



Crop Sequencing



Can Help Weed Management



Crop Response to Preceding Crop

**Some Crops Improve Growth and Yield
of Following Crop**

Will Enhanced Growth Improve

Crop Tolerance to Weeds ?

Corn Tolerance to Weeds

Study in Eastern South Dakota

Preceding Crops

Dry Pea, Soybean, Spring Wheat, Corn

No-Till



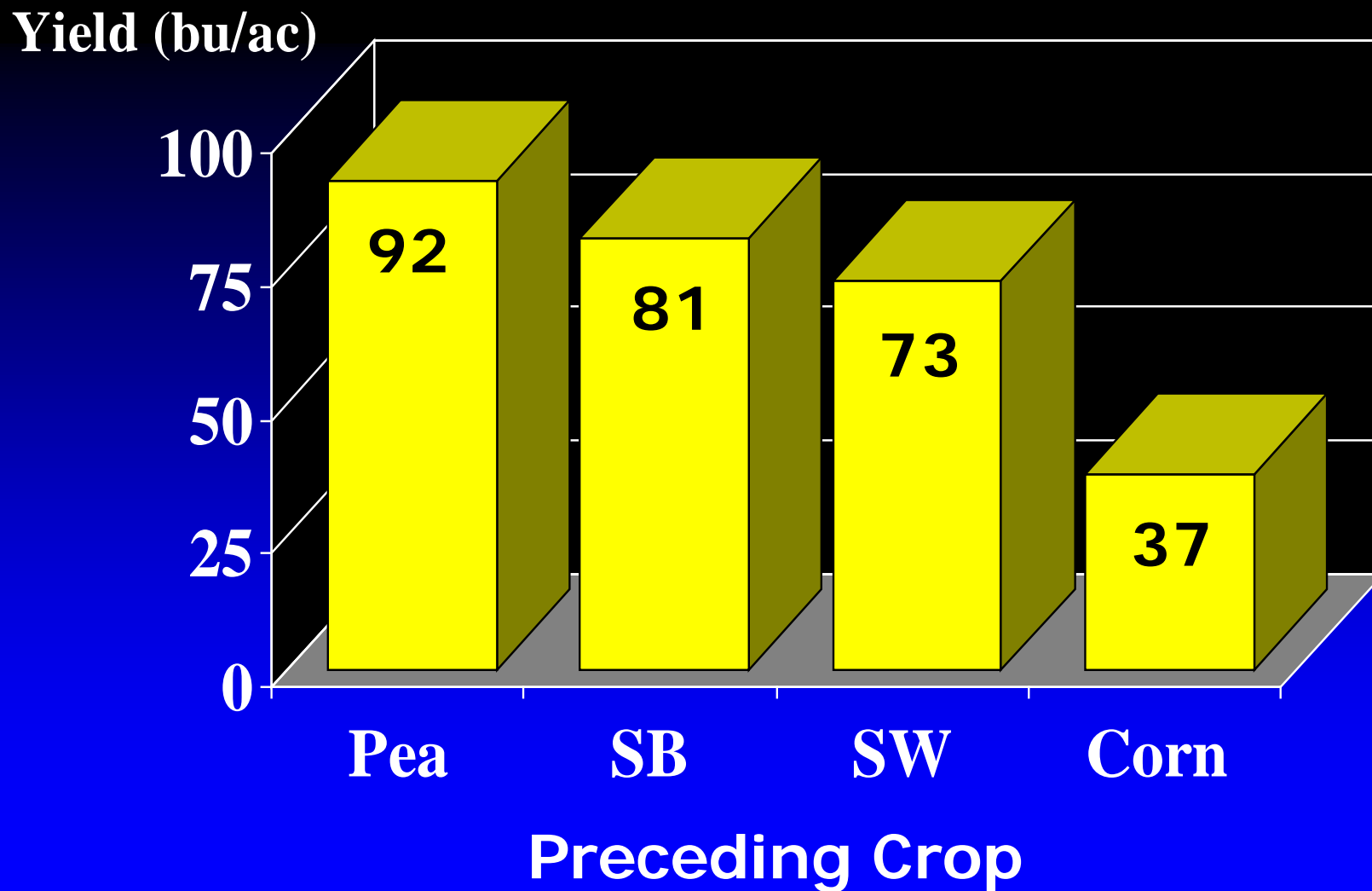
Corn Tolerance to Weeds

