

Weeds Following Alternative Crops

Research Results

Weed Control and Crop Sequences

- **Crop sequences can be a powerful means of reducing weed pressure.**
- **Weed tend to be associated with certain crops.**
- **Use of a crop sequence can help disrupt the weed life cycle and minimize weed numbers.**

Designing Crop Sequences for Improving Weed Control

- The following diagram presents some ideas for use in developing a crop sequence for weed control.
- These ideas are arranged from greatest to least impact.

Vary Life Cycle
(Winter vs. Summer)

Vary Planting Dates Among Crops
(Early vs. Late Season)

Vary Crop Type
(Broadleaf vs. Grass)

Vary Planting Dates within Crop
(Planting Outside the Weed
Emergence Window)

Vary Cultivar within Crops
(Differing Plant Heights)

**Greatest
To
Least
Impact**



Information From the Crop Sequencing Experiment

- The following slides provide information from a crop sequencing experiment conducted at the Northern Great Plains Research Lab.
- We used data from this experiment to highlight several of the concepts listed on the previous slide.

Methods Used

- **Alternative crops were seeded into winter wheat residue in Site 1 (1998) and spring barley residue in Site 2 (1999).**
- **Weed emergence was estimated the spring after the alternative crops were harvested. For example, in Site 1 weed density was estimated in May 1999 and in May 2000 for site 2.**
- **Weeds were split into broadleaf and grassy weeds and also by species.**

Weed Density Per Square Foot

- Weed density data was collected the spring after the alternative crops were harvested and prior to applying any weed control.
- Weed density indicates the amount of weeds that could potentially cause a problem during the year.
- Broadleaf weeds are typically harder to control in broadleaf crops and grassy weeds are harder to control in cereal crops (ie. wheat, barley).

After the Study Was Complete

- Following the completion of the crop sequence study the area was planted to spring wheat.
- This occurred in 2000 for Site 1 and 2001 for Site 2.

**Suggestions
for
Planning
Crop Sequences**

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Vary Planting Dates Among Crops

