Crop Production

DCR Training

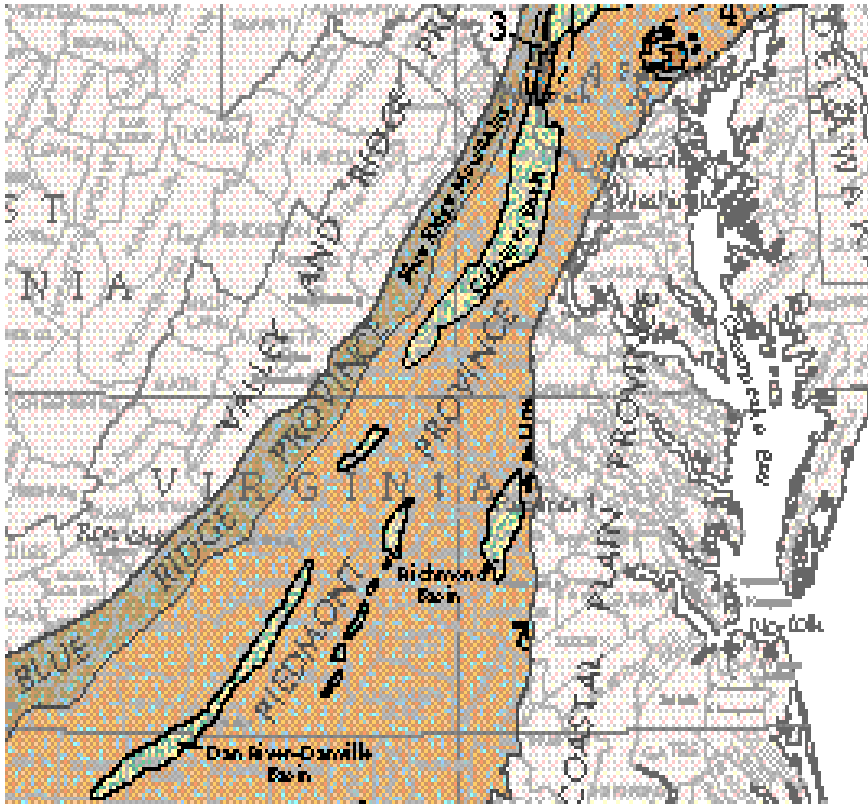
July 2011

Physiographic Regions

- Ridge and Valley
  - Bordered by the Blue Ridge and Allegheny mountains
  - Cooler climate, shorter season
  - Soils – deep, fertile clays; shallow over limestone
  - Crops – cool season grasses, corn, soybean, alfalfa

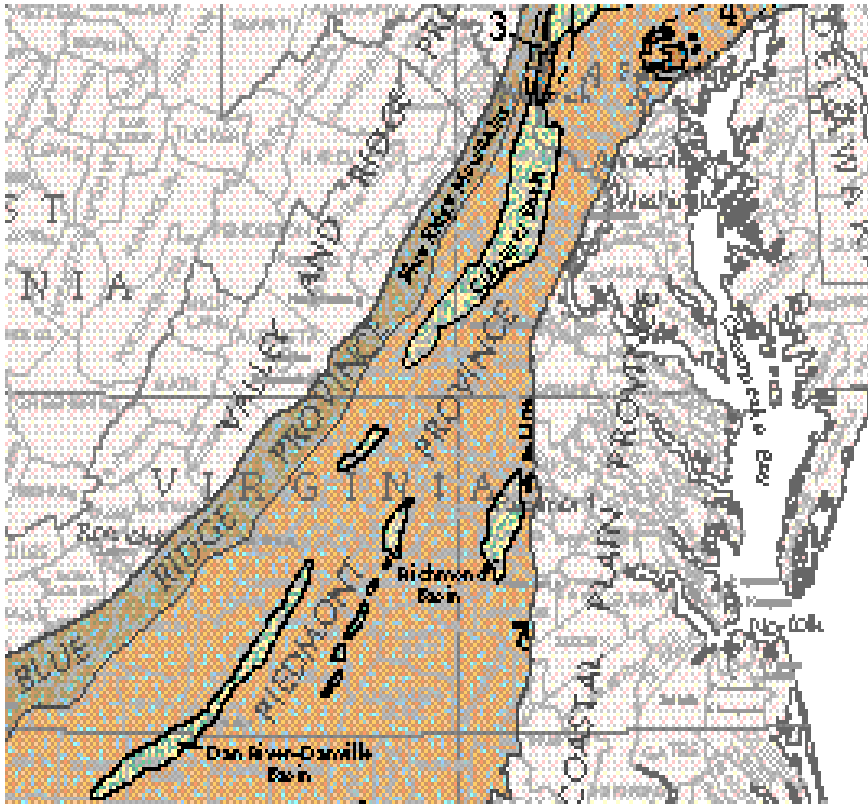
Physiographic Regions

- Northern Piedmont
  - Bordered by the Blue Ridge and Coastal Plain
  - 600-700 ft lower in elevation
  - Soils – granite derived, red, high in clay, acidic, low OM
  - Reduced tillage practices to decrease erosion
  - Crops – CS grasses, corn, soybean, small grains



Physiographic Regions

- Southern Piedmont
  - James River boundary
  - Long season
  - Soils – deep, sandy, drought prone
  - Reduced tillage in some crops
  - Crops – tobacco, peanut, cotton, CS & WS grasses, corn, soybean, small grains

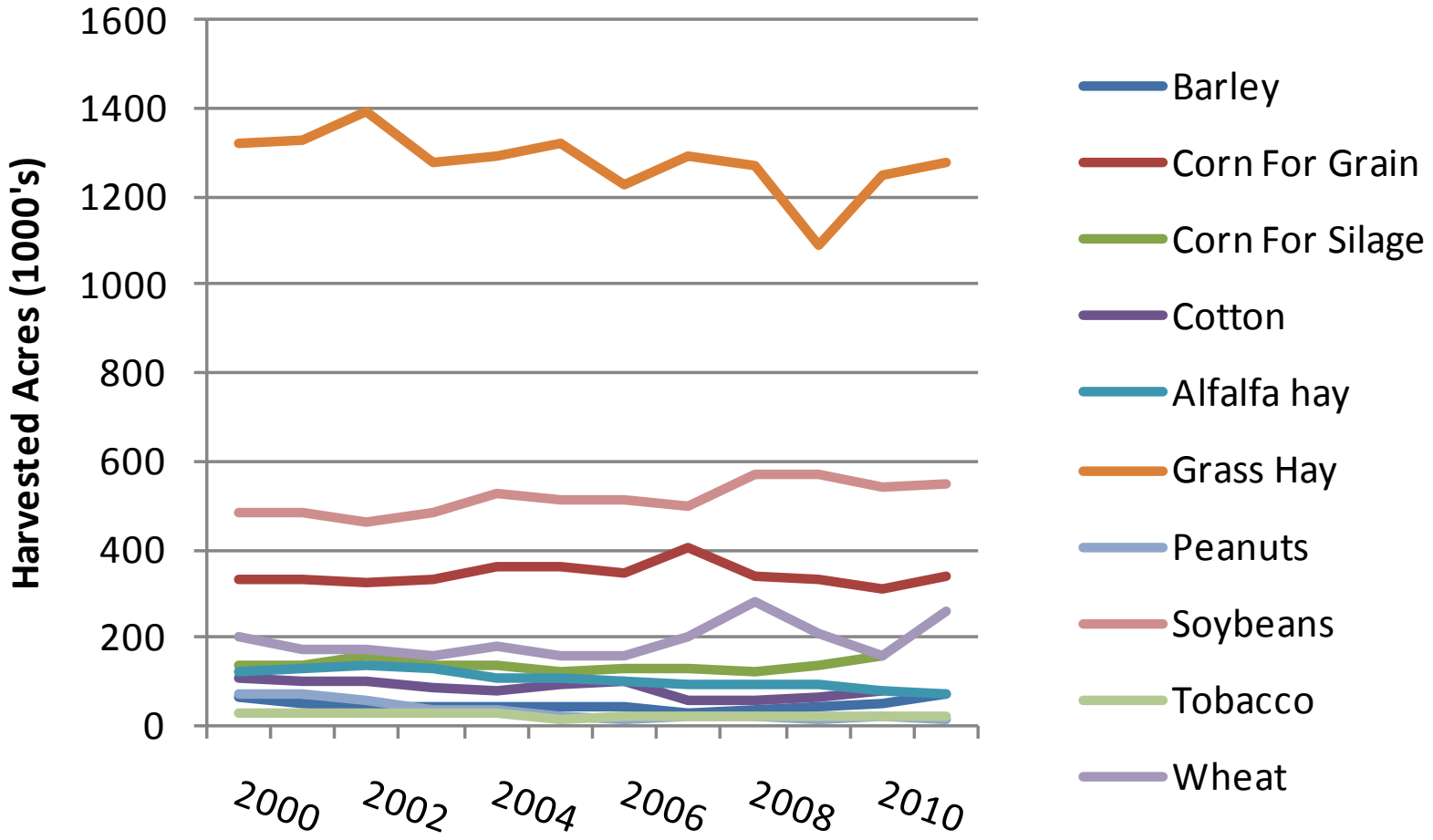


Physiographic Regions

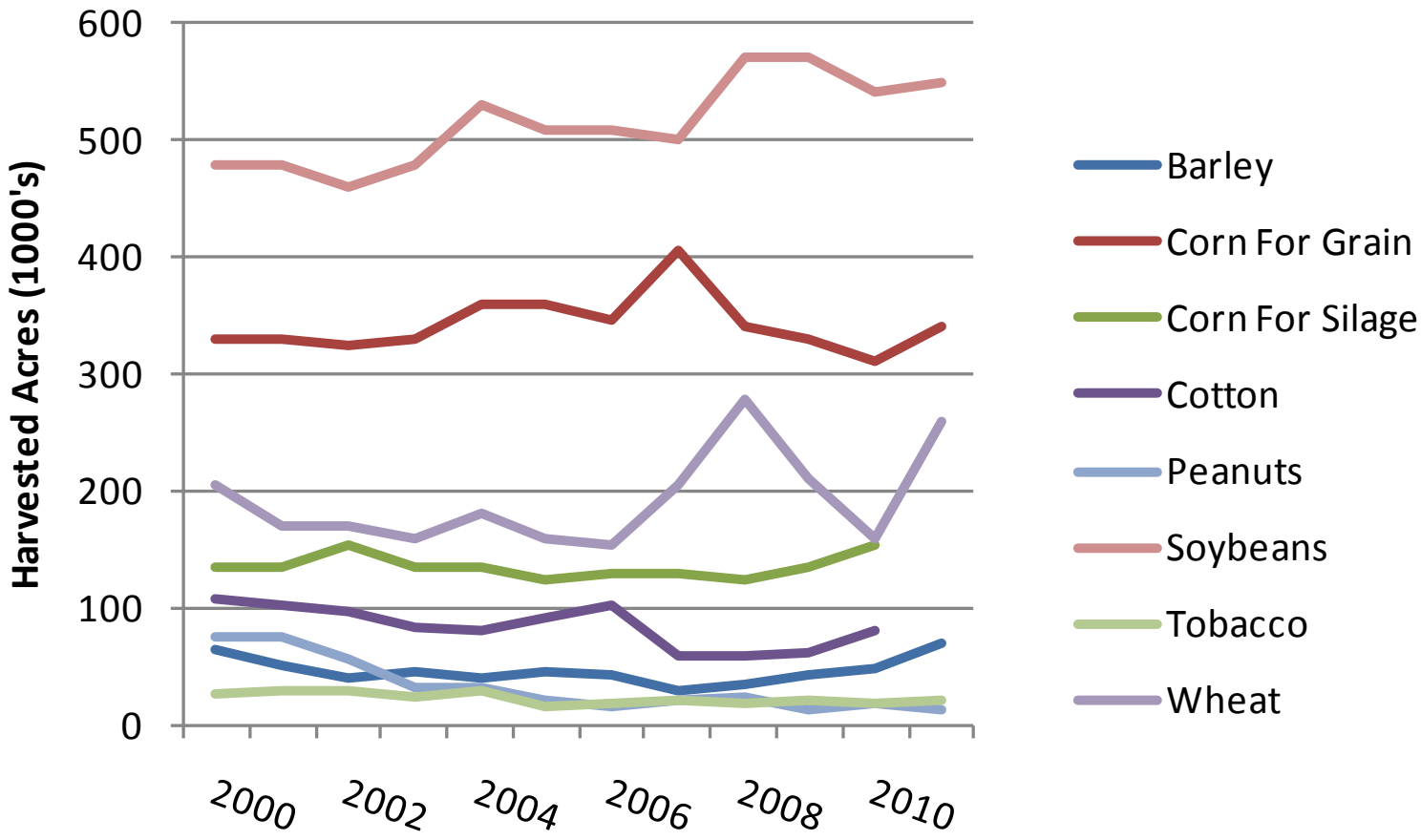
- Coastal Plain
  - Begins at fall line on west
  - Long season
  - Soils – v.deep, high in sand, low clay and OM, drought prone
  - Reduced tillage in most crops
  - Crops – corn, soybean, small grains, vegetables