Plots Split Into: Weed-Free and
Weed-Infested

Foxtail Millet Planted as Indicator Weed
For Uniform Infestation Density

Corn Yield – Weed-Free Conditions

SB: soybean; SW: spring wheat



Corn Response to Preceding Crop

Corn Yielded:

11 bu/ac More After Pea Than Soybean

55 bu/ac More After Pea Than Corn

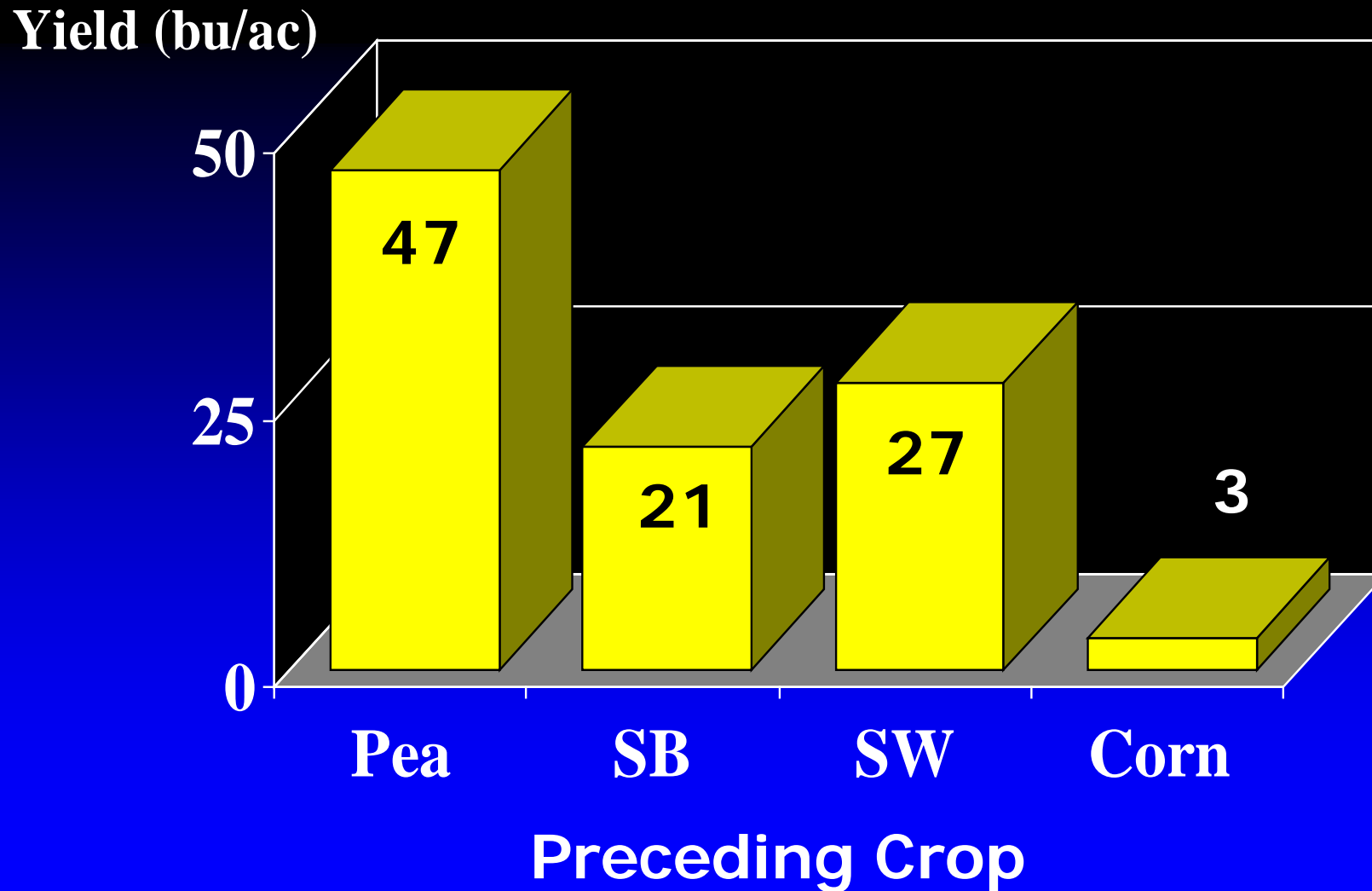
With No-Till, Corn is Allelopathic to Itself