Early Versus Late Season

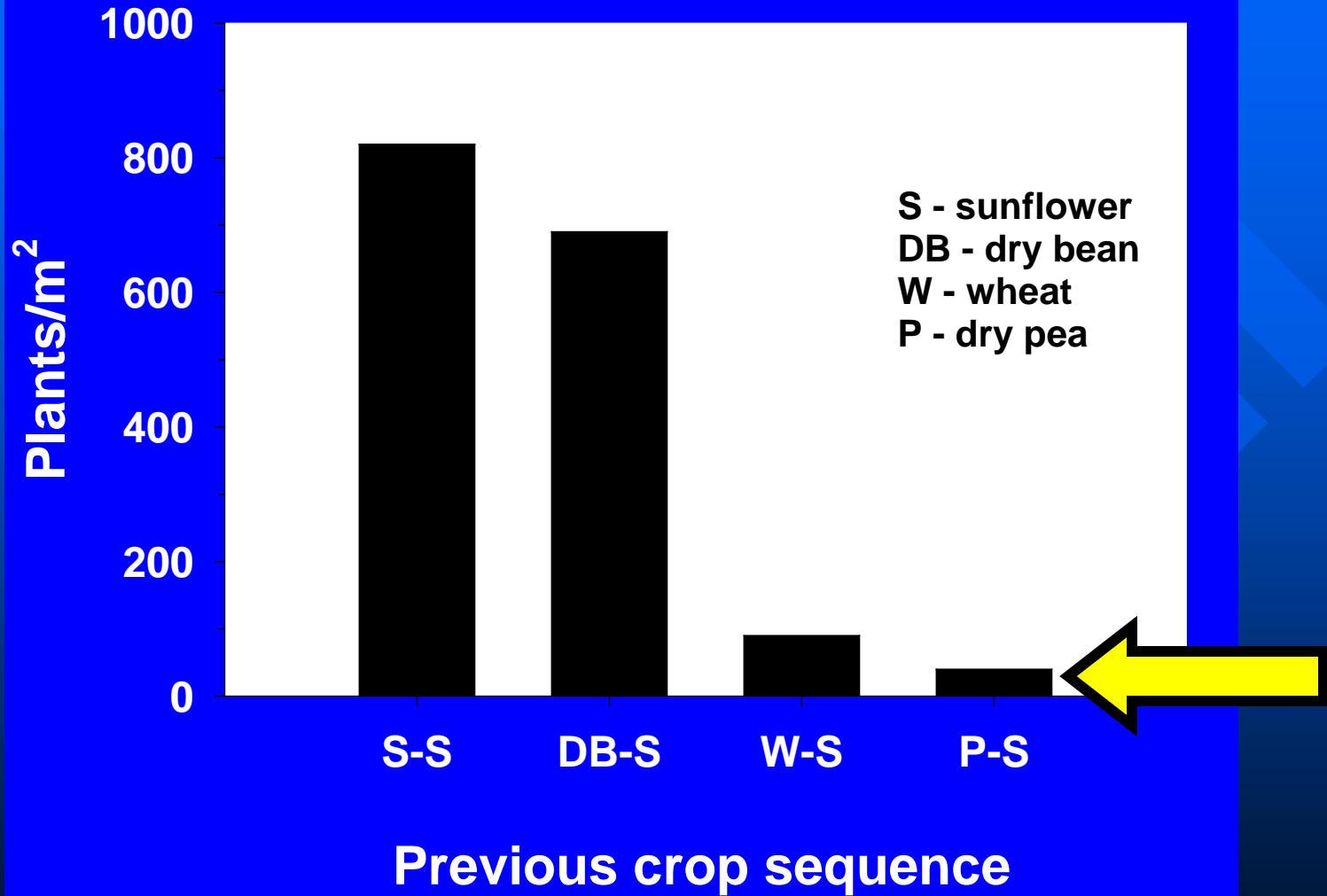
- **Weeds frequently are associated with a crop because they have similar growing seasons.**
- **Planting a crop with a different growing season can provide an opportunity to control weeds.**

Vary Planting Dates Among Crops

Early Versus Late Season

- **The next slide provides us with some information to evaluate this idea.**
- **Notice how low the weed density is in the Pea-Sunflower-Spring Wheat rotation.**

