were among the 10 most abundant weeds in all five years. Wild mustard, kochia, and Canada thistle were among the 10 most abundant weeds in four of five years. Weed Indices for the nine weeds listed above are given in Table 6 for the five survey years.

The Weed Indices of green foxtail, wild oats, wild mustard and Canada thistle were similar from 1978 through 1983 while the Weed Indices of yellow foxtail, wild buckwheat, redroot pigweed, common lambsquarters, and kochia were more variable (Table 6). Data on precipitation, soil temperature, and seeding progress for hard red spring wheat are given in Tables 7, 8, and 9, respectively. Soil temperature data were only available since 1980. Environmental data were included for 1980, though the 1980 weed survey was dissimilar to the reported surveys. Wild oats in wheat was the only cropland weed surveyed in 1980. The 1980 wild oats survey resulted in a Weed Index of 131, which is over twice the next largest

Table 2. Cass County weed infestations based on 70 surveyed fields, 1979.

Weed species	Weed Frequency	Field Uniformity		Weed Density		Density Range		Weed Index
		All ^a	Inf. ^b	All ^a	Inf. ^b	Low	Hi	
	(%)	(%)		(Plants/m ²)		(Plants/m ²)		
Green foxtail	79	41.8	53.2	17.2	21.9	0.2	133.0	108.0
Yellow foxtail	77	33.7	43.7	17.3	22.4	0.2	169.0	99.8
Wild oats	59	16.1	27.4	2.6	4.4	0.2	32.8	41.6
Wild buckwheat	57	13.6	23.9	1.7	2.9	0.2	25.0	36.6
Wild mustard	46	10.9	23.7	0.9	1.9	0.2	11.6	28.2
Common lambsquarters	27	4.7	17.4	0.4	1.6	0.2	8.2	14.8
Redroot pigweed	29	3.9	13.5	0.6	2.2	0.2	33.2	14.8
Prostrate spurge	27	4.8	17.6	0.3	1.1	0.2	4.8	14.5
Volunteer sunflower	21	5.1	24.0	0.7	3.4	0.2	24.6	14.0
Canada thistle	23	3.4	15.0	0.4	1.9	0.2	9.4	12.1
Quackgrass	13	2.9	22.2	0.5	4.0	0.2	12.0	8.3
Ragweed	13	2.4	18.3	0.3	2.2	0.2	10.0	7.3
Kochia	10	1.4	14.3	0.1	1.4	0.2	7.4	5.1
Field bindweed	11	0.9	7.5	0.1	0.5	0.2	1.2	4.8
Common milkweed	9	0.8	9.2	0.1	0.7	0.2	2.2	3.8
Common purslane	6	0.6	11.2	0.1	2.1	0.2	7.8	2.8
Perennial sowthistle	6	0.5	8.7	0.1	1.3	0.2	4.0	2.6
Volunteer soybean	4	0.9	20.0	0.1	1.3	0.2	2.4	2.4
Russian thistle	6	0.4	7.5	<0.1	0.3	0.2	0.6	2.4
Wild rose	6	0.4	6.3	<0.1	0.3	0.2	0.6	2.3
Flixweed	1	1.1	80.0	0.2	10.8	10.8	10.8	2.0
Smartweed	4	0.4	8.3	<0.1	0.4	0.2	0.6	1.8
Field pennycress	4	0.3	6.7	<0.1	0.4	0.2	0.6	1.8
Prickly lettuce	1	0.4	25.0	0.1	6.6	6.6	6.6	1.1
Clover	1	0.3	20.0	<0.1	0.8	0.8	0.8	0.8
Leafy spurge	1	0.1	10.0	<0.1	2.0	2.0	2.0	0.7
Volunteer barley	1	0.1	5.0	<0.1	0.8	0.8	0.8	0.6
Common cocklebur	1	0.1	5.0	<0.2	0.2	0.2	0.2	0.6
Nightflowering catchfly	1	0.1	5.0	<0.1	0.2	0.2	0.2	0.6
Wild vetch	1	0.1	5.0	<0.1	0.2	0.2	0.2	0.6
Weed free	67	23.5	35.0	--	--	--	--	--

^a All surveyed fields.