754350 HAY-FOR-SALE
754-3580

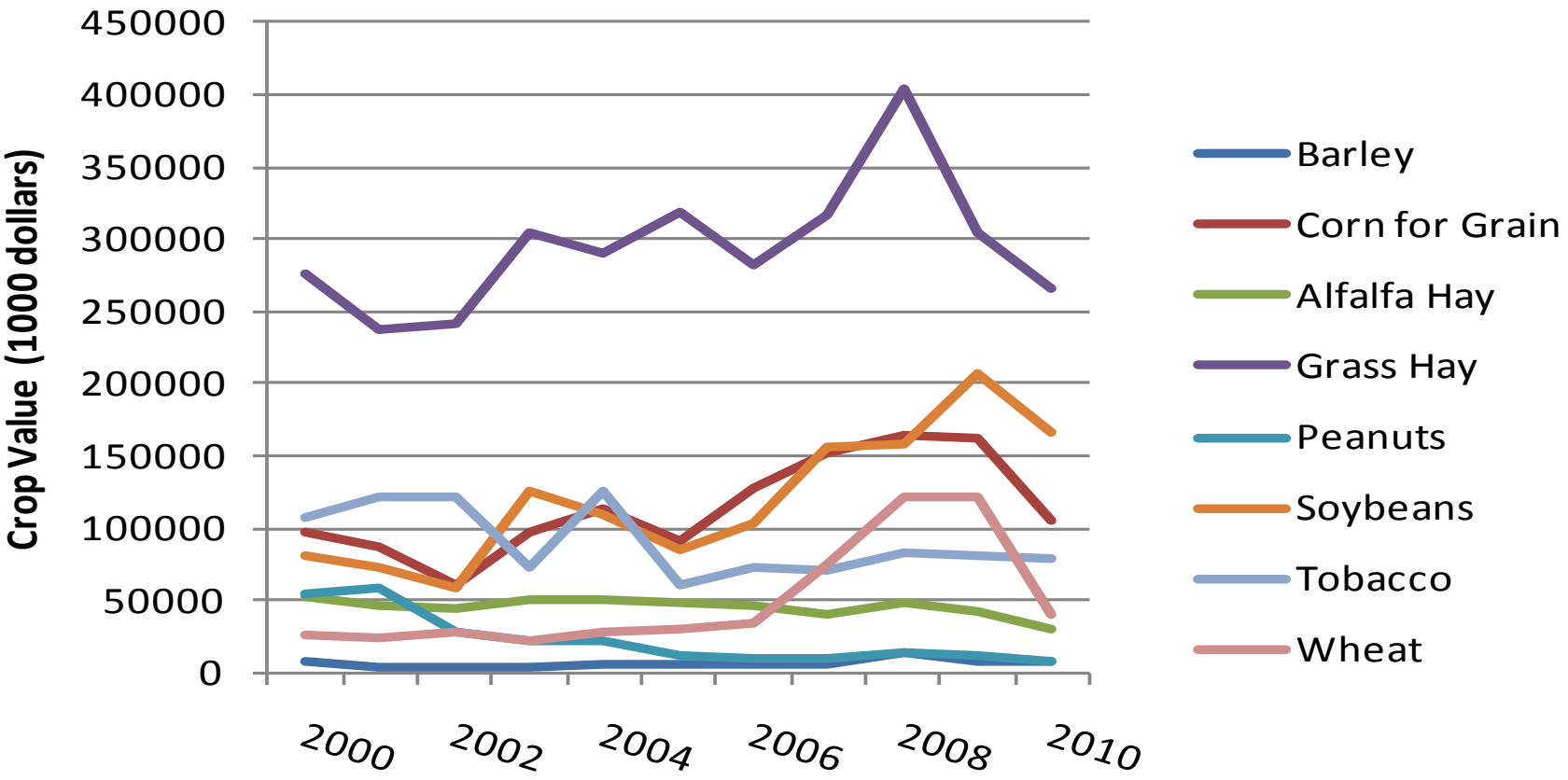
Harvested Acres, 2000-2011



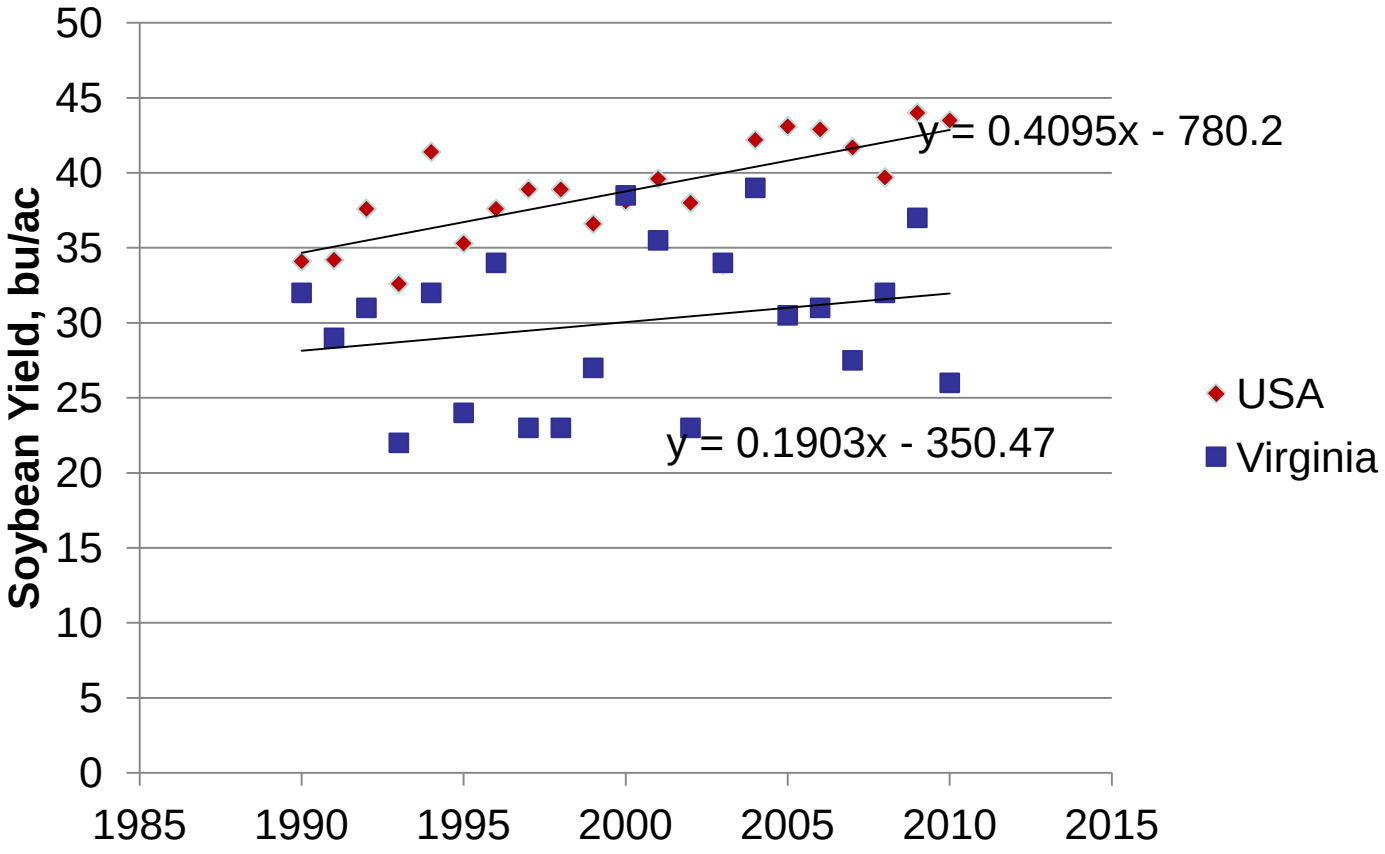
Harvested Acres, 2000-2011



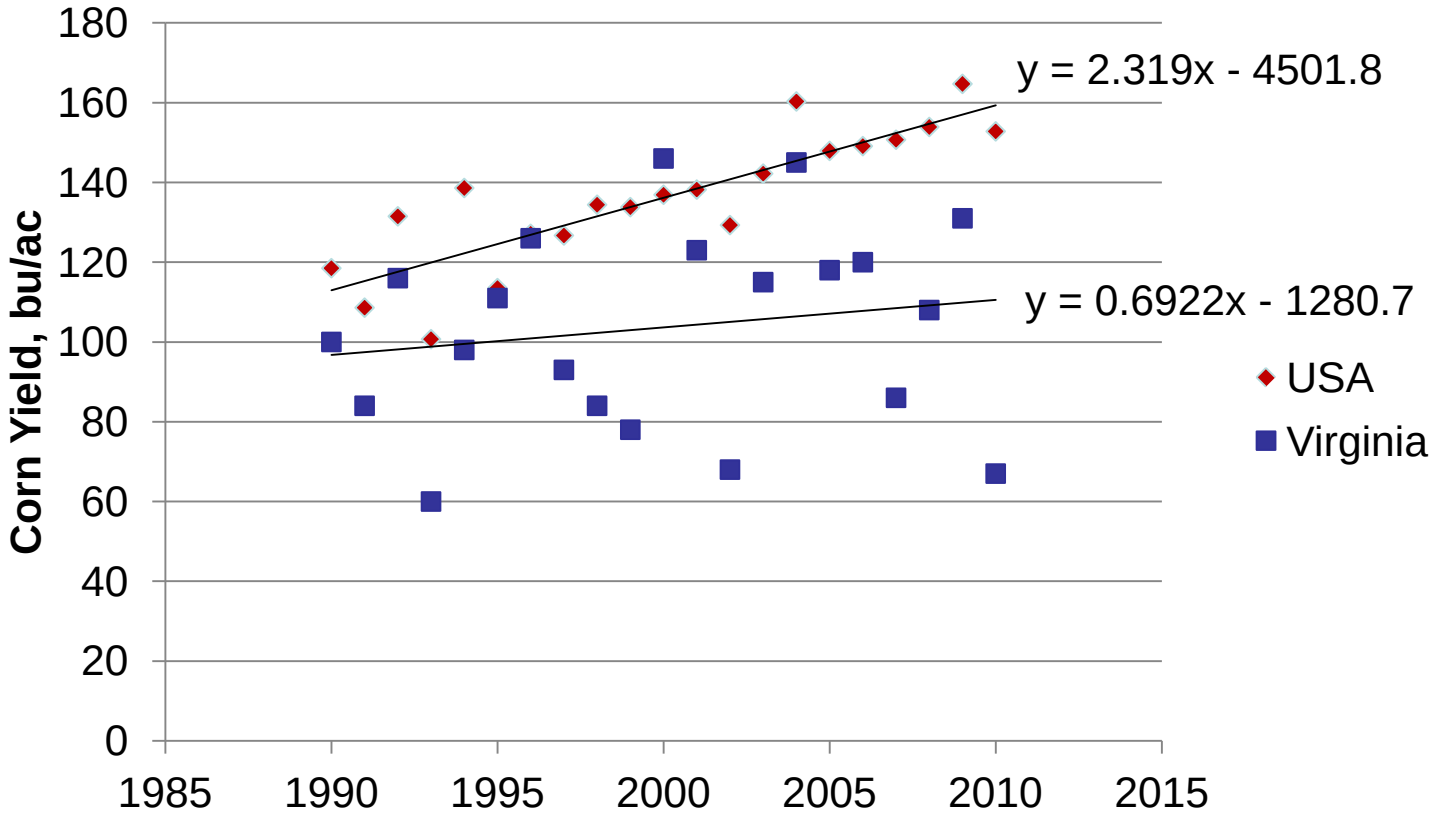
Value of Crop Produced, 2000-2010



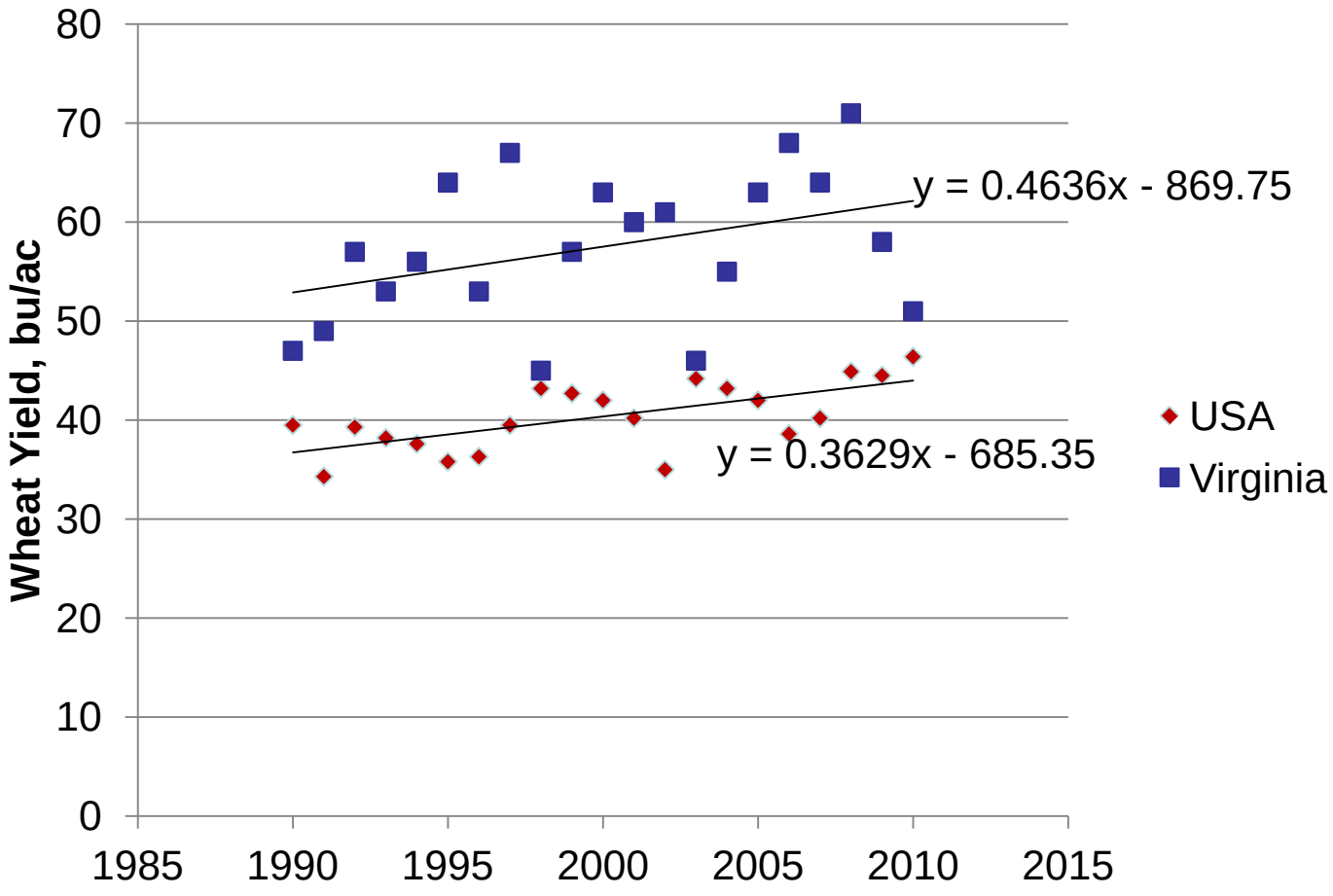
Historic Soybean Yields



Historic Corn Yields

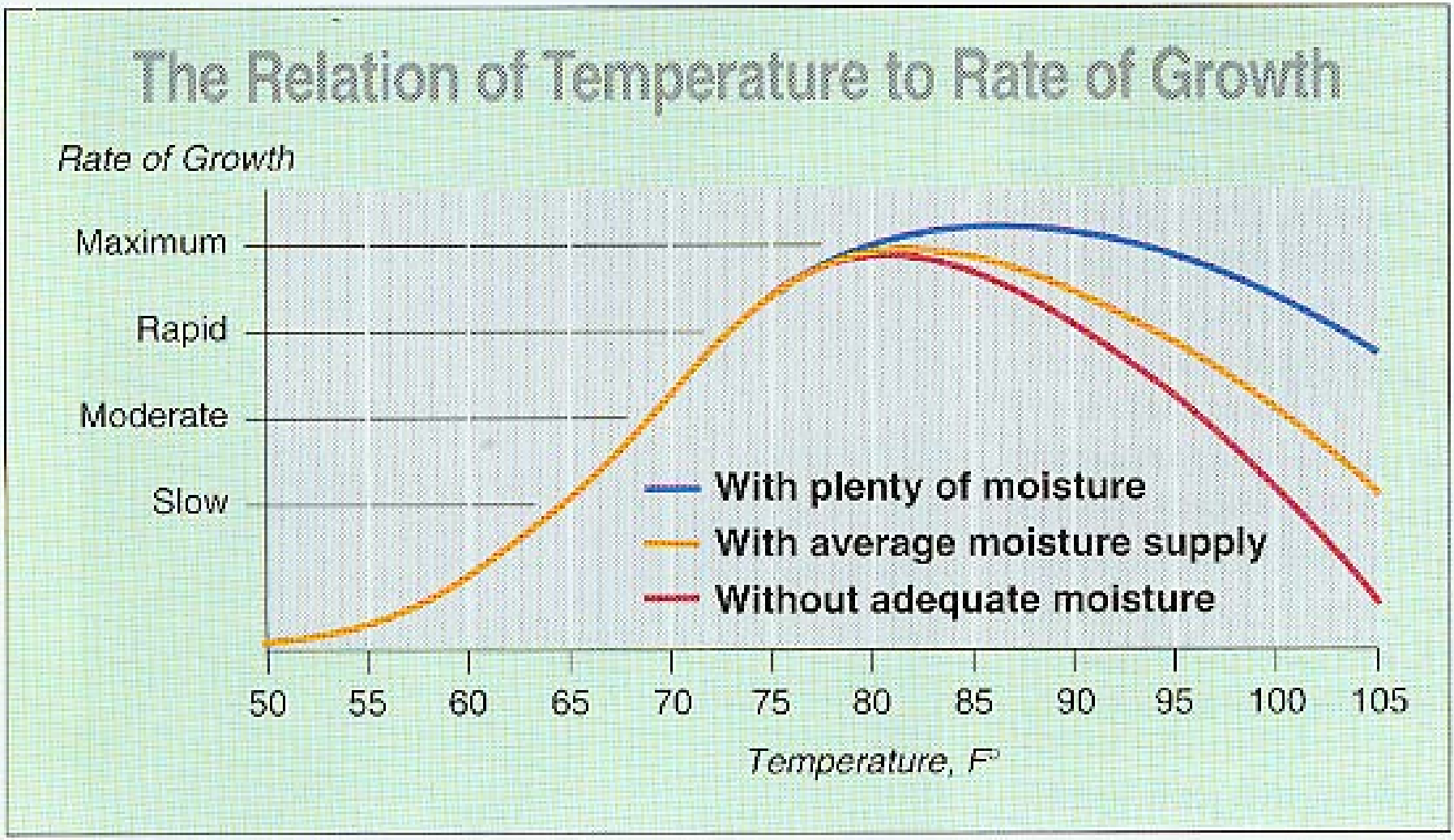


Historic Wheat Yields



What Drives Emergence and Vegetative Growth in Most Plants?

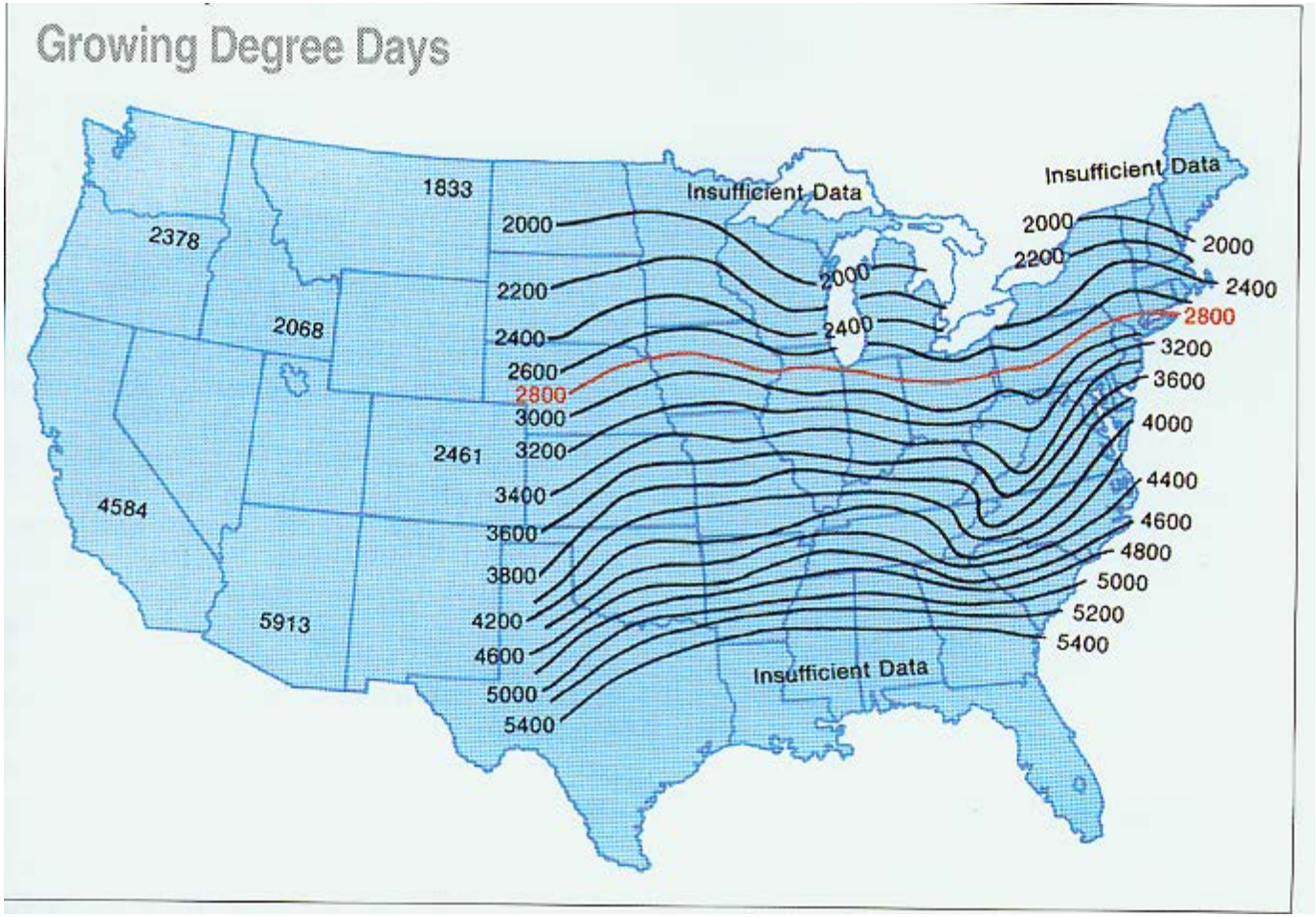
Crop Growth & Development



Heat unit (GDD) concept

- GDD = ((Tmax-Tmin) / 2) – 50F
  - Difference between avg temp and 50
  - Limits
    - Upper 86 F
    - Lower 50 F
  - Range
    - 0 – 36 GDD per day

GDD


Growing Degree Days
1833
2378
2068
2461
4584
5913
Insufficient Data
Insufficient Data
Insufficient Data
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4200
4600
5000
5400
2000
2200
2400
2800
3200
3600
4000
4400
4600
4800
5000
5200
5400