(Especially when spring is cool and wet)

Corn Yield – Weed Infested Conditions

(Note Scale Change)

SB: soybean; SW: spring wheat



Corn Tolerance to Weeds

Corn: 16 Times More Tolerant to Weeds
after Pea than after Corn

2 Times More Tolerant to Weeds
after Pea than after Soybean

Corn After Corn – Low Tolerance for Weeds

Crop Sequence Can Also Help

Crops Suppress Weed Growth

Initial Study : Wild Rye in Winter Wheat

(Fallow Precedes Winter Wheat)

Increase Crop Competitiveness with:

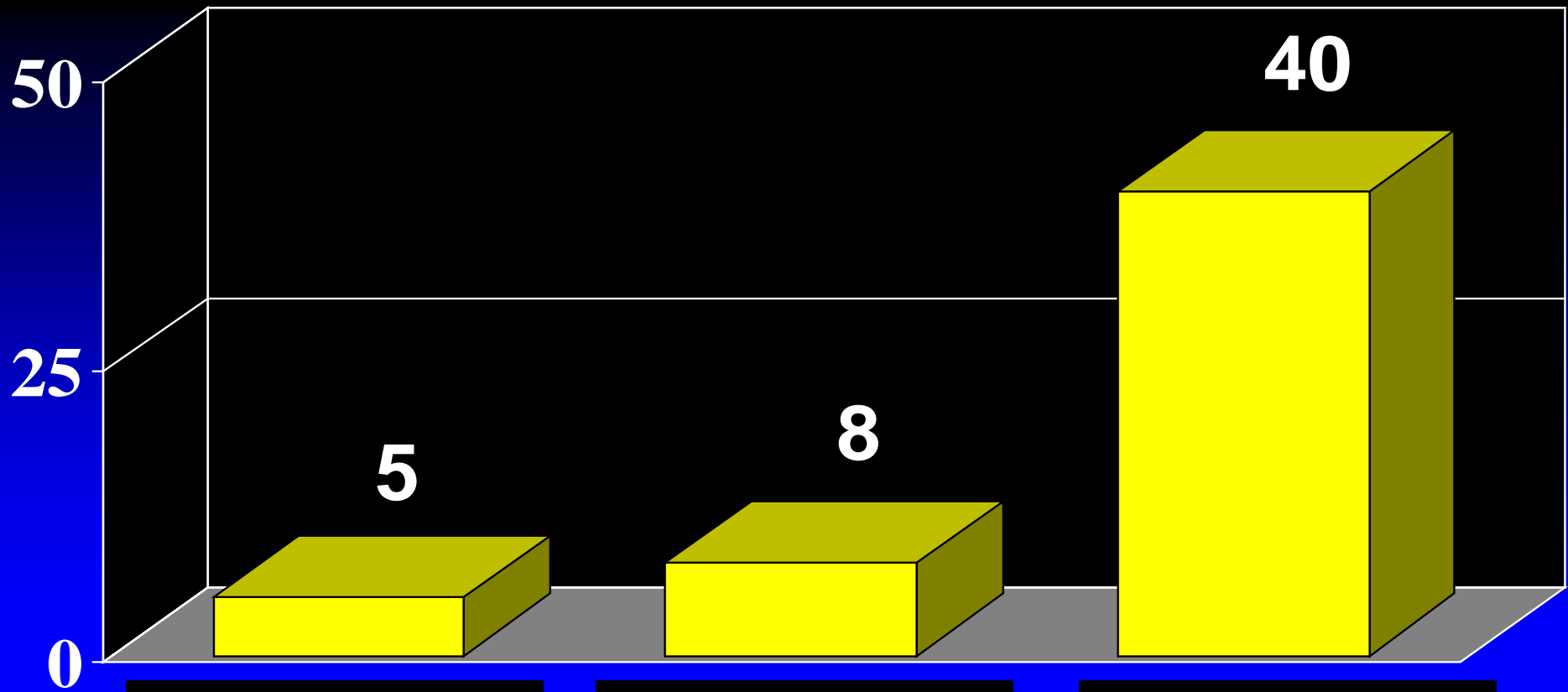