^b Surveyed fields which were infested with the weed.

wild oats index in Table 6. Thus, wild oats was very severe in 1980. Other notable variations in Weed Indices include: low wild buckwheat, high kochia, and high redroot pigweed Indices in 1978; low kochia and high yellow foxtail Indices in 1979; and a low yellow foxtail Index in 1981.

The environmental data in Tables 7, 8, and 9 indicate that the early spring of 1980 was unusually dry and warm with early wheat seeding while early spring 1979 was unusually wet with very little wheat seeded by May 15. The low kochia and high yellow foxtail index in 1979 may have been caused by the high moisture and delayed seeding that year. Kochia normally germinates quite early and is often killed by delayed tillage. Kochia infestations also may be reduced by wet soil conditions. Yellow foxtail germinates later in the season than kochia, wild buckwheat, and wild oats and is more competitive with late seeded crops. Yellow foxtail may be favored by abundant soil moisture.

Wild oats was more abundant in 1980 than any other surveyed year and the early spring was dryer and warmer than other surveyed years. The environment plus early seeding probably did not allow wild oats control with seedbed tillage and caused the wild oats to germinate at the same time as the small grains.

The data in Tables 7, 8, and 9 do not explain all the variability in Weed Indices. For example, kochia was abundant in 1978 with a relatively late seeding but the dry April and May could have favored kochia. However, April and May were dryer in 1982 than 1978 and seeding was somewhat delayed, but the kochia index in 1982 was less than half of the kochia index in 1978. Certain environmental factors may help explain variable weed abundance but a total explanation was not possible. The data in Tables 1 through 9 suggest that variations in weed abundance from 1978 through 1983 were yearly variations, probably due to

Table 3. Cass County weed infestations based on 97 surveyed fields, 1981.

Weed species	Weed Frequency (%)	Field Uniformity (%)		Weed Density (Plants/m ²)		Density Range (Plants/m ²)		Weed Index
		All ^a	Inf. ^b	All ^a	Inf. ^b	Low	HI	
Green foxtail	85	47.0	55.5	14.9	17.7	0.2	302.2	110.0
Wild oats	69	22.3	32.3	2.8	4.1	0.2	39.4	52.0
Wild buckwheat	54	18.7	34.9	2.0	3.8	0.2	20.4	41.3
Wild mustard	58	14.3	24.8	1.2	2.1	0.2	10.6	36.4
Common lambsquarters	42	11.1	26.2	1.0	2.5	0.2	10.0	27.6
Redroot pigweed	41	8.1	19.6	1.0	2.4	0.2	29.0	24.1
Kochia	32	7.0	21.8	0.7	2.2	0.2	12.2	19.3
Canada thistle	19	2.2	11.7	0.2	1.1	0.2	3.0	8.8
Russian thistle	13	2.5	18.5	0.2	1.4	0.2	6.2	7.4
Quackgrass	11	1.8	15.5	0.2	1.5	0.2	8.2	5.9
Prostrate spurge	11	0.9	7.7	0.0	0.4	0.2	0.8	4.8
Prostrate pigweed	9	1.3	13.9	0.1	0.8	0.2	2.2	4.6
Common purslane	4	1.5	37.5	0.2	4.5	0.2	8.8	3.4
Yellow foxtail	6	0.8	12.5	0.1	1.3	0.2	4.2	3.0
Volunteer sunflower	7	0.5	7.1	0.0	0.3	0.2	0.6	3.0
Wild rose	6	0.5	8.3	0.0	0.6	0.2	1.6	2.7
Ragweed	5	0.7	14.0	0.0	0.6	0.2	1.8	2.5
Marshelder	4	0.7	16.2	0.1	2.1	0.2	7.4	2.2
Perennial sowthistle	3	0.5	15.0	0.1	2.2	0.2	4.0	1.7
Common cocklebur	4	0.3	6.3	0.0	0.3	0.2	0.6	1.7
Common milkweed	4	0.2	5.0	0.0	0.3	0.2	0.4	1.6
Field pennycress	3	0.4	13.3	0.0	0.7	0.2	1.2	1.5
Sweetclover	2	0.5	25.0	0.0	1.3	0.8	1.8	1.3
Waterpod	3	0.3	8.3	0.0	0.3	0.2	0.4	1.3
Wild carrot	2	0.5	22.5	0.1	2.8	1.4	4.2	1.3
Hedge bindweed	2	0.2	7.5	0.0	0.8	0.6	1.0	0.9
Dock	2	0.2	7.5	0.0	0.4	0.2	0.6	0.9
Skeleton weed	1	0.1	10.0	0.0	0.6	0.6	0.6	0.5
Nightflowering catchfly	1	0.1	10.0	0.0	0.4	0.4	0.4	0.5
Smartweed	1	0.1	5.0	0.0	0.4	0.4	0.4	0.4
Leafy spurge	1	0.1	5.0	0.0	0.4	0.4	0.4	0.4
Dwarf mallow	1	0.1	5.0	0.0	0.2	0.2	0.2	0.4
Weed free	73	21.8	29.7	--	--	--	--	--