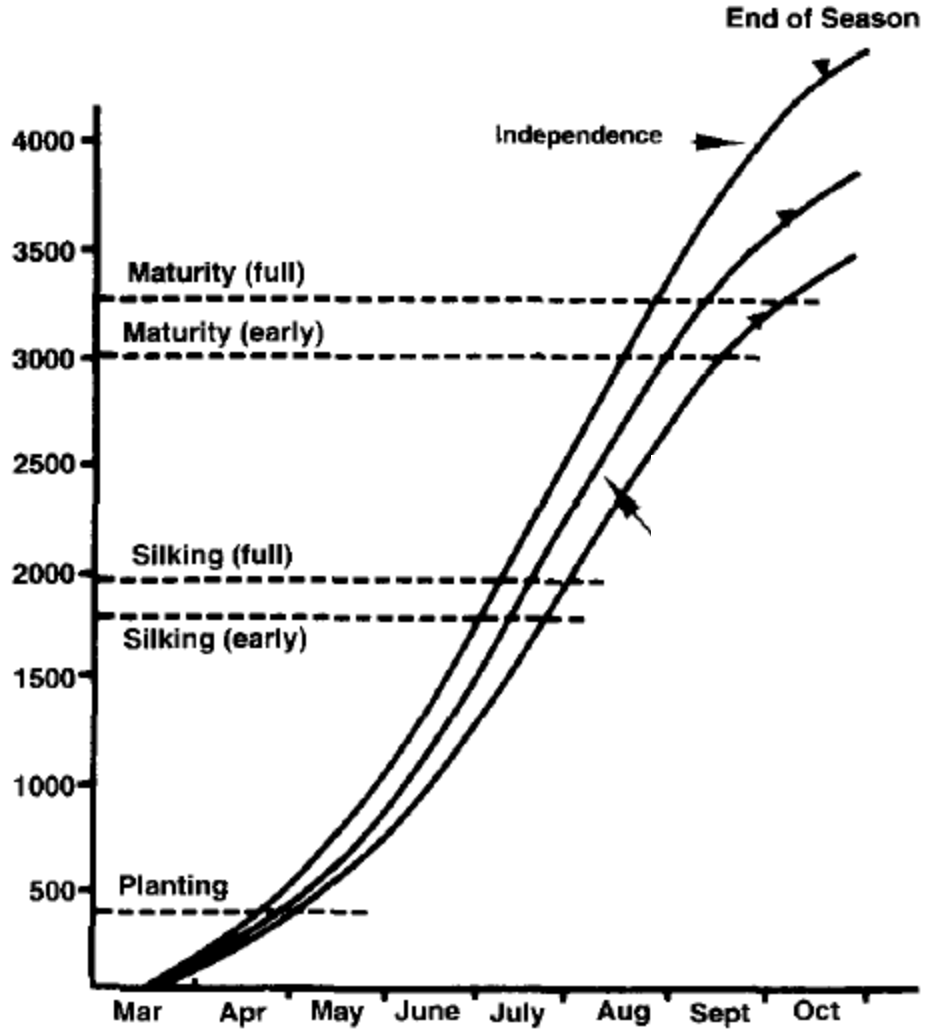
Developmental Stages

Stage	GDD Accumulated
VE	120
V2	220
V4	355
V6	470
V8	585
V10	720
V12	815
VT	1150
R1 – Silking	**1250-1400**
R5 – Dent	2130-2450
R6 – Black Layer	2350-2900

Figure 1

GDU's Required to Reach:

	Silking	Maturity
Early Season Variety	1390	2610
Full Season Variety	1560	2830

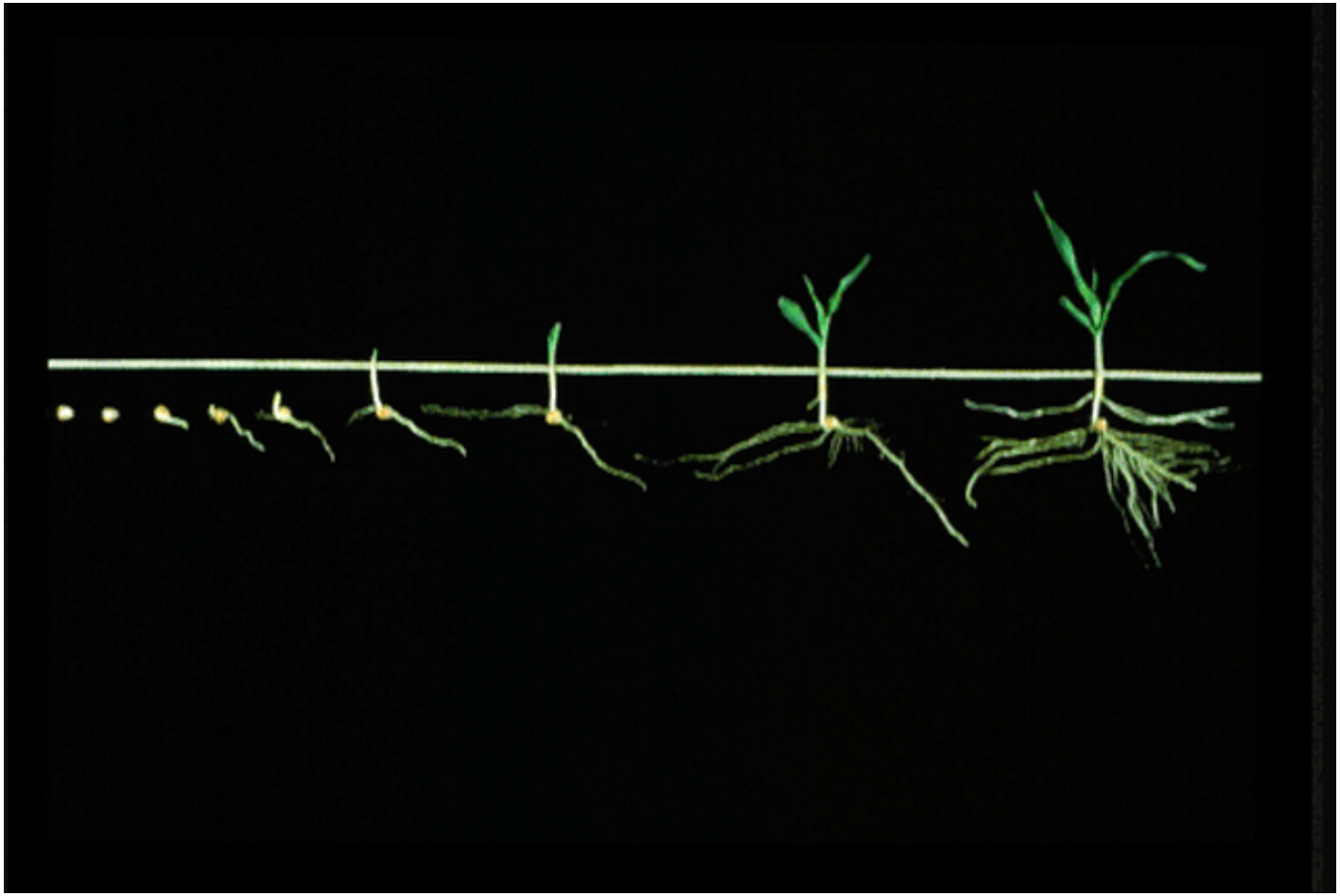


Developmental Stages

- VE (emergence)
- V1 (first leaf)
- V2 (second leaf)
- V3 (third leaf)
- V(n) (nth leaf)
- VT (tasseling)
- R1 (silking)
- R2 (blister)
- R3 (milk)
- R4 (dough)
- R5 (dent)
- R6 (physiological maturity)

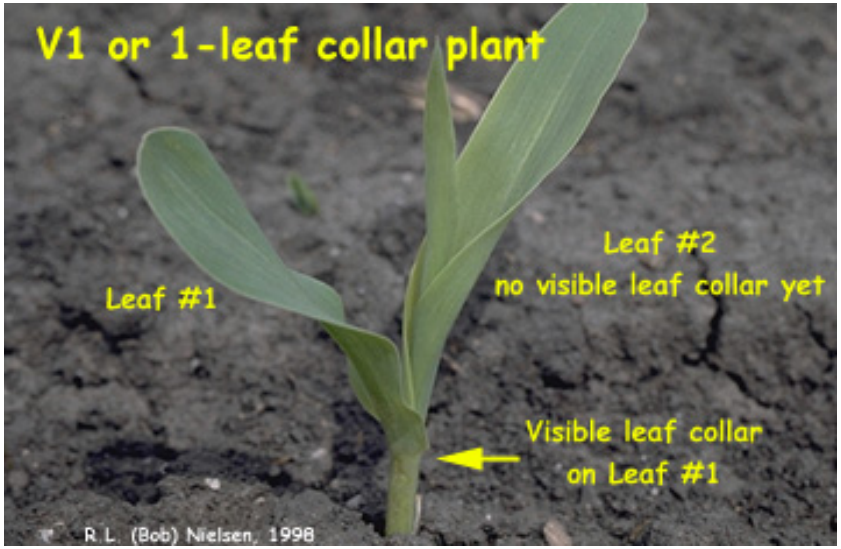
Developmental Stages

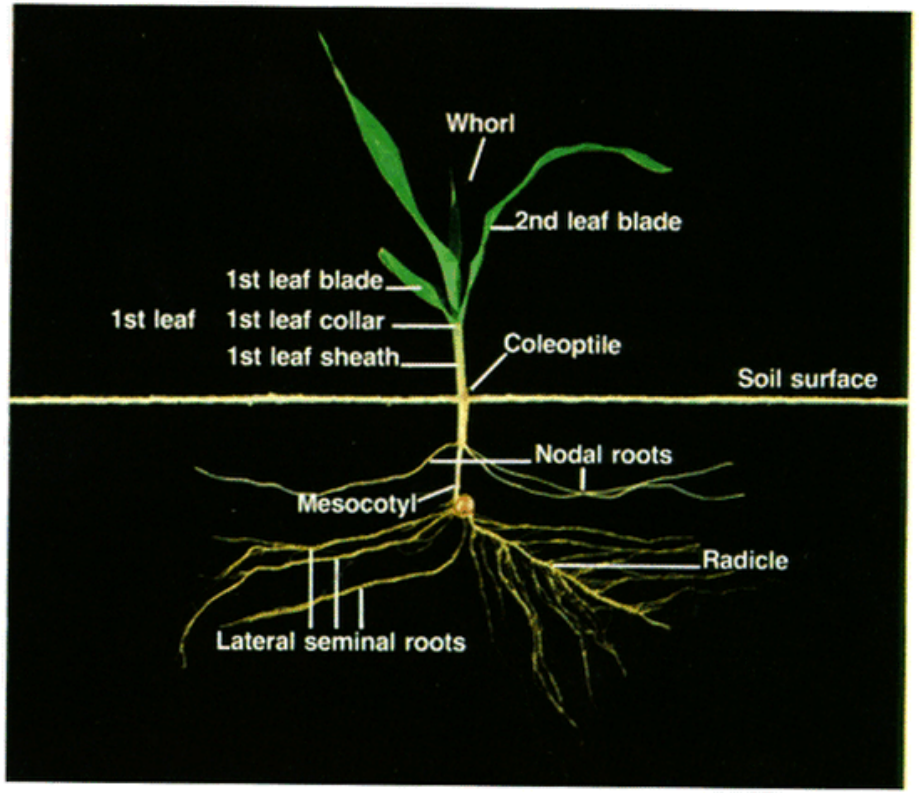
- VE - emergence



Developmental Stages

- V2 – 2 leaves





Developmental Stages

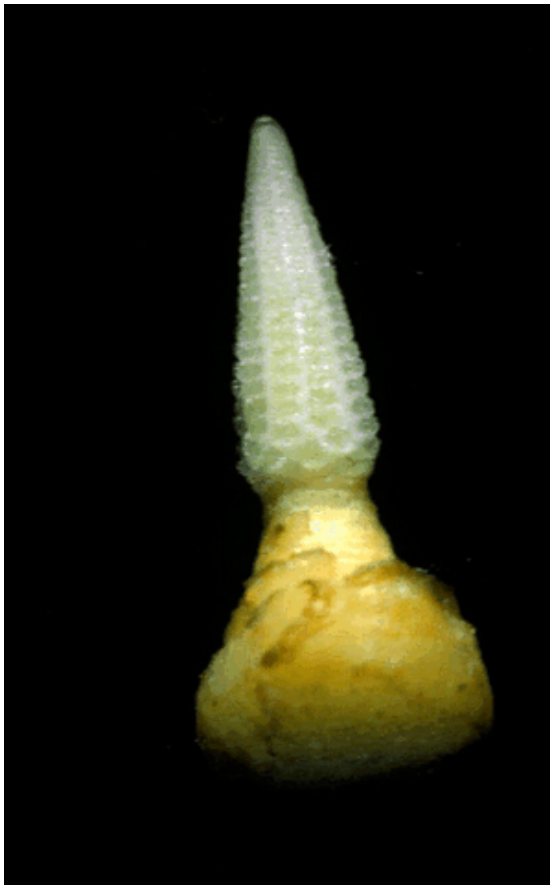
- V6 – 6 leaves emerged, all leaves formed, growing point reaches soil surface