Weeds in Spring Wheat

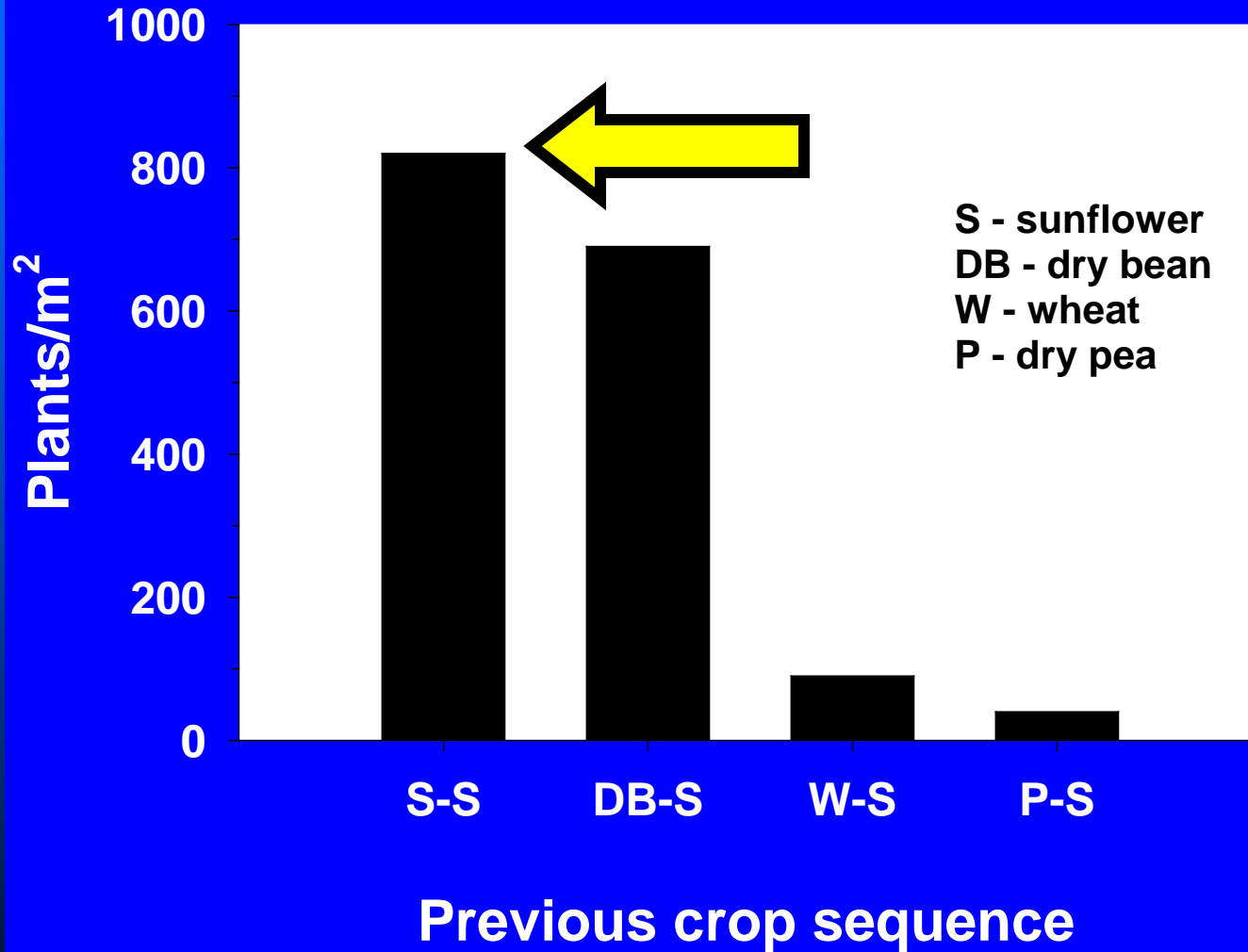


Vary Planting Dates Among Crops

Early Versus Late Season

- **Now notice the increase in weed density when the same crop was planted two years in a row followed by spring wheat (Sunflower-Sunflower-Spring Wheat).**

Weeds in Spring Wheat



Vary Planting Dates Among Crops

Early Versus Late Season

- **There was a 10-fold difference in weed density.**
- **Fewer weeds means easier control and less potential economic damage.**

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Vary Crop Type
(Broadleaf vs. Grass)