^a All surveyed fields.

^b Surveyed fields which were infested with the weed.

change in environment rather than trends for permanent changes in weed abundance.

Data from fields surveyed in 1981, 1982, and 1983 were separated by production practices. The influence of crop on Weed Index is shown in Table 10. The Weed Indices of wild oats, wild buckwheat, green foxtail, yellow foxtail, and kochia were larger in small grain crops than in the sunflower and soybean. The Weed Index of wild mustard was greater in sunflower and soybean than in small grains. Weed Indices of redroot pigweed, common lambsquarters, and Canada thistle were variable with year or similar in the small grains and the sunflower and soybean.

Small grains are seeded earlier than soybean or sunflower, so seedbed preparation tillage in sunflower and soybean would destroy many of the early germinating weeds like wild oats, wild buckwheat, and kochia. These weeds are more abundant in small grain crops. The herbicides most commonly used in crops also influence weed abundance. Most small grain fields are treated with 2,4-D or MCPA, which provide excellent wild mustard control. Wild mustard often is poorly controlled in sunflower and soybean. Herbicide use and wild mustard control probably explains the greater abundance of wild mustard in sunflower and soybean than in small grains. Most sunflower and soybean fields are treated with soil-applied

Table 4. Cass County weed infestations based on 147 surveyed fields, 1982.