Developmental Stages

- V8 – 8 leaves, potential kernel row number being determined

Developmental Stages

- V12 – 12 leaves, kernel row number set,

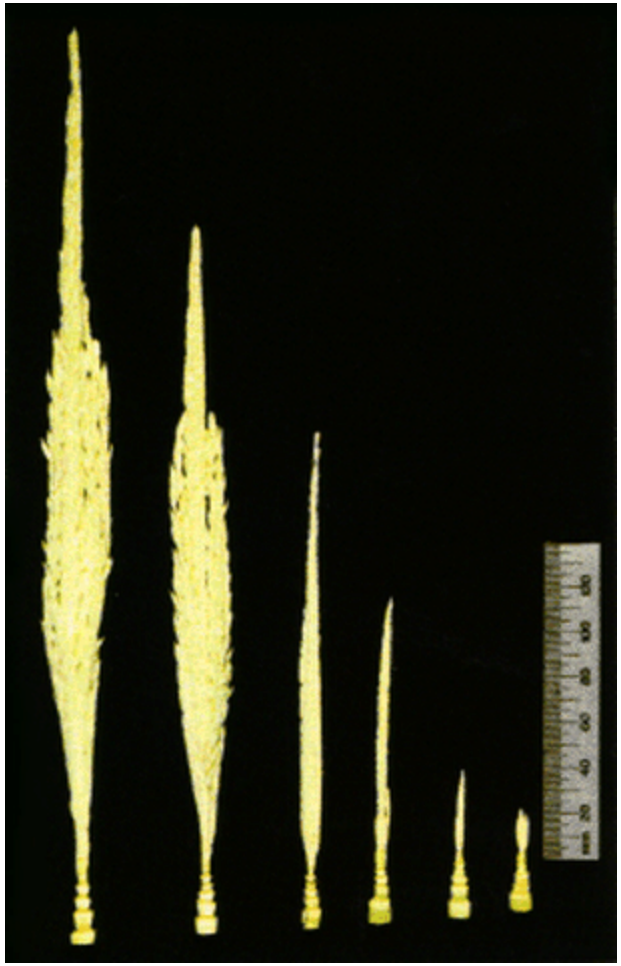


Developmental Stages

- V16 – 16 leaves or about 1 wk prior to silking, kernels per row set

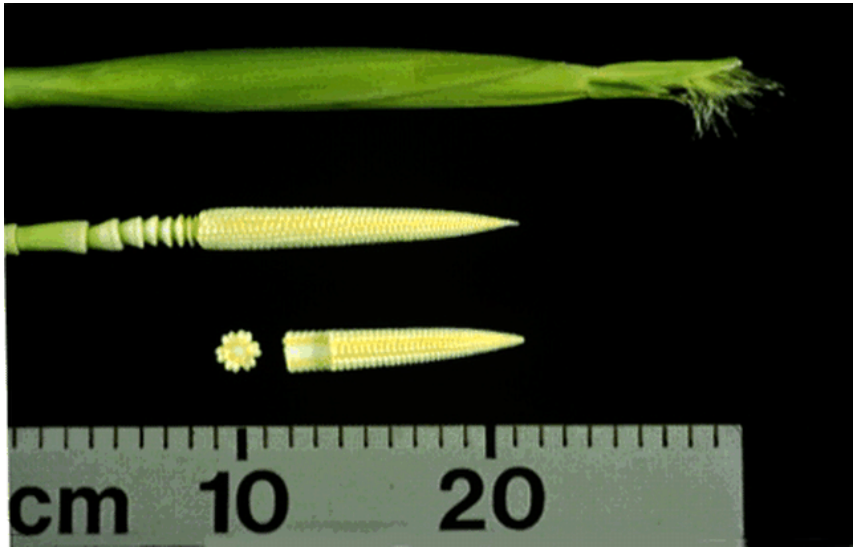
Developmental Stages

- VT – Tasseling,



Developmental Stages

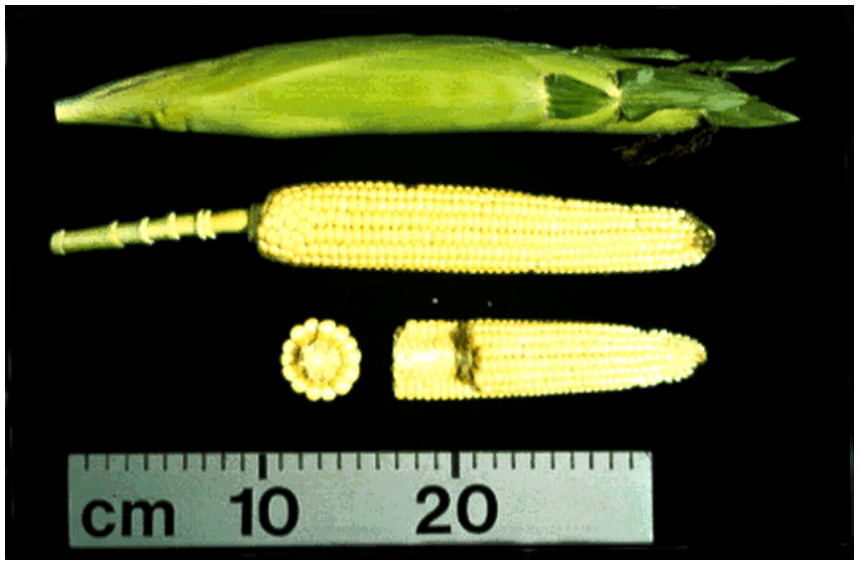
- R1 – Silking



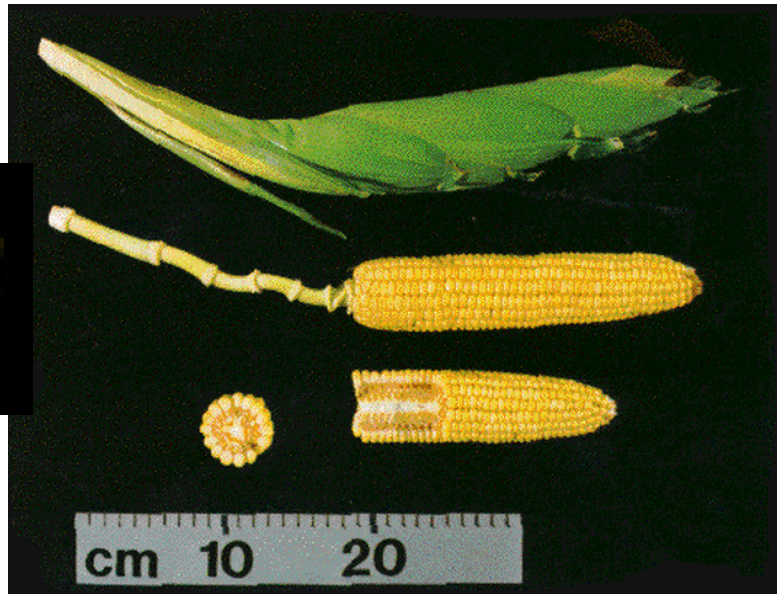
- R2 - Blister

Developmental Stages

- R3 – Milk

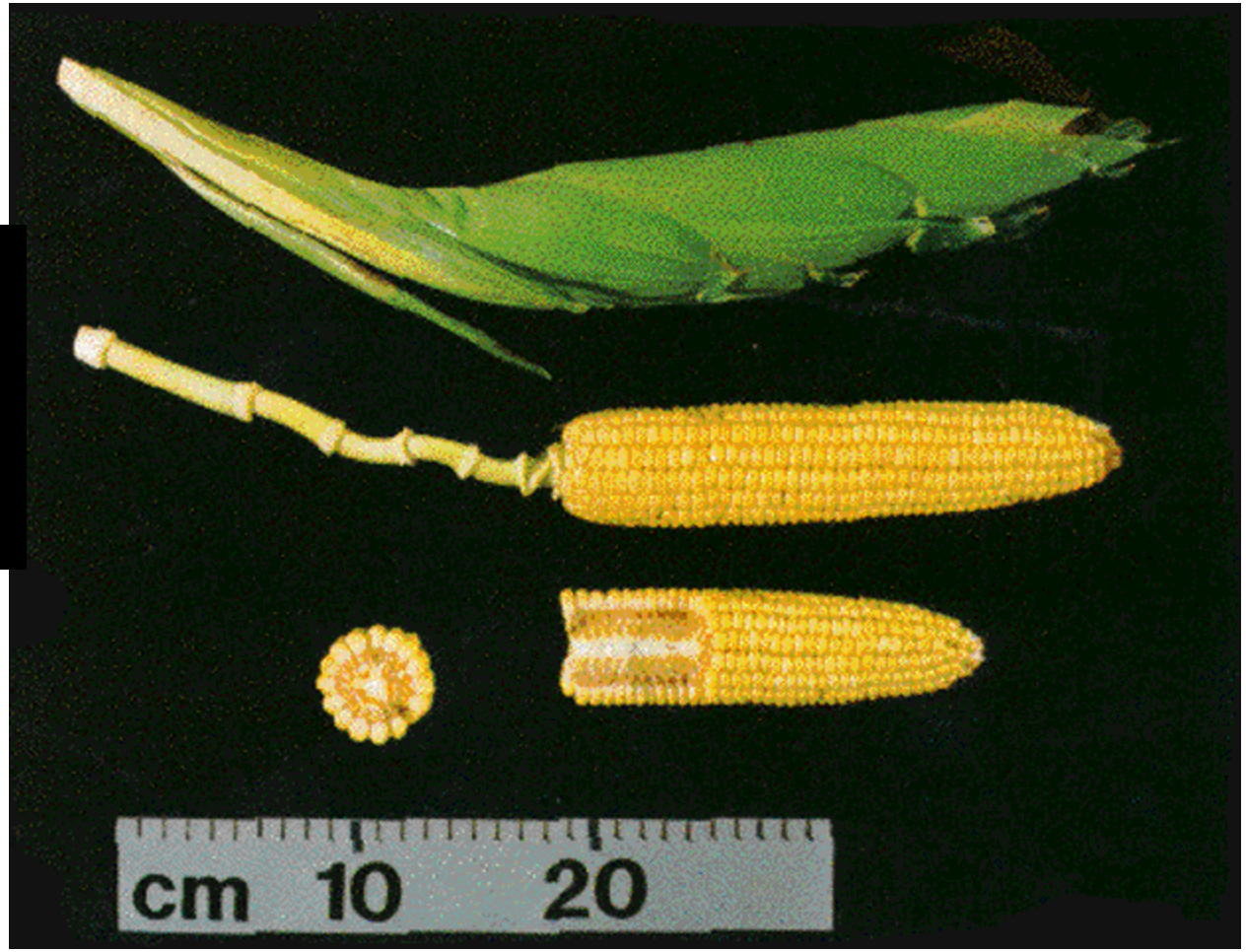


- R4 - Dough



Developmental Stages

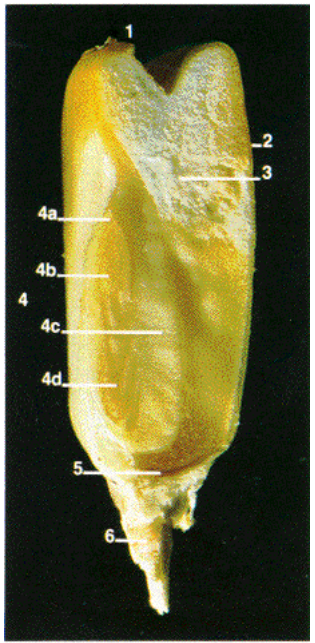
- R4 - Dough



Developmental Stages

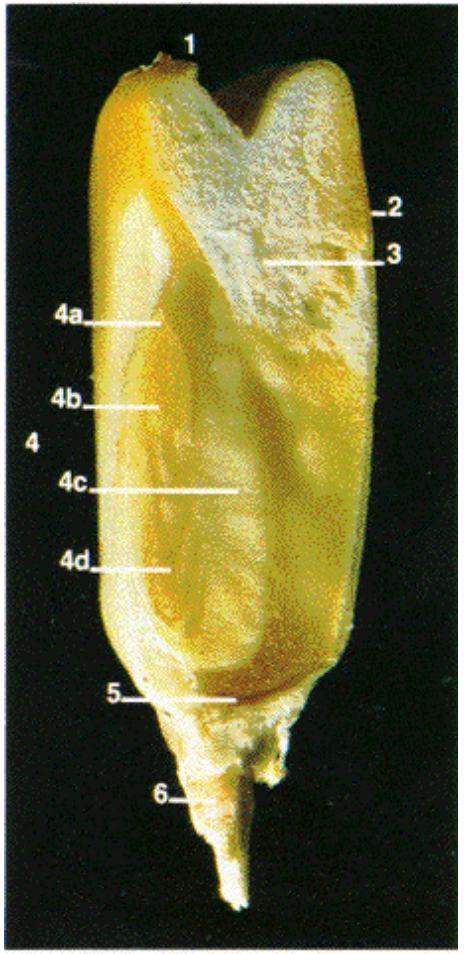
- R5 – Dent

- R6- Black layer



Developmental Stages

- R6- Black layer



Soybean Development

Vegetative Stages

- VE Emergence
- VC Unrolled unifoliate leaves
- V1 1st trifoliate
- V2 2nd trifoliate
- Vn nth trifoliate

Reproductive Stages

- R1 Begin Flower
- R2 Full Flower
- R3 Begin Podding
- R4 Full Pod
- R5 Begin Seed
- R6 Full Seed
- R7 Begin Maturity
- R8 Full Maturity

Soybean Development

- VC

Soybean Development

- V1

Soybean Development

- V2

Soybean Development

- V3

Soybean Development

- R1

Soybean Development

- R2

Soybean Development

- R4

Soybean Development

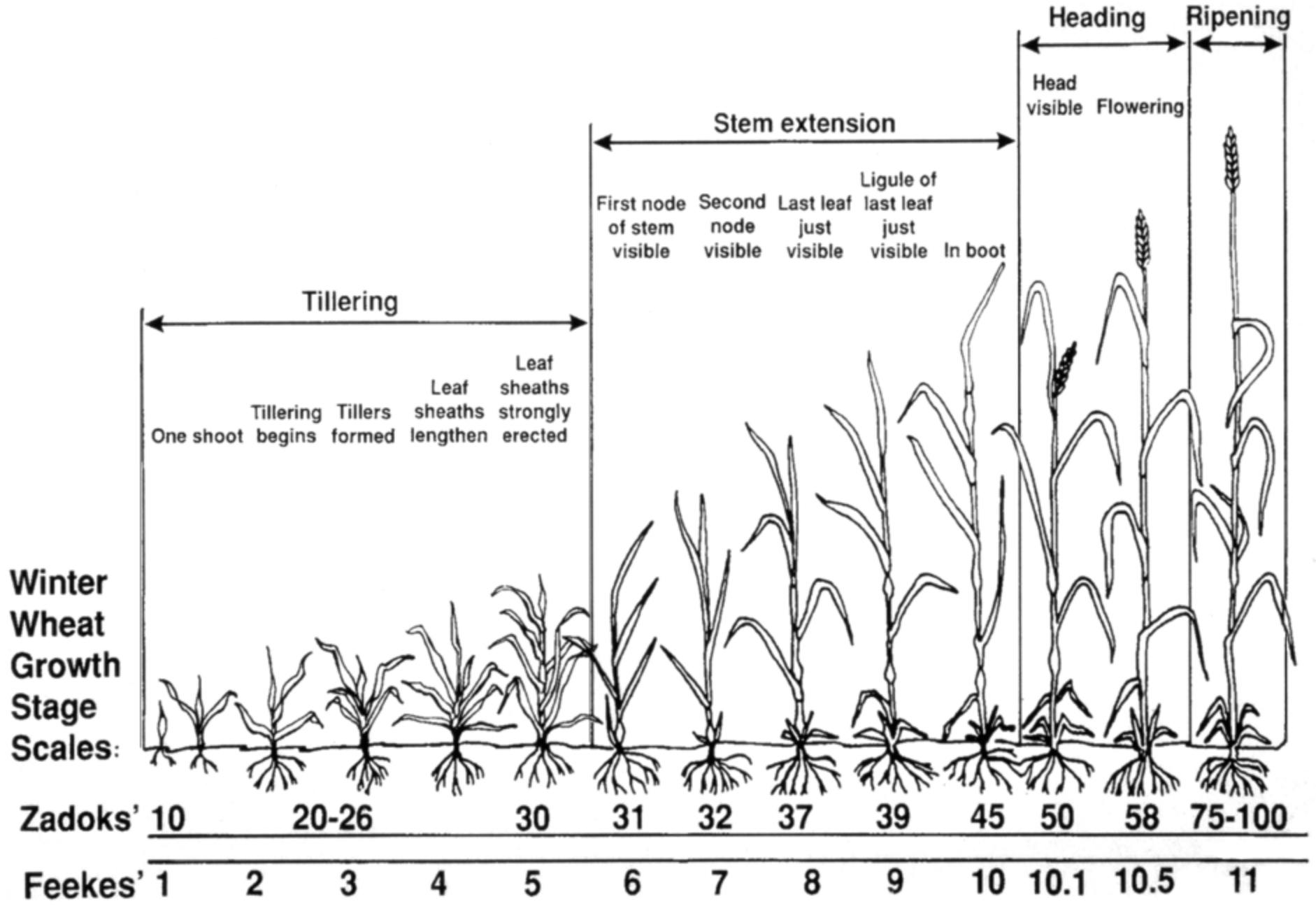
- R6

Soybean Development

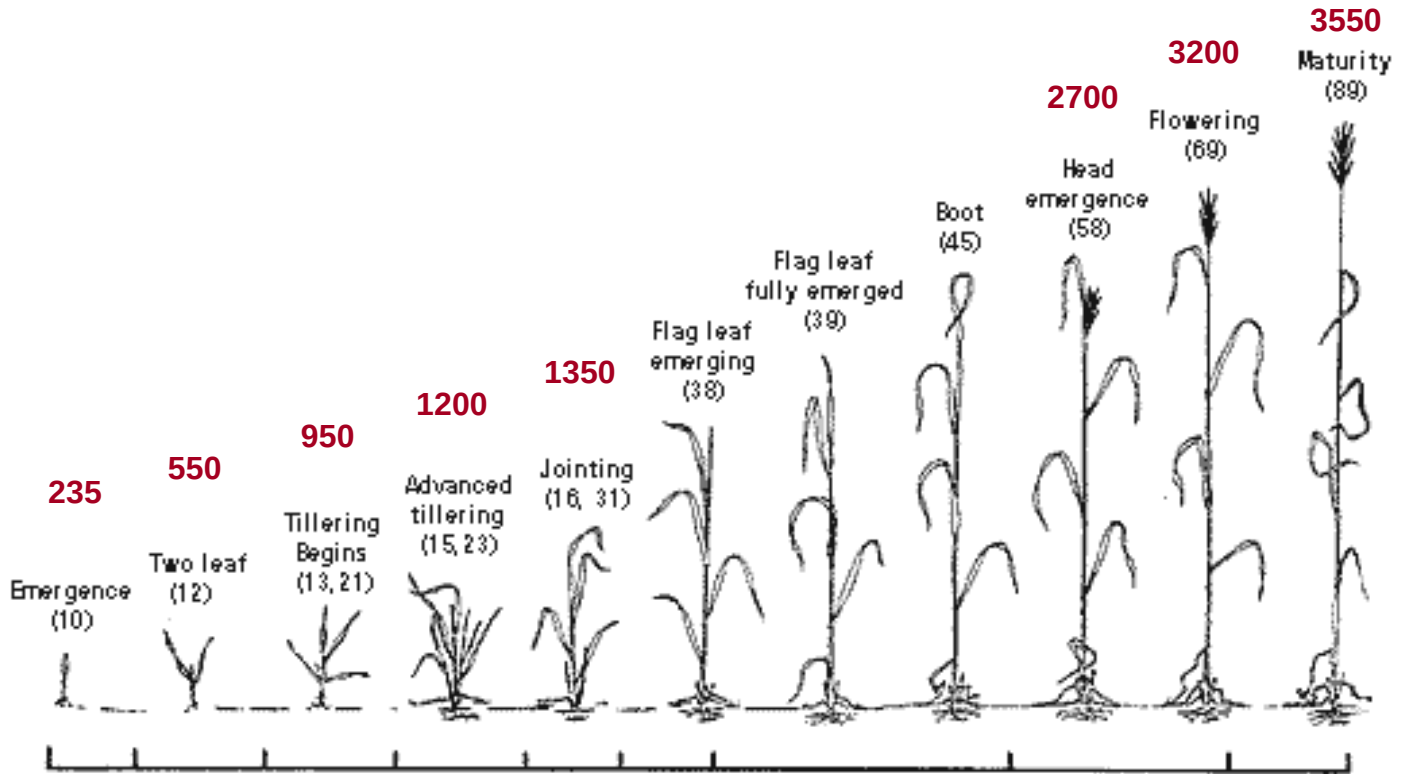
- R7

Soybean Development

- R8


Heading
Ripening
Head visible
Flowering
Stem extension
First node of stem visible
Second node visible
Last leaf just visible
Ligule of last leaf just visible
In boot
Tillering
One shoot
Tillering begins
Tillers formed
Leaf sheaths lengthen
Leaf sheaths strongly erected
Winter Wheat Growth Stage Scales:
Zadoks' 10 20-26 30 31 32 37 39 45 50 58 75-100
Feekes' 1 2 3 4 5 6 7 8 9 10 10.1 10.5 11

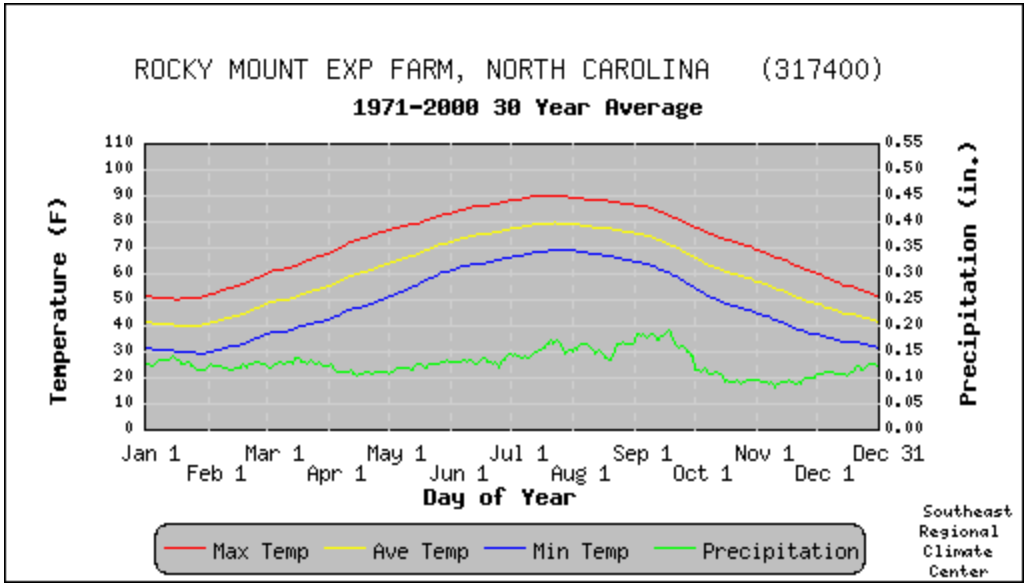
Estimated GDD (base 32ºF) Required to Reach Key Developmental Stages