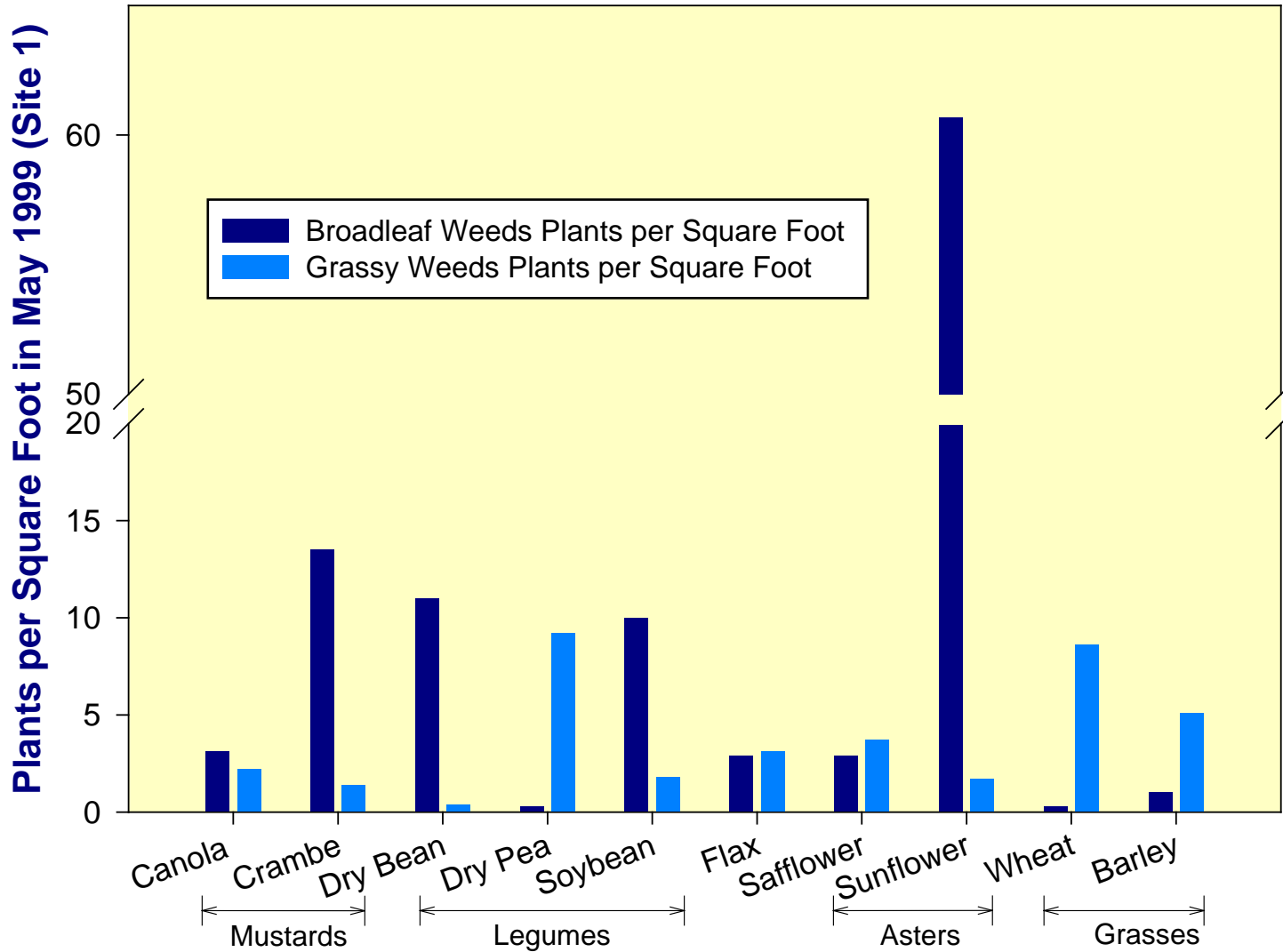
Vary Planting Dates within Crop
(Planting Outside the Weed
Emergence Window)

Vary Cultivar within Crops
(Differing Plant Heights)

Vary Crop Type

- **In the next slide, notice how the grass crops (Spring Wheat and Barley) tended to have more grassy weeds and the broadleaf crops tended to have more broadleaf weeds.**

Weed Populations After Alternative Crops *



* Graph is based on one year's data.

** Alternative Crops Planted in 1998 into Winter Wheat Residue.

Vary Crop Type

- Generally, broadleaf weeds are harder to control in broadleaf crops and grassy weeds are harder to control in grassy crops such as wheat and barley.
- If the weed problem is primarily broadleaf weeds, planting a grass type crop may allow more effective control.
- The same is true if the primary weed problem is grasses. Using a broadleaf crop may increase the weed control options available.