Weed species	Weed Frequency (%)	Field Uniformity (%)		Weed Density (Plants/m ²)		Density Range (Plants/m ²)		Weed Index
		All ^a	Inf. ^b	All ^a	Inf. ^b	Low	Hi	
Green foxtail ^c	90	50.0	55.3	13.9	15.3	0.2	87.8	112.5
Wild oats	72	23.7	32.9	2.5	3.5	0.2	68.8	53.6
Wild buckwheat	54	21.2	39.4	2.1	4.0	0.2	18.0	44.1
Wild mustard	54	18.6	34.6	2.0	3.7	0.2	32.6	41.1
Redroot pigweed	38	7.6	19.9	0.8	2.2	0.2	27.0	22.2
Common lambsquarters	31	7.2	23.7	0.8	2.6	0.2	19.0	19.3
Kochia	30	5.1	16.9	0.6	2.0	0.2	25.8	16.4
Canada thistle	17	1.8	10.8	0.2	1.0	0.2	2.8	7.9
Ragweed	12	1.9	15.6	0.1	1.1	0.2	5.6	6.3
Quackgrass	12	2.0	17.4	0.2	1.6	0.2	8.8	6.3
Russian thistle	9	1.6	17.7	0.3	3.0	0.2	28.2	5.1
Volunteer sunflower	8	1.6	20.0	0.2	2.1	0.2	11.6	4.7
Common milkweed	10	0.9	8.9	0.1	0.7	0.2	3.0	4.2
Prostrate pigweed	7	0.7	11.0	0.1	0.9	0.2	3.6	3.2
Smartweed	5	0.9	17.9	0.1	1.9	0.2	8.6	2.6
Dwarf mallow	5	0.7	15.7	0.1	1.2	0.2	5.8	2.5
Prostrate spurge	4	0.8	20.0	0.1	2.1	0.4	9.6	2.4
Field pennycress	5	0.4	9.3	0.0	0.5	0.2	1.8	2.1
Marshelder	4	0.5	12.5	0.0	0.7	0.2	1.2	1.9
Wild rose	4	0.4	9.2	0.0	0.7	0.2	2.0	1.8
Nightshade	2	0.8	38.3	0.1	4.7	2.2	6.0	1.7
Common cocklebur	3	0.4	16.3	0.0	1.1	0.2	2.8	1.4
Hedge bindweed	3	0.3	12.5	0.0	0.6	0.2	1.8	1.3
Groundcherry	2	0.5	25.0	0.0	2.0	1.2	2.8	1.3
Greenflower pepperweed	2	0.5	25.0	0.0	2.1	0.2	5.4	1.3
Dock	3	0.3	10.0	0.0	0.7	0.2	1.2	1.2
Perennial sowthistle	2	0.3	15.0	0.0	1.2	0.2	3.2	1.0
Wild carrot	2	0.2	11.7	0.0	0.6	0.4	0.8	0.9
Common purslane	2	0.1	5.0	0.0	0.2	0.2	0.2	0.8
Prickly lettuce	1	0.2	17.5	0.0	1.3	0.2	2.4	0.7
Leafy spurge	1	0.2	12.5	0.0	1.2	0.2	2.2	0.7
Venice mallow	1	0.3	40.0	0.0	4.2	4.2	4.2	0.6
Field bindweed	1	0.2	25.0	0.0	2.4	2.4	2.4	0.4
Flixweed	1	0.0	5.0	0.0	1.0	1.0	1.0	0.3
Nightflowering catchfly	1	0.1	15.0	0.0	0.6	0.6	0.6	0.3
Velvet leaf	1	0.0	5.0	0.0	0.2	0.2	0.2	0.3
Weed free	67	20.7	31.1	--	--	--	--	--

^a All surveyed fields.

^b Surveyed fields which were infested with the weed.

^c Green and yellow foxtail were not counted separately.

Table 5. Cass County weed infestations based on 133 surveyed fields, 1983.