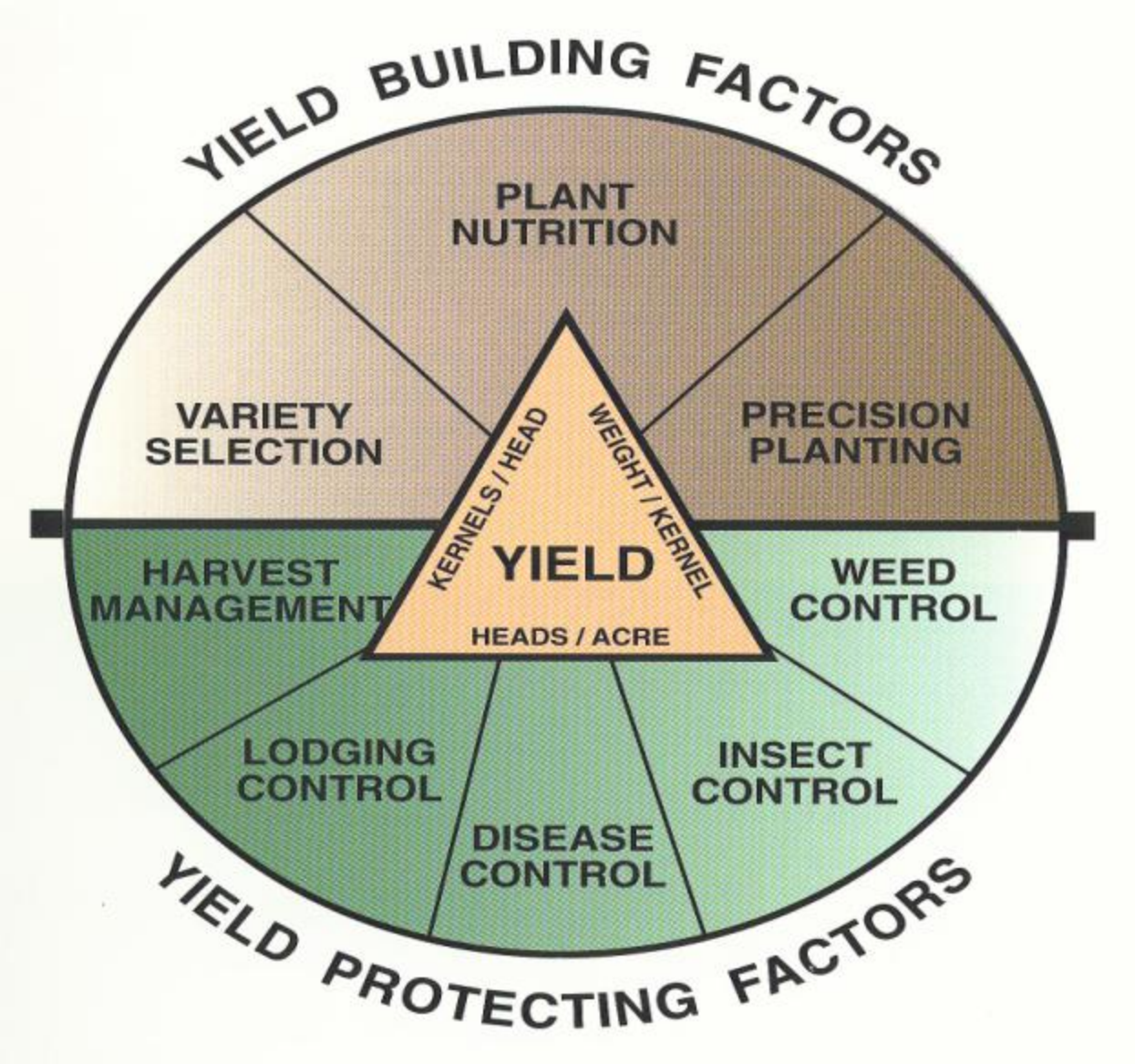
Zadoks stage, in parenthesis

Wheat

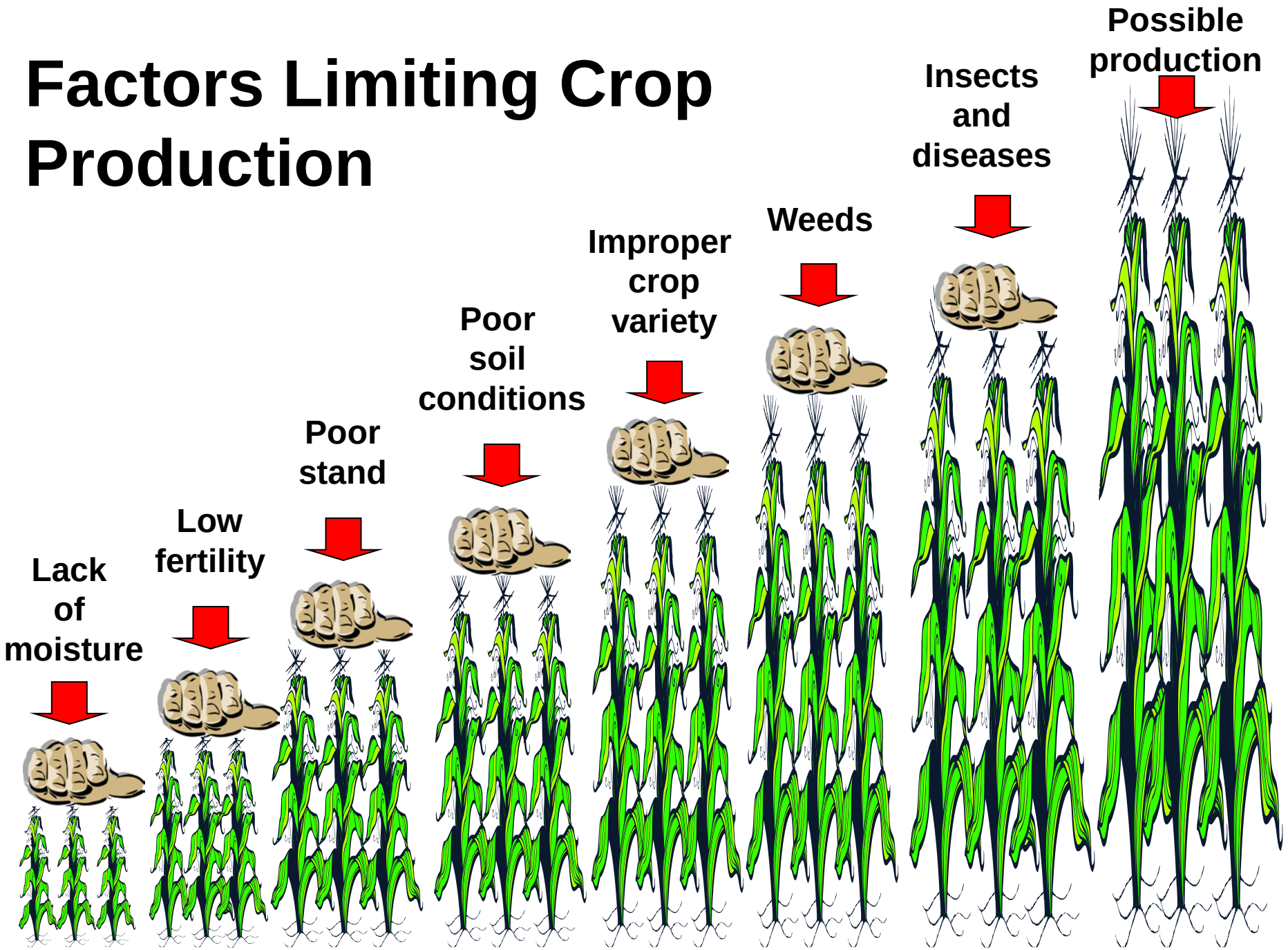
- Daylength Sensitivity
  - What triggers the change from vegetative to reproductive growth?



Integrated Management



Factors Limiting Crop Production



Wheat Varieties Recommended

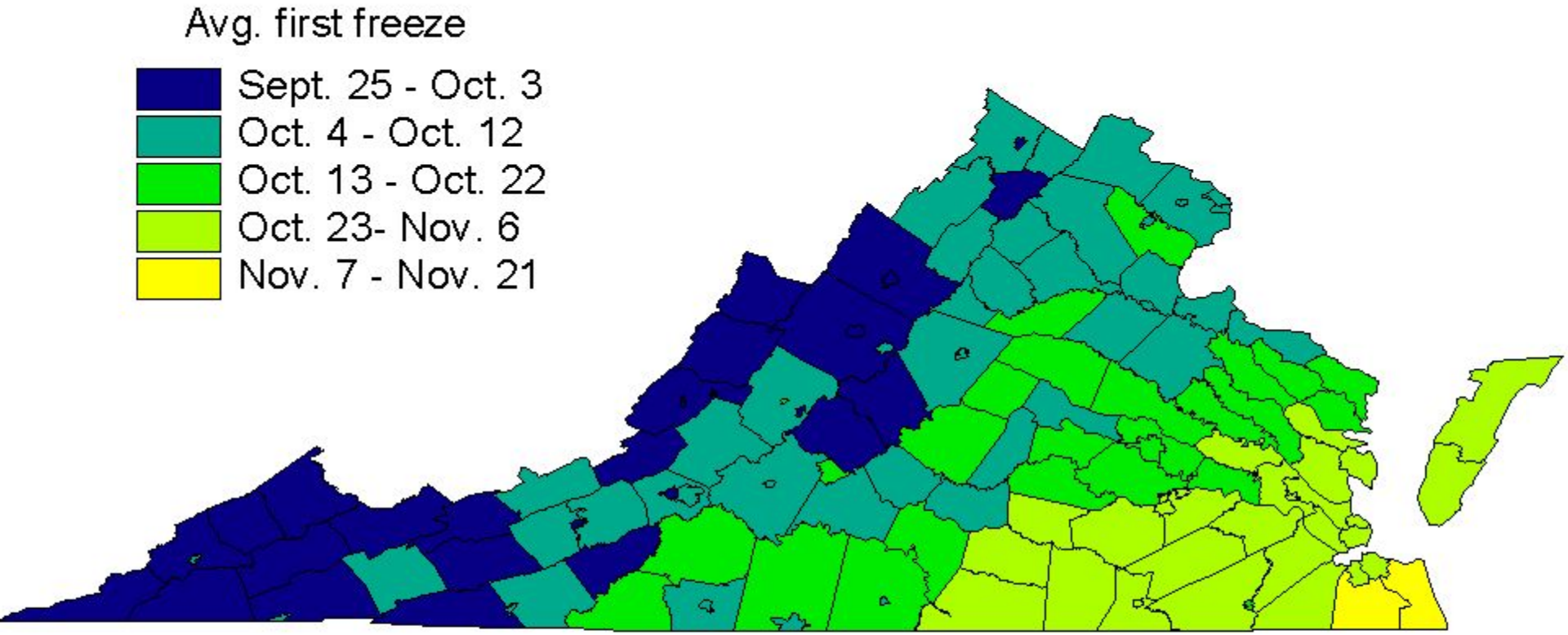
Agronomic Characteristics

Cultivar	Grain Yield	Test Weight	Milling Quality	SRW Baking Quality	Relative Heading
SS 520[a]	3[b]	2	4	2	Early
FEATHERSTONE 176	3	2	3	3	Early
Sisson	3	3	3	3	Early
PIONEER BRAND 26R24	4	3	3	3	Early
USG 3706	3	4	4	3	Early
USG 3209[a]	4	2	1	1	Early
VIGORO Tribute	3	4	3	2	Avg.
McCormick	2	4	3	2	Avg.
SS 8404[a]	3	4	4	4	Avg.
VIGORO V9510[a]	3	3	1	2	Avg.
Chesapeake	3	4	1	2	Avg.
PIONEER BRAND 26R15	4	3	4	3	Avg.
VIGORO Dominion	3	3	4	2	Late
SS 560	4	2	3	1	Late
PIONEER BRAND 26R12	2	4	3	3	Late
USG 3665[a]	4	2	NA	NA	Late
SS 8302	3	4	3	3	Late
SS 8309	3	3	NA	NA	Late
SS MPV 57	4	2	4	3	Late

[a]These lines are not daylength sensitive and should not be planted early in order to avoid potential freeze damage.

[b]4 - Significantly greater or better than average; 3 - Greater or better than average; 2 - Below or worse than average; 1 - Significantly below or worse than average

[c]Based on performance over only two season and may be less reliable than other recommendations.


Avg. first freeze
Sept. 25 - Oct. 3
Oct. 4 - Oct. 12
Oct. 13 - Oct. 22
Oct. 23- Nov. 6
Nov. 7 - Nov. 21

Suggested Seeding Dates for No-till Wheat

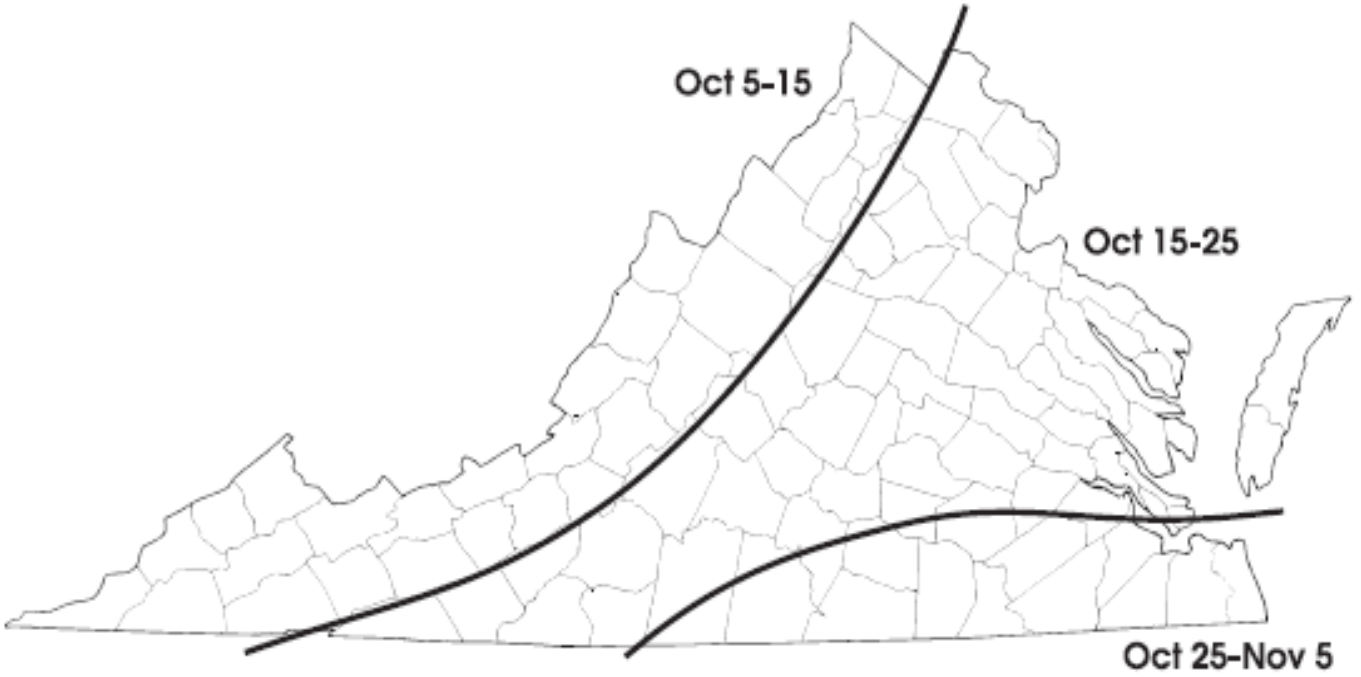
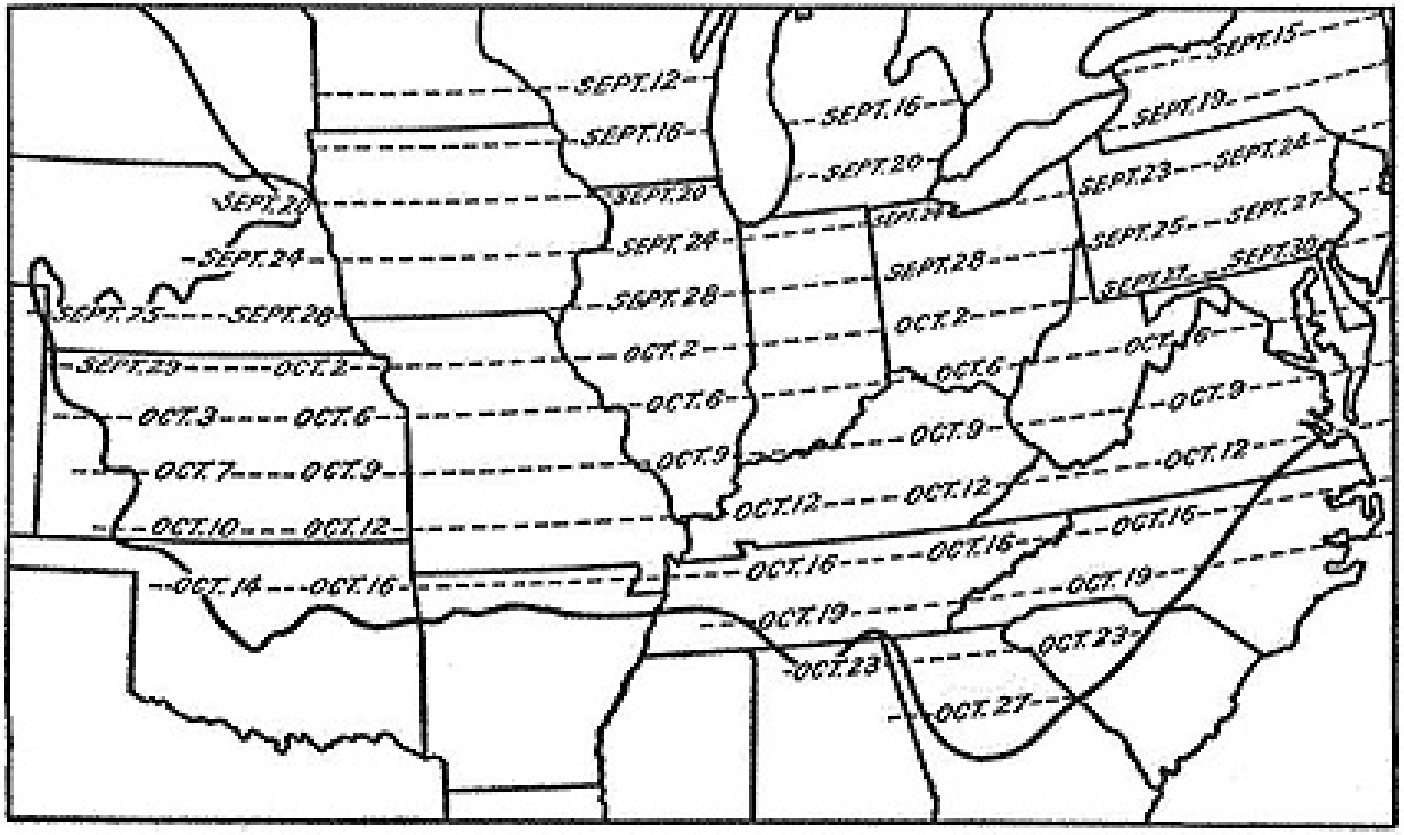