Taller Cultivar

Higher Seeding Rate

Fertilizer Placement (Banding)

Wild Rye Seed Production in Winter Wheat

% Suppression of
Conventional System



**Higher Seeding
Rate**

**Taller Cultivar
+ HSR**

**N Placement
+ TC + HSR**

Crop Competition with Weeds

Note: Crop Competitiveness is

Enhanced by Combining

Cultural Practices Together

Single Practice – 3 to 8 % Suppression

3 Practices Together – 40 % Suppression

Crop Sequence and Competition

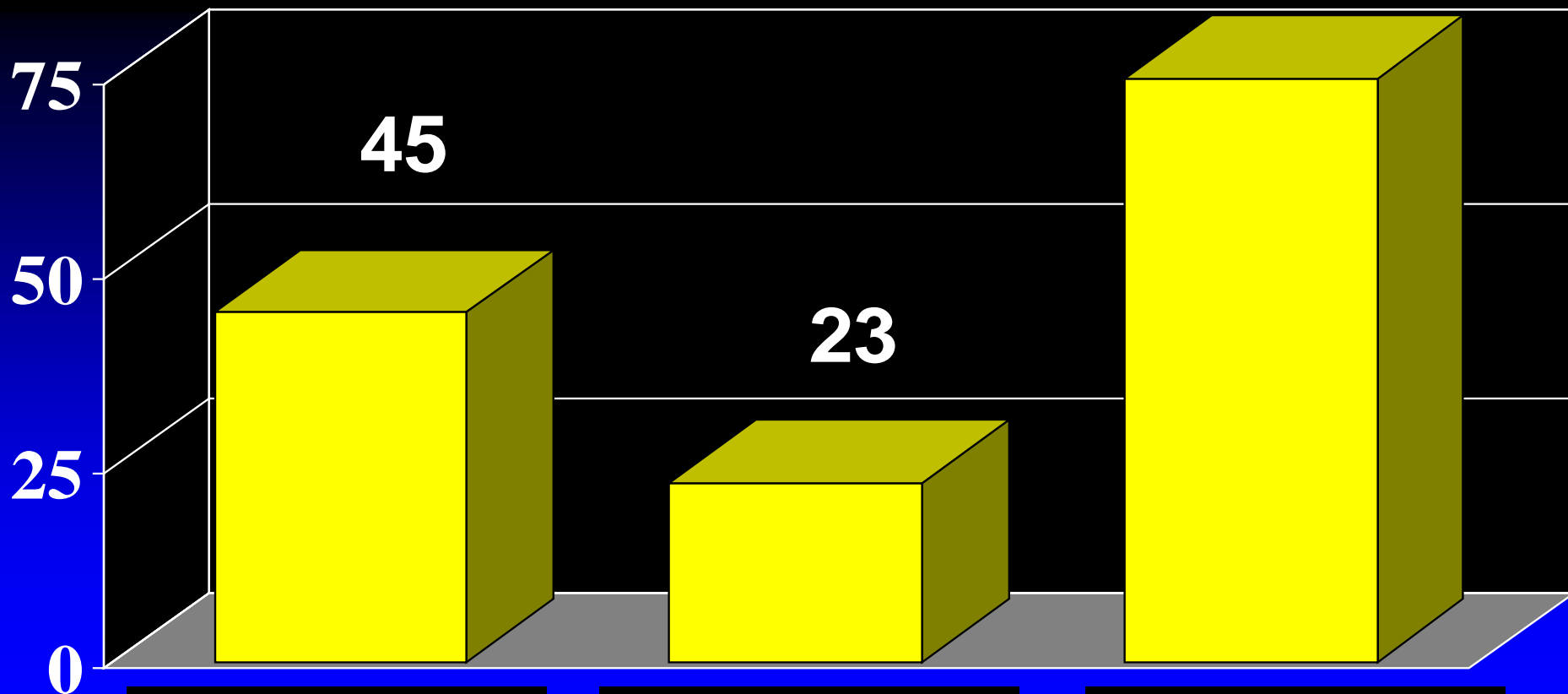
Second Study (Spring Wheat Precedes Winter Wheat)