Weed species	Weed Frequency (%)	Field Uniformity (%)		Weed Density (Plants/m ²)		Density Range (Plants/m ²)		Weed Index
		All ^a	Inf. ^b	All ^a	Inf. ^b	Low	Hi	
Green foxtail	86	40.0	46.6	7.6	8.8	0.2	75.6	86.2
Wild oats	68	23.7	34.6	1.8	2.6	0.2	13.0	50.7
Wild buckwheat	61	18.2	29.9	2.1	3.4	0.2	32.8	43.4
Yellow foxtail	55	16.5	30.1	2.2	4.0	0.2	41.2	40.0
Wild mustard	51	15.0	29.3	1.2	2.3	0.2	10.0	34.7
Redroot pigweed	39	7.0	18.0	0.5	1.4	0.2	7.8	21.3
Kochia	34	5.8	17.2	0.6	1.6	0.2	10.0	18.4
Common lambsquarters	29	5.3	18.1	0.5	1.6	0.2	10.0	16.2
Canada thistle	17	2.2	13.2	0.2	1.3	0.2	4.4	8.2
Russian thistle	14	2.0	14.7	0.2	1.2	0.2	4.4	6.9
Volunteer sunflower	10	1.5	15.0	0.1	1.3	0.2	4.6	5.0
Prostrate spurge	9	1.2	13.3	0.1	0.7	0.2	2.4	4.4
Common cocklebur	7	1.1	16.1	0.1	1.7	0.2	6.4	3.6
Ragweed	7	0.7	10.0	0.0	0.6	0.2	2.8	3.0
Dock	8	0.5	0.6	0.0	0.4	0.2	0.6	3.0
Marshelder	6	0.6	10.6	0.0	0.7	0.2	1.6	2.7
Prickly lettuce	6	0.4	6.9	0.0	0.5	0.2	1.0	2.5
Common milkweed	6	0.4	6.9	0.0	0.6	0.2	1.2	2.5
Volunteer soybean	5	0.6	10.7	0.0	0.7	0.2	2.0	2.4
Quackgrass	5	0.7	15.0	0.0	0.9	0.2	2.0	2.3
Wild rose	5	0.7	15.0	0.0	1.0	0.2	3.4	2.3
Common purslane	4	0.4	10.0	0.0	0.6	0.2	1.4	1.7
Morningglory	4	0.3	9.0	0.0	0.6	0.2	2.2	1.6
Leafy spurge	3	0.4	13.8	0.1	1.9	0.4	4.6	1.5
Nightflowering catchfly	3	0.2	7.5	0.0	0.4	0.2	1.0	1.3
Dwarf mallow	2	0.2	6.7	0.0	0.3	0.2	0.4	0.9
Prostrate pigweed	2	0.2	12.5	0.0	0.5	0.2	0.8	0.7
Field pennycress	1	0.0	5.0	0.0	0.2	0.2	0.2	0.3
Weed free	70	22.9	32.8	--	--	--	--	--

^a All surveyed fields.

^b Surveyed fields which were infested with the weed.

Table 6. Weed Index for several of the more common weeds in Cass County survey based on all surveyed fields.

Weed	Survey Year				
	1978	1979	1981	1982	1983
	------(Weed Index)-----				
Green foxtail	112	108	110	112 ^b	86
Yellow foxtail	48	100	3	-- ^b	40
Wild oats	48	42	52	54	51
Wild buckwheat	4	37	41	44	43
Redroot pigweed	86	15	24	22	21
Common lambsquarters	37	15	28	19	16
Wild mustard	-- ^a	28	36	41	35
Kochia	34	5	19	16	18
Canada thistle	-- ^a	12	9	8	8

^a Not identified in the 39 surveyed fields in 1978.

^b Green foxtail and yellow foxtail were combined in 1982.

Table 7. Monthly and annual precipitation at Fargo, ND.^a

Month	Precipitation, Fargo						
	Normal	1978	1979	1980	1981	1982	1983
	------(Inches)-----						
April	1.90	1.15	3.04	0.02	0.61	0.45	0.42
May	2.24	1.78	2.02	0.64	3.46	1.82	2.00
June	3.06	4.40	2.92	2.68	2.56	1.61	2.34
July	3.34	2.92	3.38	0.76	3.21	2.64	4.16
August	2.67	3.79	0.90	4.24	1.76	1.12	2.56
September	1.87	0.92	0.31	2.52	1.11	1.12	1.63
Total annual	19.75	17.44	19.97	15.11	17.59	20.20	19.67

^a Source, Dr. John Enz, Soil Science Department, North Dakota State University.