Figure 1. Suggested seeding date for no-tillage small grains in Virginia, based on 50 percent fall freeze probability (VASS, 2003, http://www.nass.usda.gov/va/14-15.pdf)


Lufkin
6'

Hessian Fly Free Date



Map showing the earliest safe-sowing dates to avoid injury by the Hessian fly. These dates are only approximate. Farmers should consult their county agricultural agent or nearest experiment station to obtain more exact information on the safe-sowing dates recommended for their immediate localities

Seeding Rate

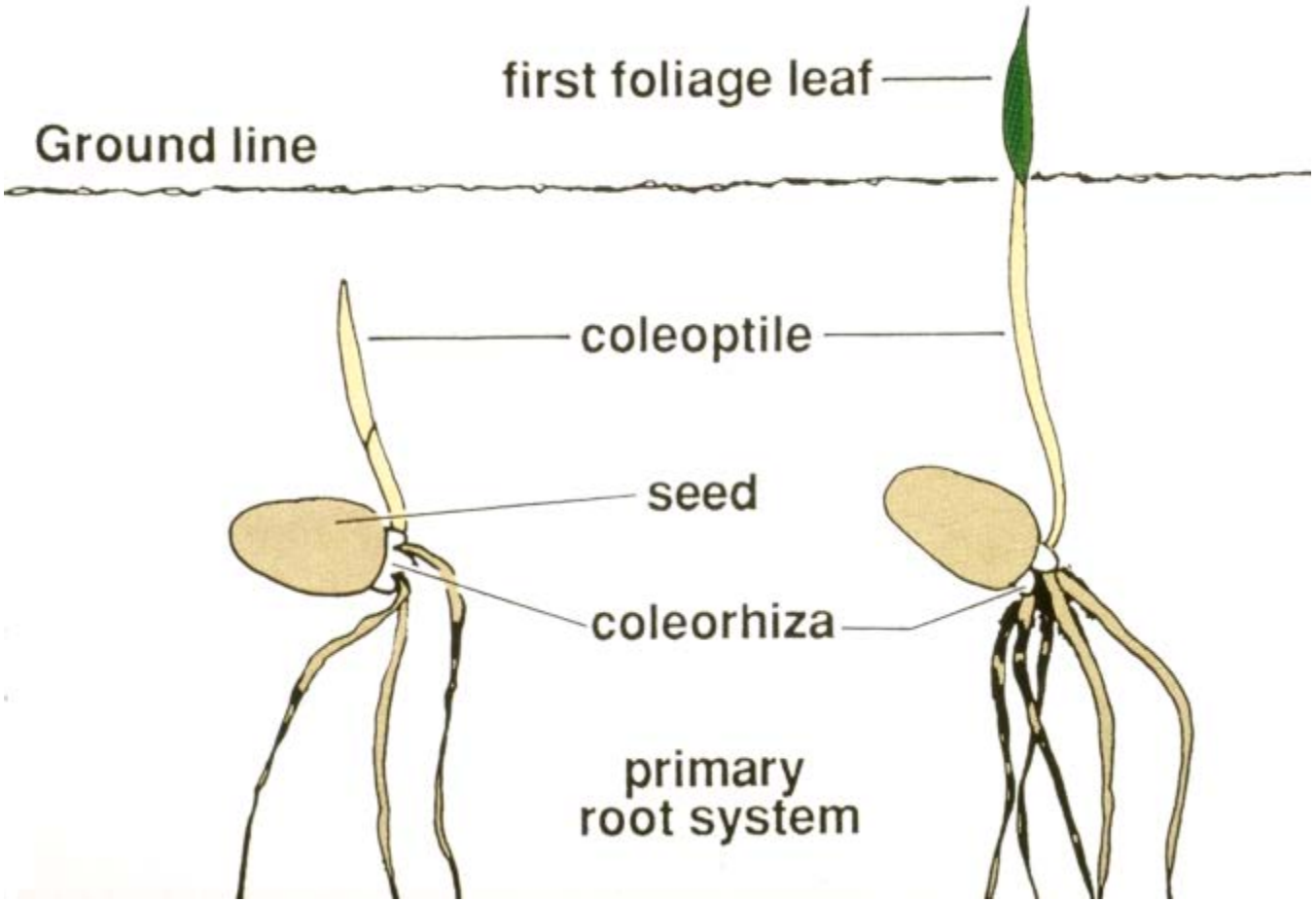
- Attain 30 vigorous seedlings per square foot.
- Calibrate the drill for 30-35 seeds per square ft.

Row width, in	Planting Time		
	Timely	2 wk late	4 wk late
	Seeds/row foot		
4	12	13	14
6	18	20	22
7	20	22	24
8	22	24	26