Vary Life Cycle
(Winter vs. Summer)

Vary Planting Dates Among Crops
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(Broadleaf vs. Grass)

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Vary Cultivar within Crops
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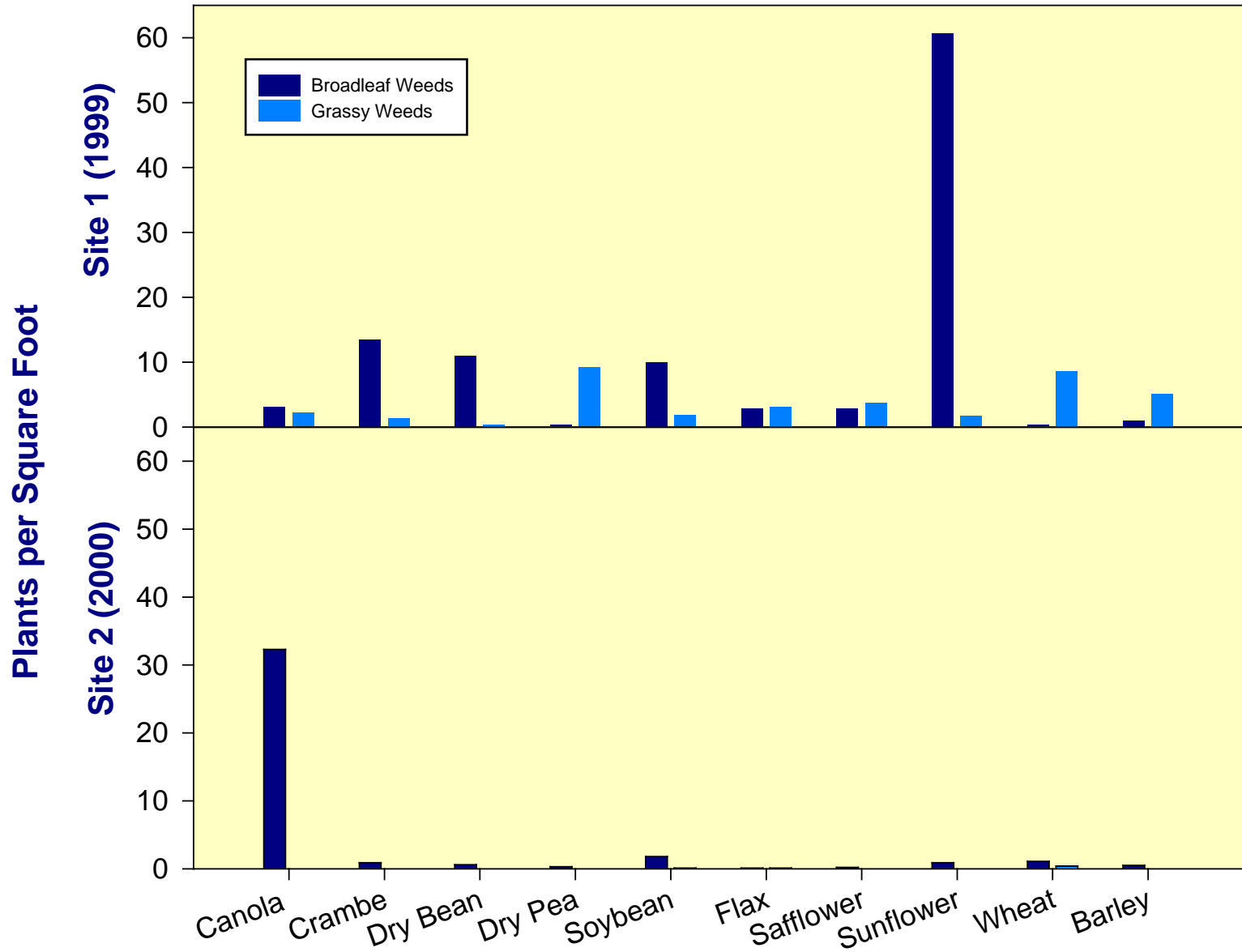
Vary Planting Dates Within a Crop

- **Varying the time of planting may allow for more effective weed control.**
- **The key is to plant outside the weed emergence window.**
- **If the primary weed problem is early emerging weeds, then delaying planting as long as possible may allow the weeds to be controlled before planting.**

Vary Planting Dates Within a Crop

- In the next slide, notice the decrease in weeds in site 2.
- Barley was planted into site 2 in 1998. A wet period caused a delay in the planting date.
- Although a variety of factors contributed to the lower weed numbers, the delay in planting allowed many weeds to emerge and be controlled before the barley was seeded.