1. Conventional Canopy
2. *Competitive Canopy*
3. *Oat/Pea* + Conventional Canopy
4. *Oat/Pea + Competitive Canopy*

(Oat/Pea replaces Spring Wheat)

Wild Rye Seed Production in Winter Wheat

% Suppression of
Conventional System



**Competitive
Canopy**

**Oat/Pea
Only**

**Oat/Pea +
Comp. Canopy**

Crop Competition with Weeds

Competitive Canopy –

Reduced Seeds/Rye Plant 45%

Oat/Pea + Competitive Canopy –

Increased Suppression From 45% to 75%

Preceding Crop Can Enhance Crop Competitiveness

Another Weed Control Benefit

Rotating Crops with Different Life Cycles

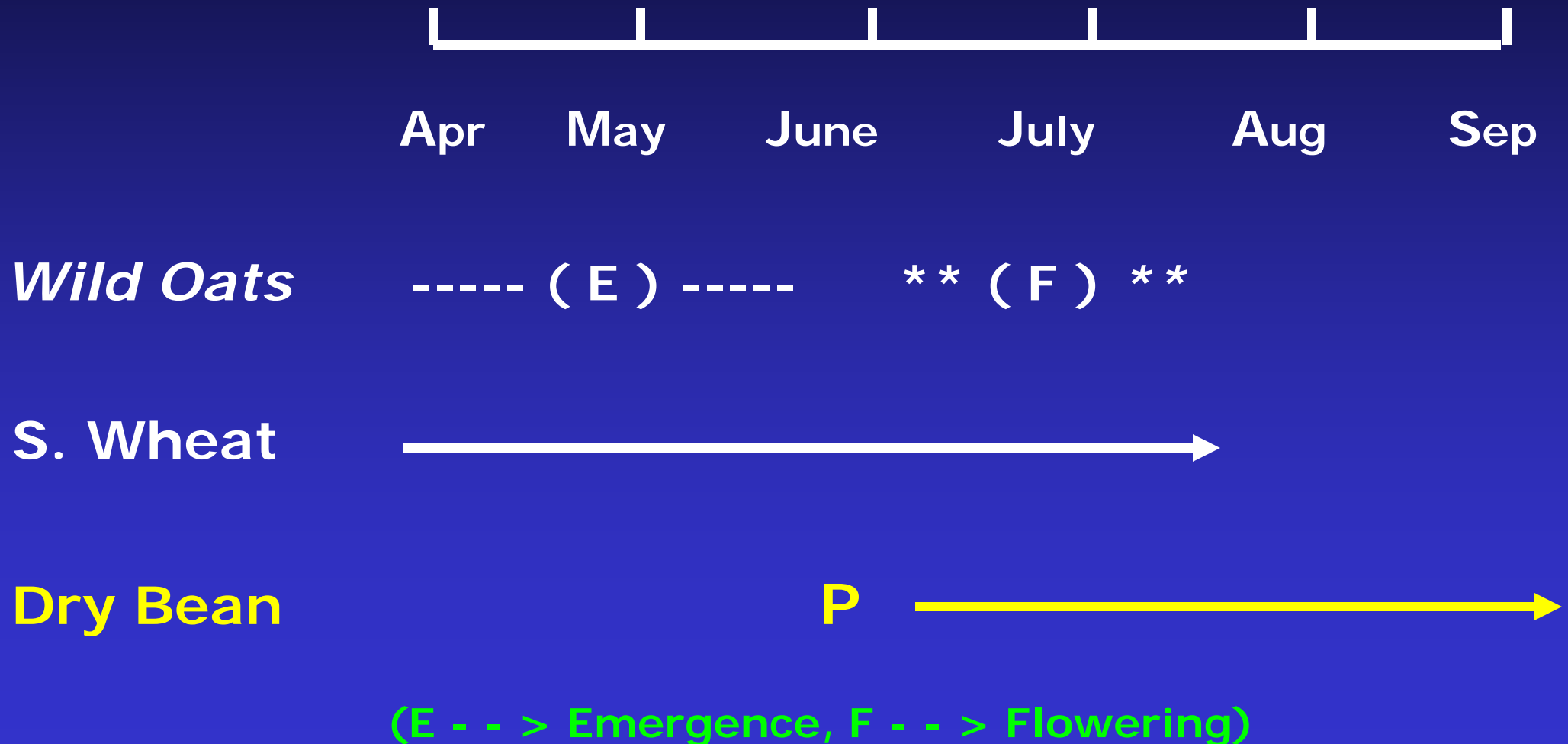
(Cool-Season Crops with Warm-Season Crops)