Seed Size

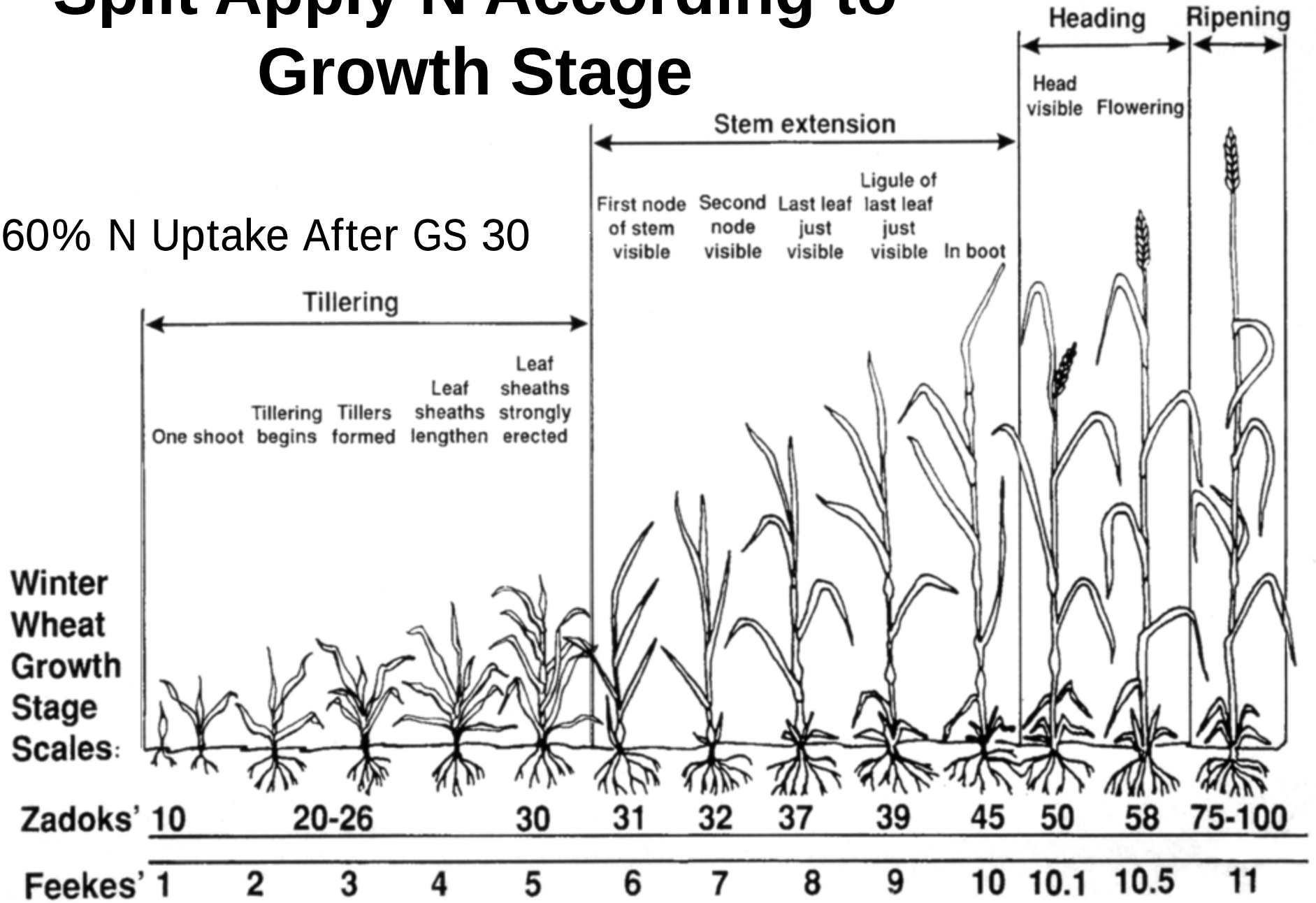
30 seeds/sq ft 10 seeds/sq ft

Nitrogen Management In Winter Wheat Production

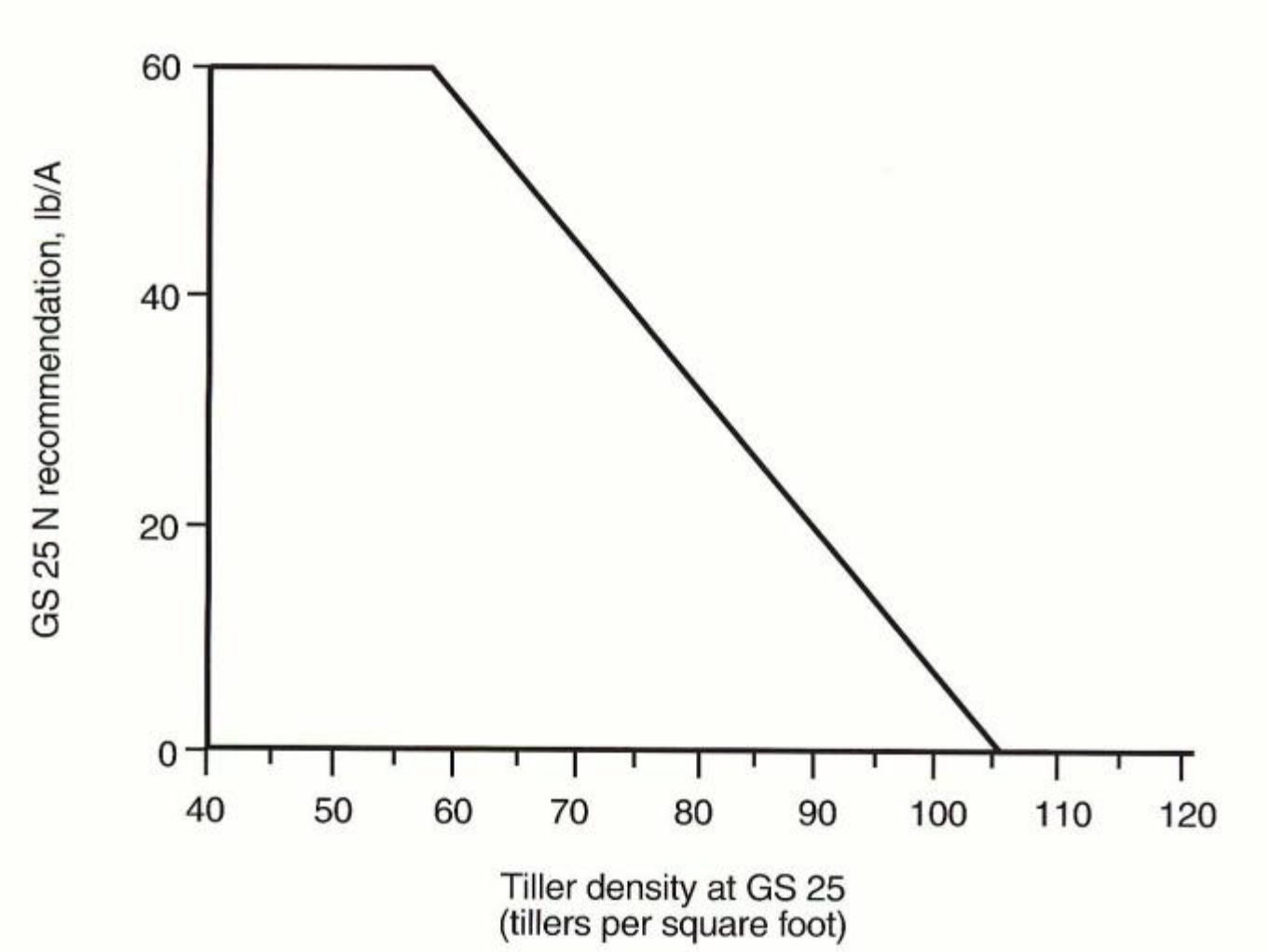

first foliage leaf
Ground line
coleoptile
seed
coleorhiza
primary
root system

Split Apply N According to Growth Stage

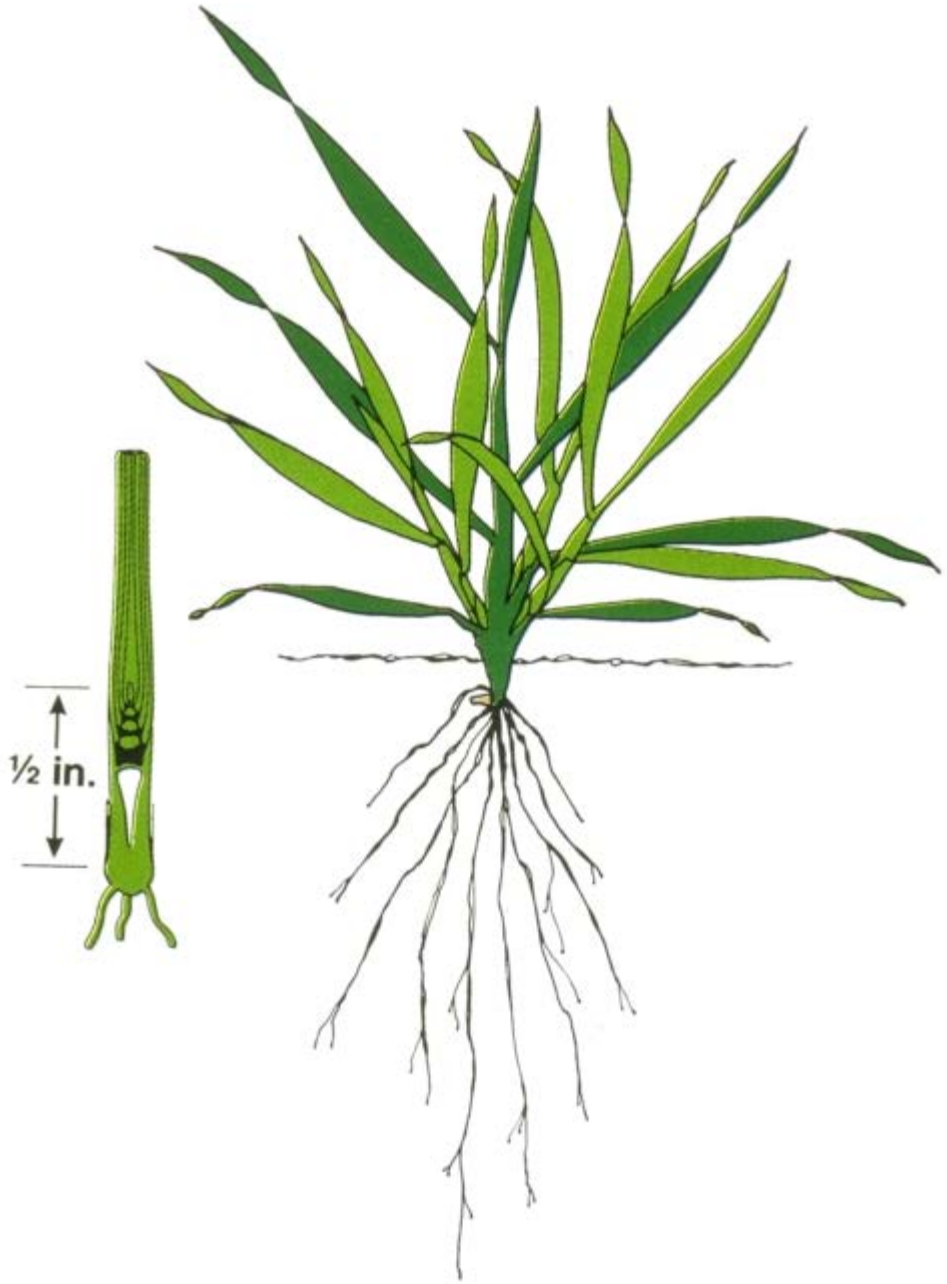
60% N Uptake After GS 30



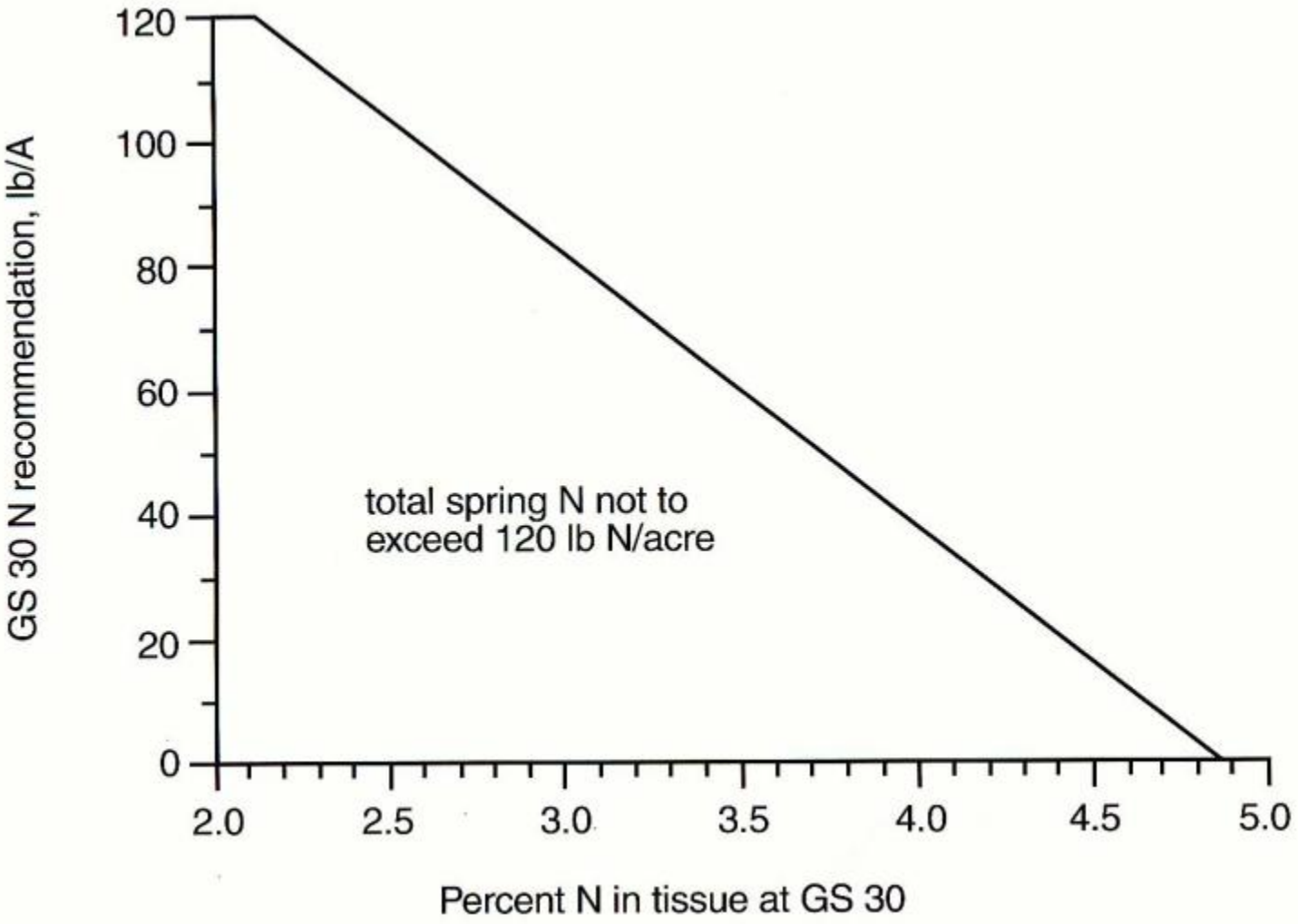
GS 25 N Rate
Directly Related to Tiller Numbers



Growth Stage 30
Just prior to jointing



GS 30 N Application Directly Related to Tissue N Content

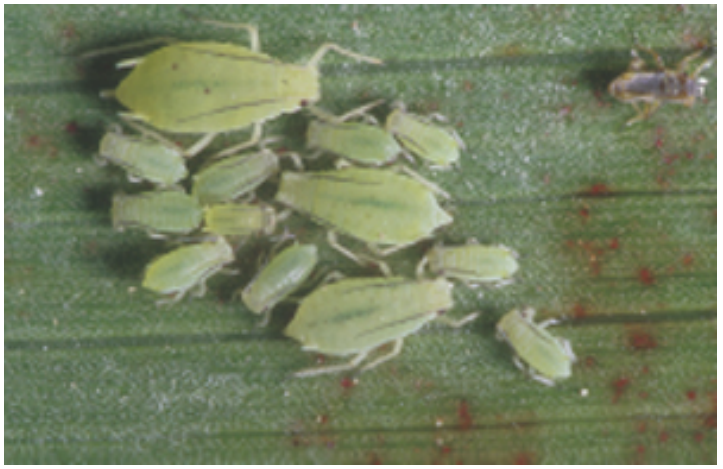


Weeds, Insects, and Disease

- Weed Control information
  - Site specific
  - See the VT Pest Management Guide

  http://pubs.ext.vt.edu/456/456-016/456-016.html

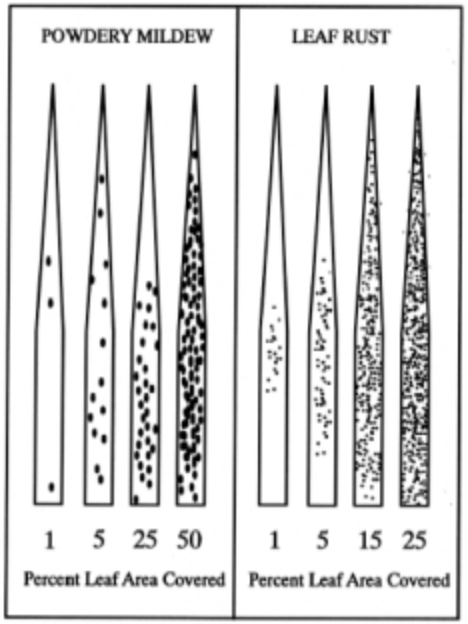
Weeds, Insects, and Disease



- Insects
  - See the PMG
  - Aphids and BYDV
    - Seed treatments
    - Scouting and in-season control
  - Cereal Leaf Beetle
    - Scouting and thresholds, timing

Foliar Diseases

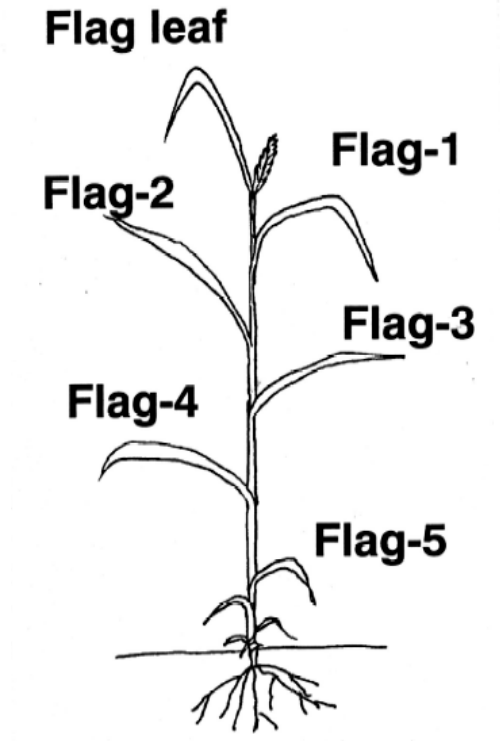
Figure 2. Percent leaf area affected by powdery mildew and leaf rust.



(After C. James. 1971. A Manual of Assessment Keys for Plant Diseases, Canada Department of Agriculture, Publication No. 1458).

Figure 3: Determination of treatment threshold for leaf and glume blotch in wheat.

Scout fields weekly from Zadoks' Growth stage 31 through 73 (Feeks' 6 through 11). Randomly select 10 locations within a wheat field. At each randomly selected location, examine and record number of indicator leaves out of ten main tillers with one or more leaf and glume blotch lesion(s). If 25% of the (100) indicator leaves in the field have one or more lesions then a fungicide application is indicated



Indicator Leaves are:

Flag-4 and **Flag-5** for Zadoks' Growth Stages 31-37 (Feeks' 6-8)

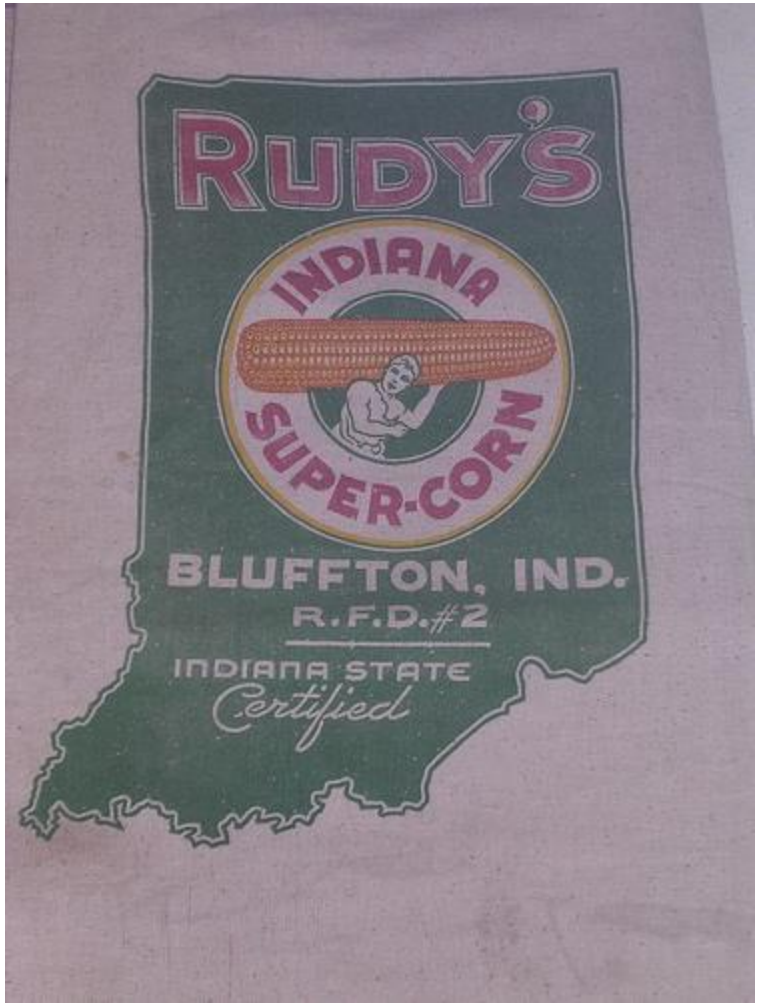
Flag-3 for Zadoks' Growth Stages 38-45 (Feeks' 8-10)

Flag-2 for Zadoks' Growth Stages 46-59 (Feeks' 10-10.51)

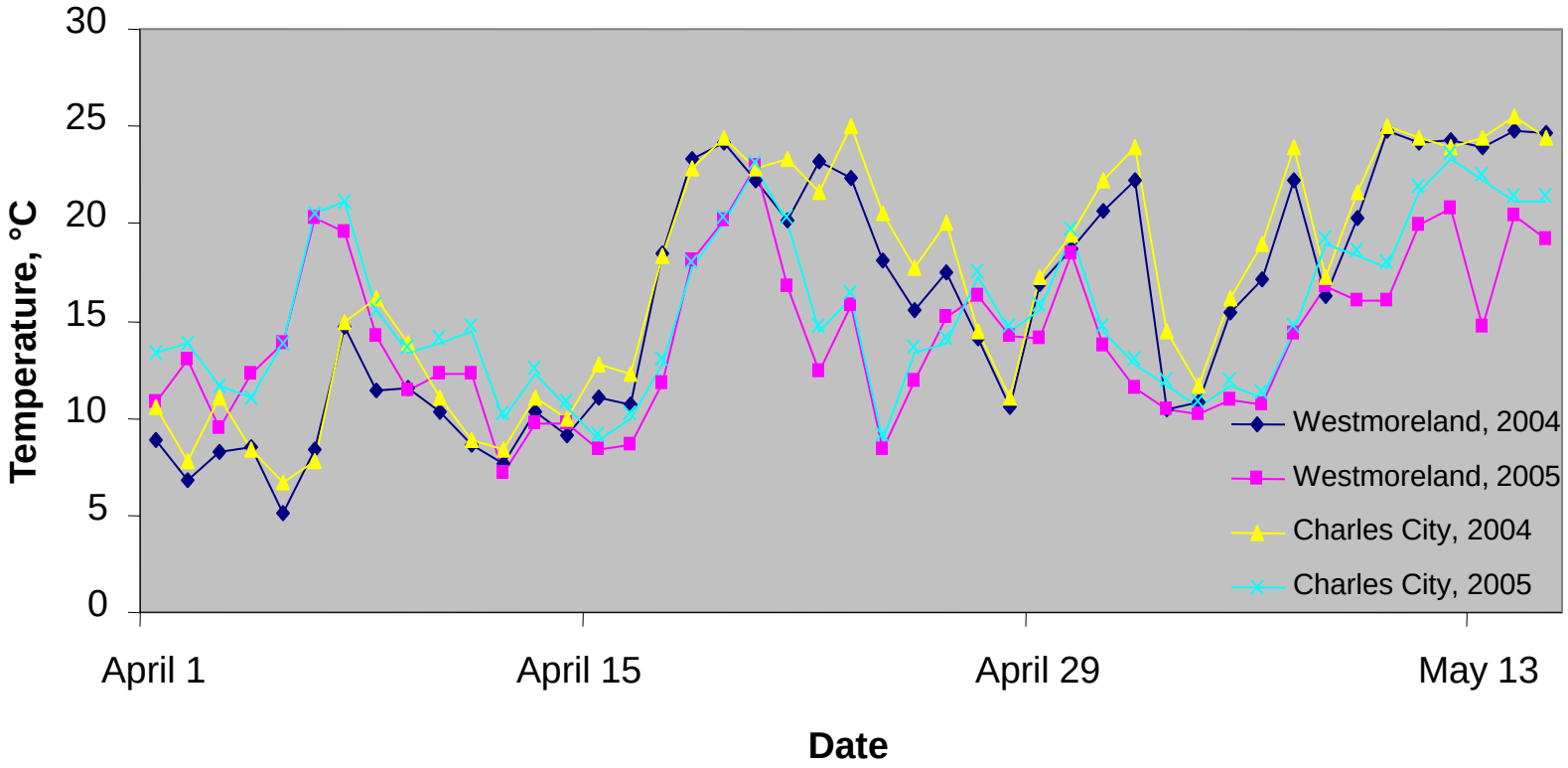
Flag-1 from Zadoks' Growth Stages 60-73 (Feeks' 10.52-11)

Corn Hybrid Selection Considerations

- Adaptation
- Performance Data
  - Yield & Test wt.
  - Heading
  - Disease resistance
  - Lodging/Standability
- Use Quality Seed



Corn Planting Date

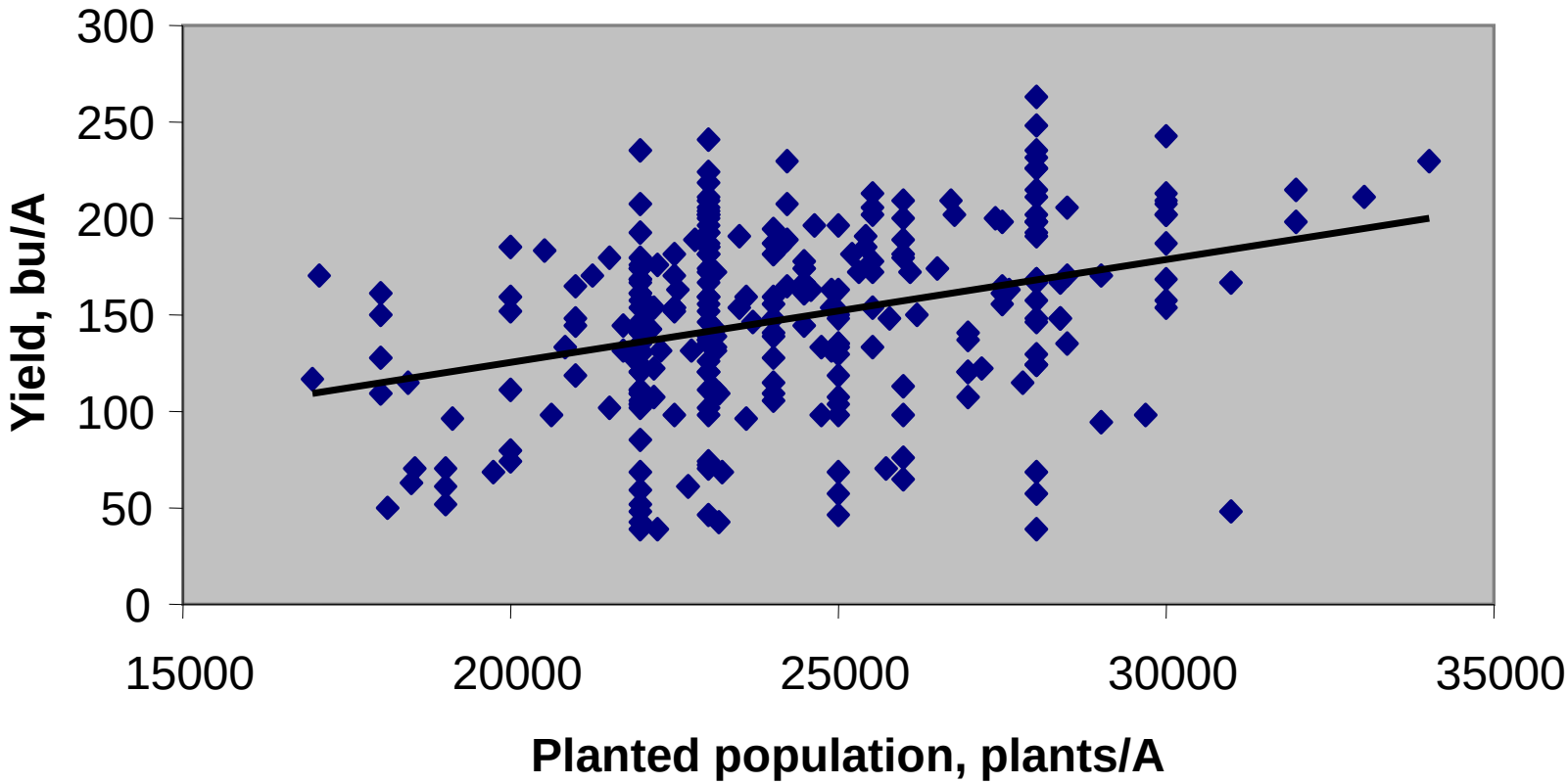


http://www.ext.vt.edu/pubs/grains/424-033/424-033.html
http://www.ext.vt.edu/pubs/grains/424-032/424-032.html