Table 8. Average weekly soil temperature 12 inches under sod at Fargo, ND from April through July.^a

	1980	1981	1982	1983
	------(Temp. F)-----			
April 1-7	46	34	31	33
April 8-14	48	37	31	33
April 15-21	57	39	33	33
April 22-28	59	41	39	37
April 29-May 5	58	47	44	40
May 6-12	62	50	46	45
May 13-19	64	53	50	46
May 20-26	65	57	54	51
May 27-June 2	67	57	57	54
June 3-9	70	60	57	57
June 10-16	68	62	58	60
June 17-23	68	62	60	62
June 24-30	68	65	62	67
July 1-7	66	70	65	66
July 8-14	65	72	67	70
July 15-21	67	72	70	72

^a Source, Dr. John Enz, Soil Science Department, North Dakota State University.

herbicides, which give good to excellent control of green and yellow foxtail. Small grain fields are treated less frequently for foxtail control so herbicide use may explain the greater abundance of foxtail in small grains compared to sunflower and soybean.

The Weed Index from 45 fields with standard height wheat was similar to the Weed Index from 111 fields with semidwarf wheat (data not presented), averaged over the nine weed species and three years shown in Table 10, indicating that wheat height had no effect on Weed Index. These data only indicate weed population and do not indicate whether standard height wheat was more competitive with weeds than semidwarf wheat.

Weed Indices in soybean were less than in sunflower averaged over 1981, 1982, and 1983 (Table 11). The more extensive selection of herbicides for soybean compared to sunflower probably explains the lower weed abundance in soybean. The difference in weed abundance between soybean and sunflower also influenced Weed Indices the following year since fields planted to sunflower the previous year had larger Weed Indices than fields planted to soybean (data not presented). Good weed control during the cropping season also reduced weed problems the following year.

Nearly all surveyed fields in 1981, 1982, and 1983 were treated with herbicides. Only 11 of the 377 fields or 3 percent of the surveyed fields were not treated with a herbicide. The number of untreated fields was too small to make valid comparisons of untreated with herbicide-treated fields, so the results of the Cass County surveys from 1978 through 1983 are primarily from herbicide-treated fields. The results of the survey do not indicate the relative abundance of weeds without herbicides but rather indicate the relative abundance of weeds as influenced by crop production practices and environment.

Table 9. Percentage of hard red spring wheat seeded in North Dakota on April 30 and May 15, 1978 through 1983.^a

Date	Year					
	1978	1979	1980	1981	1982	1983
	------(% seeded)-----					
April 30	3	<1	45	57	14	14
May 15	36	7	79	86	47	57

^a Source, North Dakota Crop and Livestock Reporting Service, Fargo, ND.

Table 10. Comparison of Weed Indices in wheat, barley, oats, and flax with Indices in sunflower and soybean in Cass County.

Weed	Survey year					
	1981		1982		1983	
	52 flds	45 flds	99 flds	48 flds	88 flds	45 flds
	small grain	sun + soy	small grain	sun + soy	small grain	sun + soy
	------(Weed Index)-----					
Green foxtail	118	100	127 ^a	82 ^a	100	59
Yellow foxtail	5	1	-- ^a	-- ^a	46	29
Wild oats	64	38	59	43	62	28
Wild buckwheat	60	19	60	12	58	14
Redroot pigweed	17	33	27	13	26	12
Common lambsquarters	25	30	14	31	14	20
Wild mustard	22	53	28	69	24	55
Kochia	24	13	21	6	25	5
Canada thistle	8	9	8	7	9	7

^a Green foxtail and yellow foxtail were combined in 1982.

Table 11. Weed Indices in surveyed sunflower and soybean and weed Indices in fields which produced sunflower and soybean the previous year averaged over 1981, 1982, and 1983 in Cass County.

Weed	Surveyed crop		Previous crop	
	60 fields	78 fields	35 fields	61 fields
	Sunflower	Soybean	Sunflower	Soybean
Green foxtail	111	57	106	44
Wild oats	38	35	45	34
Wild buckwheat	21	10	59	29
Redroot pigweed	24	16	12	10
Common lambsquarters	38	20	17	7
Wild mustard	65	55	20	18
Kochia	10	7	29	13
Canada thistle	9	6	8	4

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