Allows Control of Weeds with Contrasting Life
Cycles Before Planting

(i.e., Cool-Season Weeds in Warm-Season Crops)

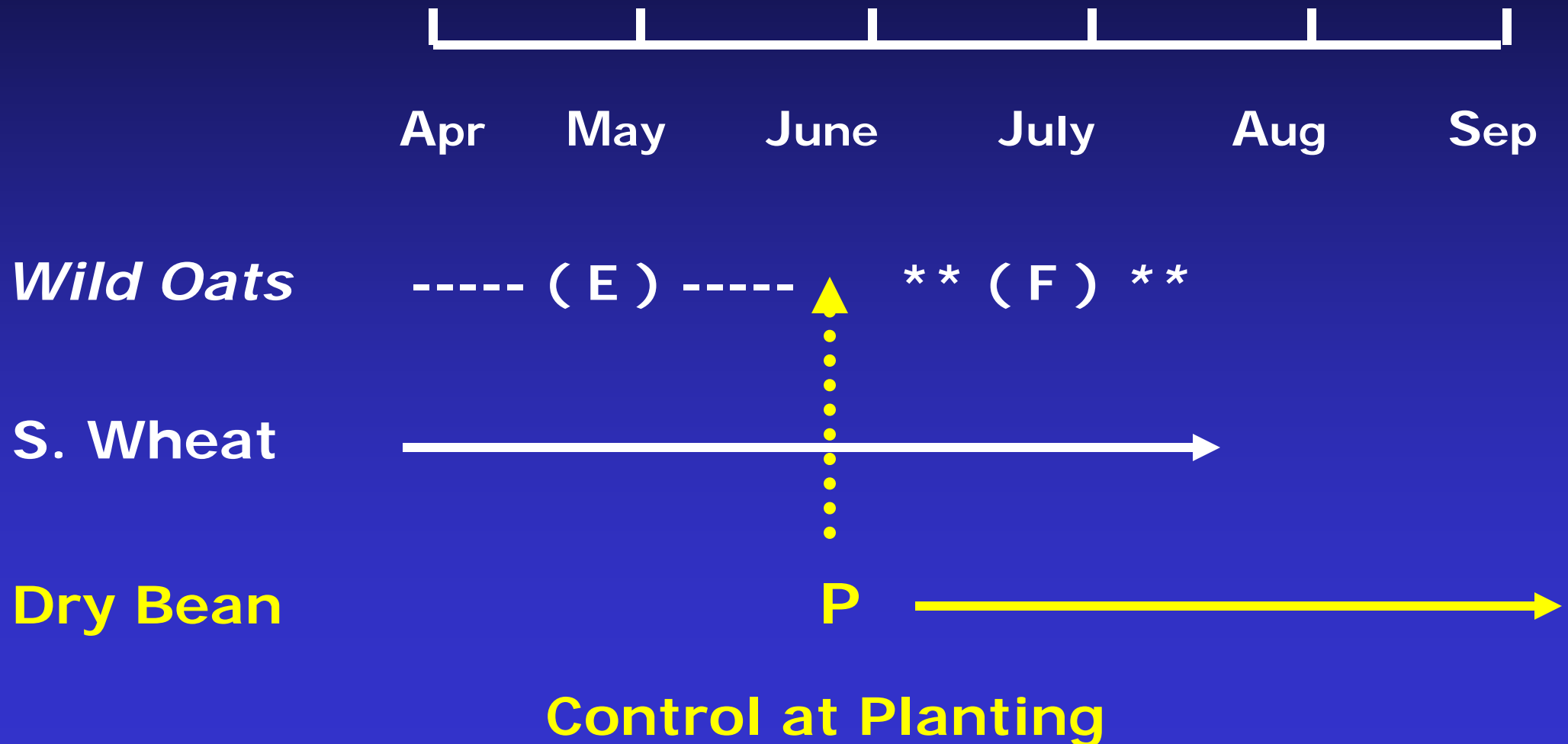
Life Cycle Sequence

Wild Oats



Life Cycle Sequence

Wild Oats



Weed Control Benefit

Wild Oats Flowers and Produces Seed

During Life Cycle of Spring Wheat

However, Wild Oats Controlled

at Planting Time of Dry Beans

Prevents Seed Production

Weed Control Benefit

Preventing Seed Production

Accelerates Natural Decline of

Live Weed Seeds in Soil

Less Seeds in Soil - - > Less Seedlings in Next Crop

Delay of Planting – Spring Wheat

Another Option, But

- 1) Usually Reduces Yield
- 2) Leads to Other Weeds in Spring Wheat
e.g. Green Foxtail

Rotating Crops With Different Growth Periods

Avoids These Negative Aspects

Can Crop Sequencing Affect Weed

Community Density Across Time ?