Seeding Rate

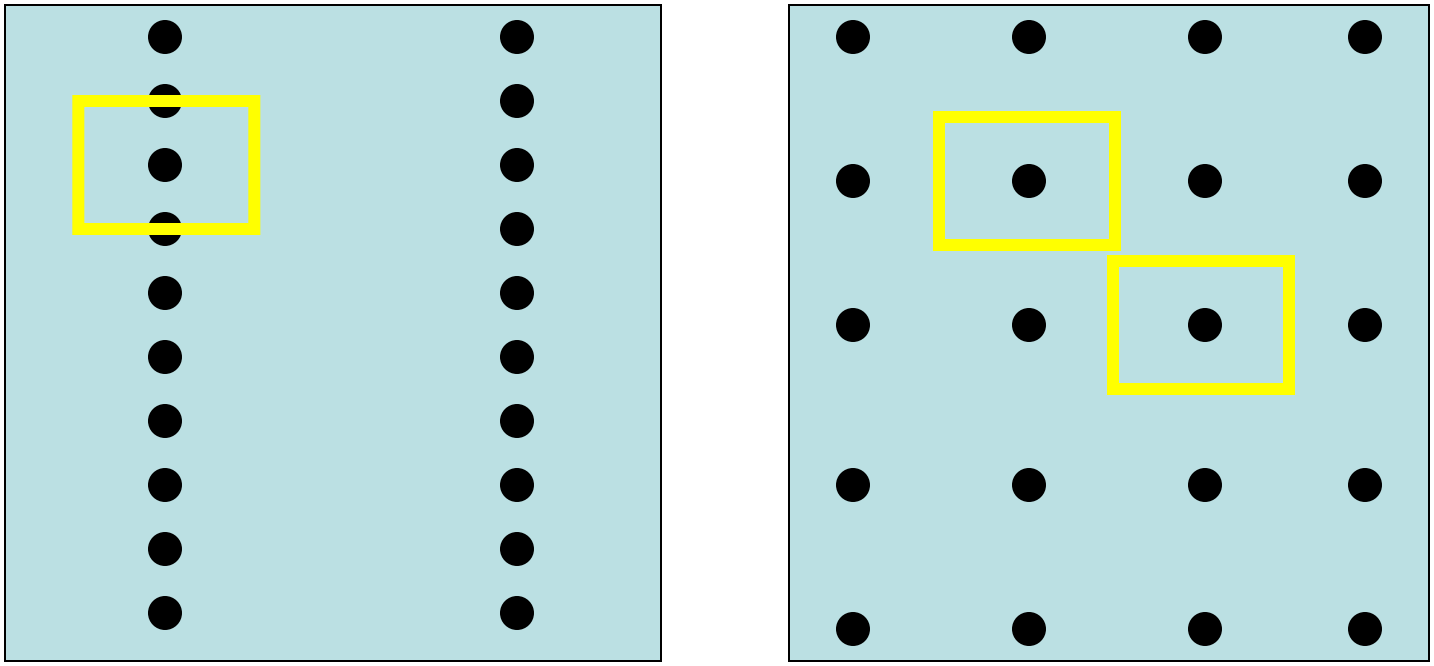
- Yield potential
  - <90 bu/ac = 18,000-20,000 seeds
  - 90-120 bu/ac = 20,000-22,000
  - >120 bu/ac = 22,000-26,000+
- “Stretch” hybrids
  - 18,000-20,000 seeds
- Planting >26,000 seeds only on soils w/ 4 plus inches of available moisture and avg yields >125 bu/ac

Plant Population



Row Width

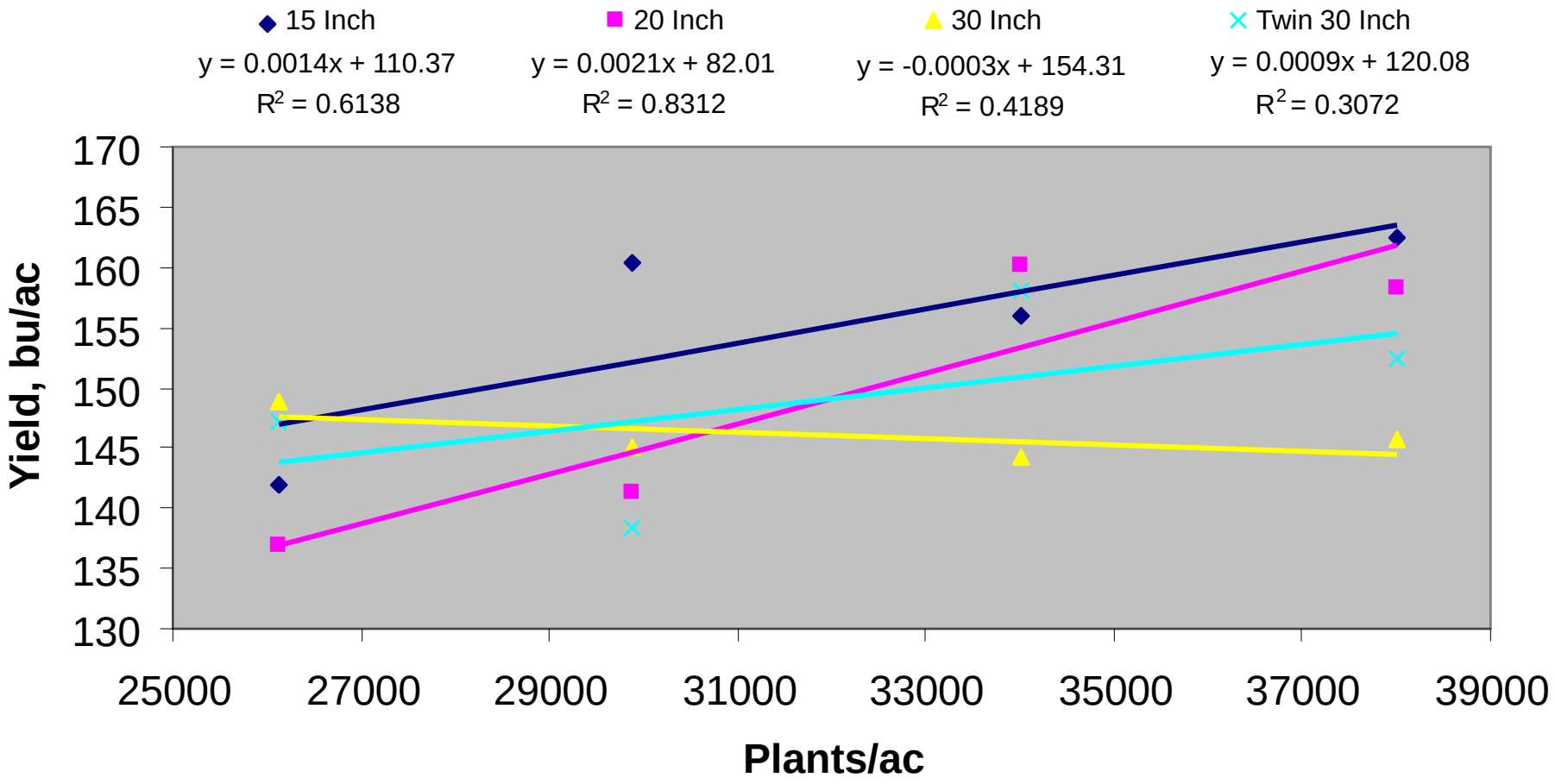
- Why narrow rows should increase yields.



Row width

Location	Experiments	Row spacing (in)	% yield change vs. 30 in. row
Michigan	10	22	8.8
Minnesota	6	20	7.3
Purdue	9	15	2.7
Iowa	5	20	4.5
Pennsylvania			
27,000 PPA	2	15	3.2
34,000 PPA	2	15	11
Kentucky	5	20	0
Tennessee	3	20	-4.3

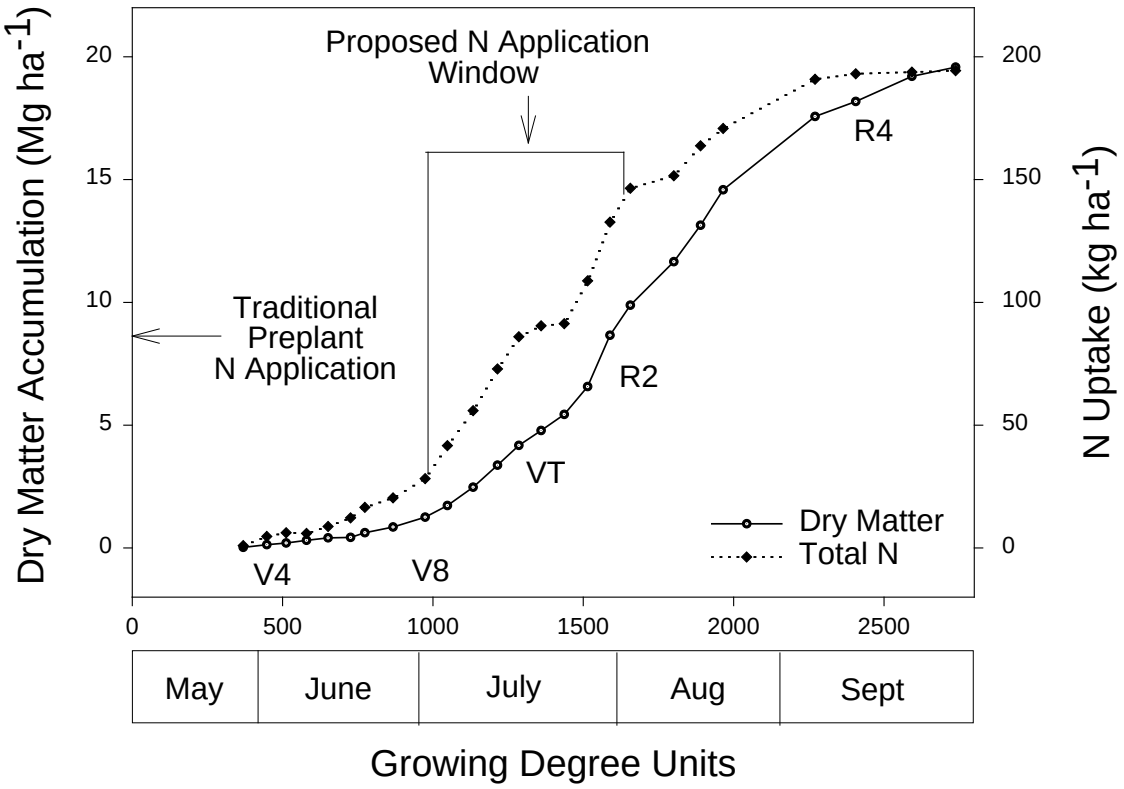
Row Spacing


15 Inch
y = 0.0014x + 110.37
R2 = 0.6138
20 Inch
y = 0.0021x + 82.01
R2 = 0.8312
30 Inch
y = -0.0003x + 154.31
R2 = 0.4189
Twin 30 Inch
y = 0.0009x + 120.08
R2 = 0.3072
170
165
160
155
150
145
140
135
130
Yield, bu/ac
25000
27000
29000
31000
33000
35000
37000
39000
Plants/ac

N Fertilizer Rate
1.0 lb N Per Bu Yield Potential

- (56 lbs/bu) * (1-0.15) = 47.6 lbs dry matter/bu
- Corn grain: 9% protein = 1.44%N
- (47.6 lbs dm/bu) * (0.0144) = 0.69 lbs N/bu
- Efficiency of uptake:
  - **69% eff. = (0.69 lbs N / 1.0 lb N applied) (100%)**
  - **60% eff. = (0.69 lbs N / 1.15 lb N applied) (100%)**

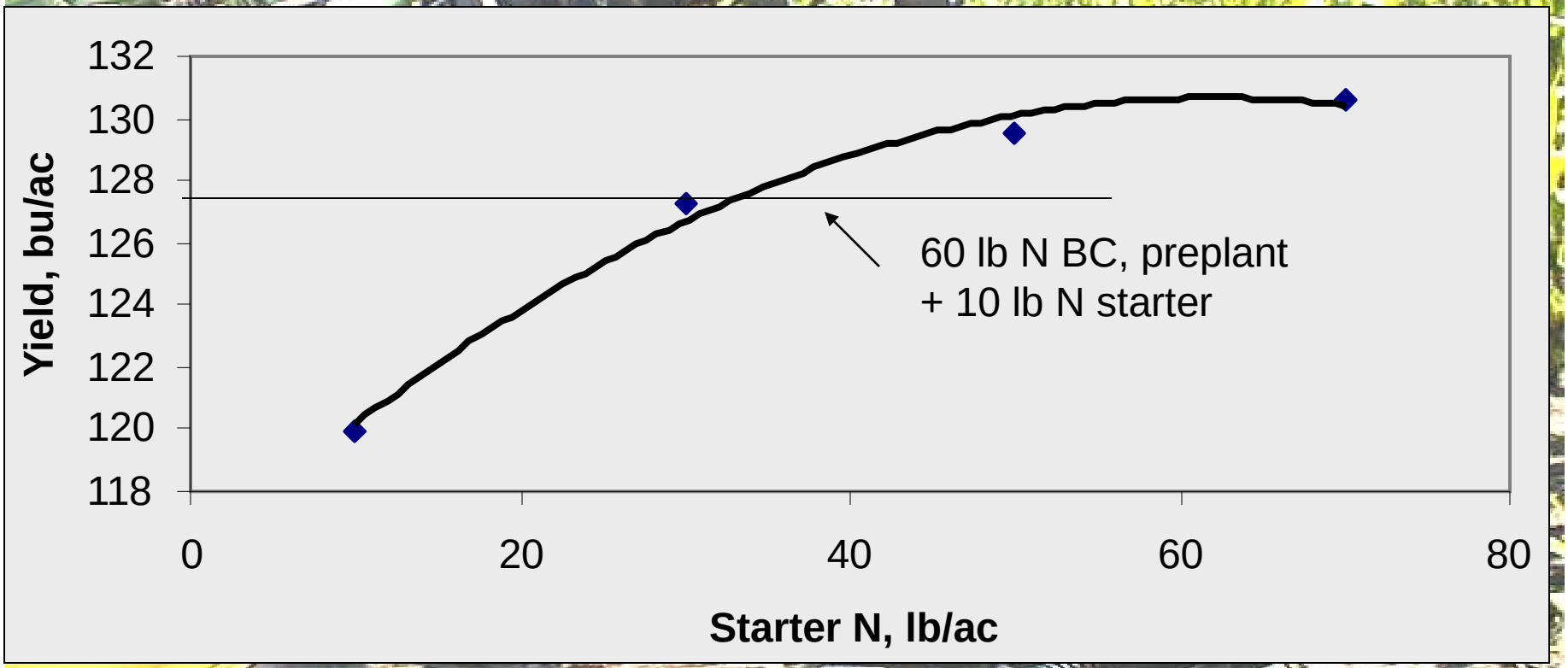
Nitrogen


Proposed N Application Window
Traditional Preplant N Application
V4
V8
VT
R2
R4
Dry Matter
Total N
Dry Matter Accumulation (Mg ha-1)
N Uptake (kg ha-1)
0
5
10
15
20
0
50
100
150
200
0
500
1000
1500
2000
2500
May
June
July
Aug
Sept
Growing Degree Units

FERTILIZER EFFICIENCY

- Placement

Sub-Surface Placement



Yetter

Optimum Starter Band and Sidedress N Rates for No-till Corn

Soil Series	Starter Band* N Rate (lbs/ac)	Side-dress N Rate (lbs/ac)	Yield (bu/acre)
Pamunkey	66	0	89
Slagle sil	70	93	168
Pamunkey fsl	70	80	154
Slagle sl	49	125	128
Turbeville sl	27	107	111
Cullen l	44	58	126
Eubanks sil	70	0	122
Ross l	70	93	105
Pamunkey sil	70	93	148

*Starter band placed 2x2. N rates were 10, 30, 50, 70 lbs N/acre.

Developmental Stages

- V6 – 6 leaves emerged, all leaves formed, growing point reaches soil surface
- kernel row number being determined

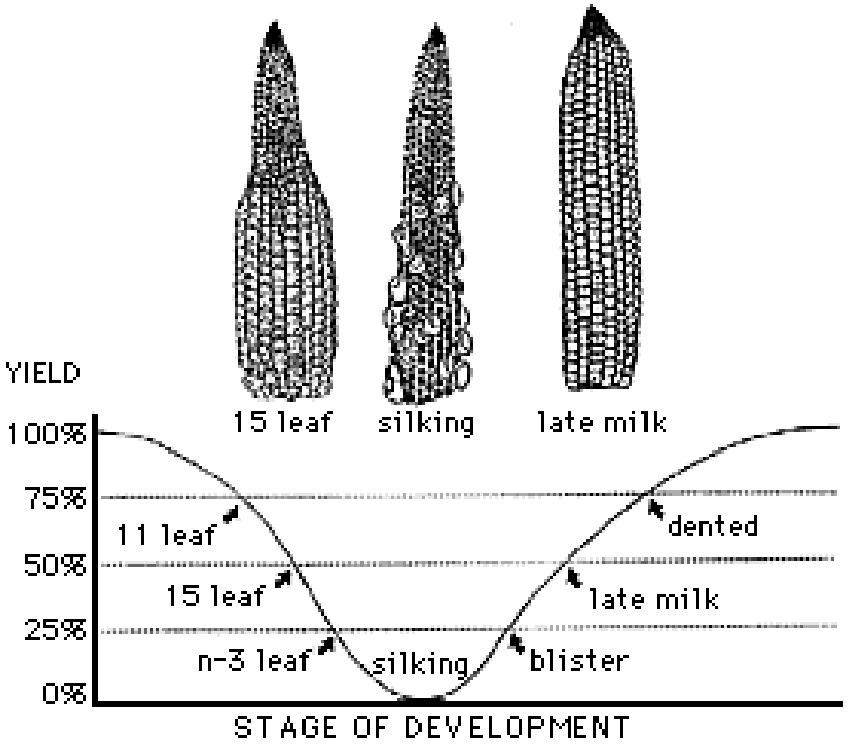

N STRESS
WKS N APP
0&5
0&7

Stress

- Types of Stress
  - Temperature
  - Moisture
  - Nutrient

Critical Stages

- Early Vegetative
- Tassel Emergence
- Silking
- Blister
- Dough



Critical Stages

Growth Stage	Yield loss from 4 days visible wilting (%)
Early Vegetative	5-10
Tassel Emergence	10-25
Silking	40-50
Blister	30-40
Dough	20-30

Classen and Shaw, 1970


Questions ?