Weed Populations After Alternative Crops *



Vary Planting Dates Within a Crop

- The maximum weed density was reduced by half in site 2.
- Primary broadleaf weed was volunteer canola.

Vary Planting Dates Within a Crop

- A couple words of caution.
 - Planting outside the optimum planting dates for a crop may reduce yield. A producer needs to balance the reduction in yield due to weed pressure with the potential reduction in yield caused by missing the optimum planting date.
 - Site 1 was planted into **WHEAT** stubble and Site 2 was planted into **BARLEY** stubble. The effects of the stubble residue on weed density are not known.

Another Consideration for Weed Control

- **Knowledge of weed species composition can help in selecting herbicides.**

Weed Composition

- **Weed composition is shown as a percentage of total broadleaf or grassy weeds.**
 - **For example, in 1999 18% of all the broadleaf weeds in canola were kochia and 100% of all the grassy weeds were downy brome.**
- **Knowing the weed composition helps to target herbicide applications.**

Weed Composition Following Alternative Crops in May 1999

Species Composition of Broadleaf and Grassy Weeds (%)

Alternative Crop	Broadleaf Weeds						Grassy Weeds	
	Kochia	Wild Mustard	Prickly Lettuce	Russian Thistle	Tansy Mustard	Wild Buck Wheat	Downy Brome	Volunteer Wheat
Canola	18	69	0	11	0	2	100	0
Crambe	84	T	0	T	0	15	100	0
Dry Bean	51	9	0	32	1	6	100	0
Dry Pea	20	0	0	0	0	80	100	0
Soybean	30	13	2	53	0	2	100	0
Flax	6	6	0	80	2	6	98	2
Safflower	8	34	0	30	0	28	100	0
Sunflower	96	1	0	3	0	0	100	0
Wheat	0	0	0	67	0	33	99	1

T = Trace Less than 1%

Weed Composition Following Alternative Crops in May 2000

Species Composition of Broadleaf and Grassy Weeds (%)

Alternative Crop	Broadleaf Weeds							Grassy Weeds	
	Kochia	Wild Mustard	Fairy Candalabra	Russian Thistle	Tansy Mustard	Volunteer Canola	Wild Buck Wheat	Downy Brome	Volunteer Wheat
Canola	1	0	0	T	T	98	0	0	0
Crambe	86	0	7	0	0	0	7	0	0
Dry Bean	0	100	0	0	0	0	0	0	0
Dry Pea	0	100	0	0	0	0	0	0	0
Soybean	0	97	0	0	0	0	3	0	100
Flax	0	20	14	0	46	0	14	0	100
Safflower	0	68	0	0	32	0	0	0	0
Sunflower	6	74	0	6	14	0	0	0	0
Wheat	6	47	6	0	41	0	0	14	86

T = Trace Less than 1%

Herbicide Selection and Carryover.

- **Many universities have excellent weed control handbooks to help in selecting herbicides and determining carryover.**
- **These handbooks may be found on the internet.**
 - **For example, North Dakota State University's 2001 weed control handbook can be found at our linkage section.**

Implications

- **Crop sequence can be a powerful tool to reduce weed pressure.**
- **Sequences that provide maximum diversity in the crops lifecycle may provide the maximum benefit.**
- **The effectiveness of the previous year's weed control will affect weed numbers.**
- **Knowledge of weed species composition is important in herbicide selection.**

Disclaimer

- **These are preliminary numbers. The kind of year, previous herbicide control and current weed populations can all affect the results.**