Long-Term Rotation Studies in Great Plains

Pierre SD and Wall SD

Mix of Cool-Season and Warm-Season Crops

Can Crop Sequencing Affect Weed

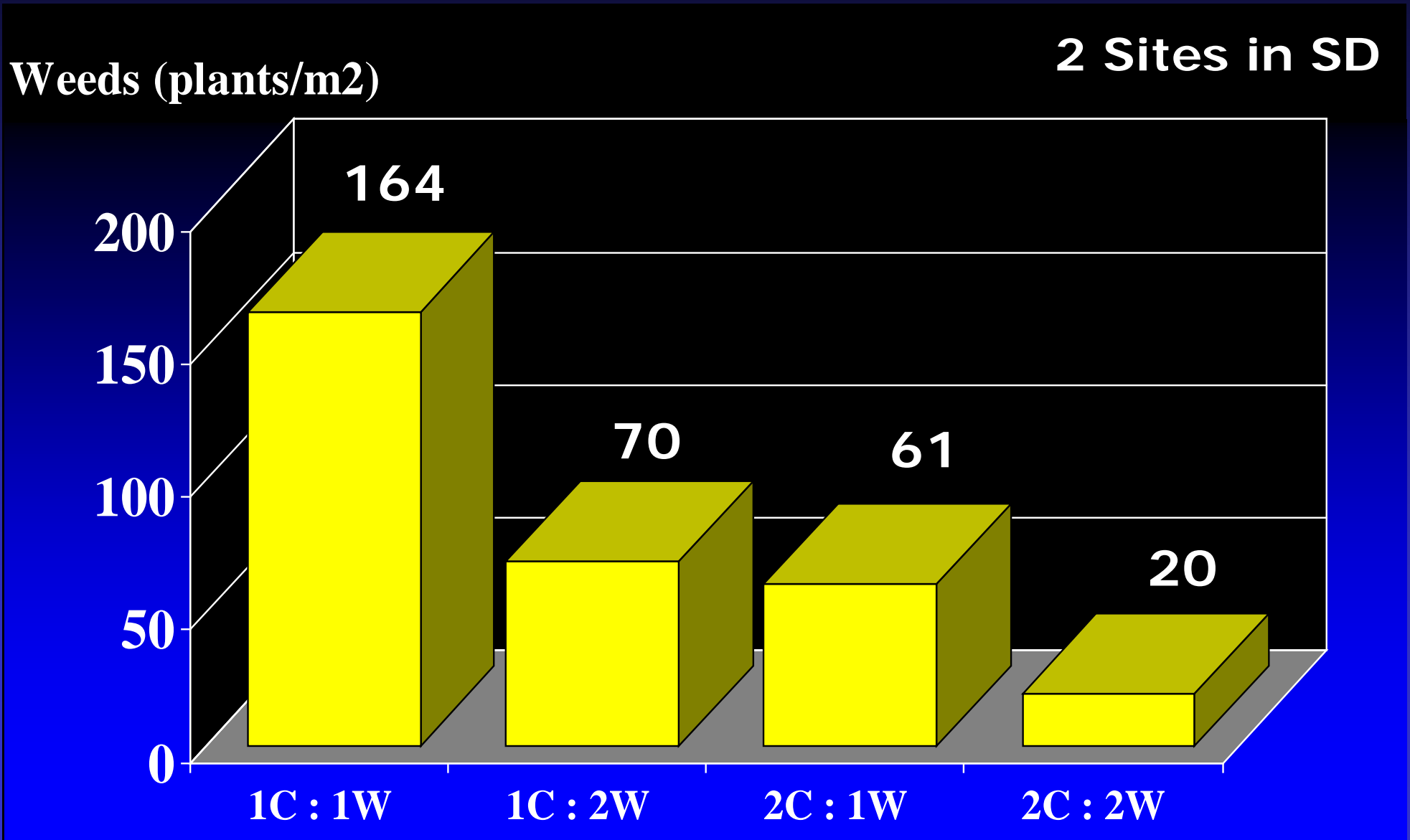
Community Density Across Time ?

Conventional Weed Management

Count Weeds in Non-Treated Quadrats

After 8 Years of Each Study

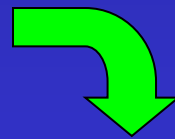
Weed Density - Ratio of Cool-Season (C) and Warm-Season (W) Crops



Impact on Weed Community Density

Note: Weed Density was 8-Fold Higher in
Rotations of 1 Cool-Season (C) Crop
and 1 Warm-Season (W) Crop
Than Rotations with 2C : 2W

2C : 2W Example



Dry Pea-Winter Wheat-Corn-Proso Millet

Diversity of Planting Date Ranges * (P) *



Apr

May

June

July

Aug

Sep

Oct

Pea * (P) *

W. Wheat

* (P) *

Corn * (P) *

Proso Millet * (P) *

Impact on Weed Community Density

Why ? More Opportunities to Control Weed
Seedlings Before Planting Crops

Improves Herbicide Performance In-Crop
Less Weed Escapes to Produce Seeds

Contrast With Monoculture Corn or Spring Wheat

Crop Sequencing Can Help Weed Management

Improves Crop Competitiveness

Reduces Weed Community Density



More Information

A multi-tactic approach to manage weed population dynamics in crop rotations. *Agronomy Journal* 97:1579-1583. 2005

An ecological approach to strengthen weed management in the semiarid Great Plains. *Advances in Agronomy* 80: 33-62. 2003