CCA Basic Training - Forage Crops

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University of Vermont Extension

Credit: Jerry Cherney
Cornell University

Handout Orientation!

CCA Basic Training - Forage Crops

National Exam:
Sections related to forages, but appear to be very Brief.

Northeast Regional Exam:
More forages than national.
Specific examples for NYS.

Primarily Dairy forage in Northeast

Variable soils
High quality forage

Tolerance to Wet Soils

Reed Canarygrass
Meadow Fescue
Tall Fescue
Smooth Bromegrass
Orchardgrass
Timothy

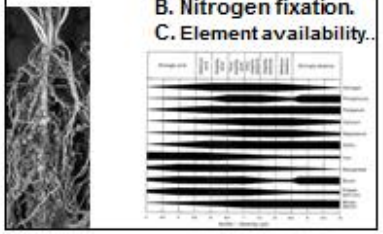
8 CCA Competency Areas

1. Crop Adaptation
2. Tillage Systems
3. Seeding Factors
4. Seeding Rates & Row Spacing
5. Replanting Decisions
6. Staging, Growth & Development
7. Forage Harvesting Factors
8. Cropping Systems

(37 Performance Objectives) 1

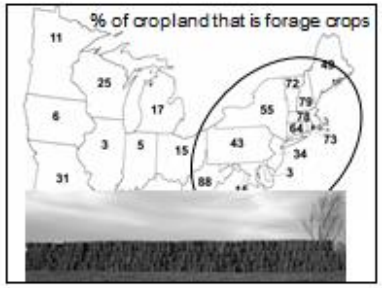
1 Soil pH influences:

A. Species selection.
B. Nitrogen fixation.
C. Element availability..



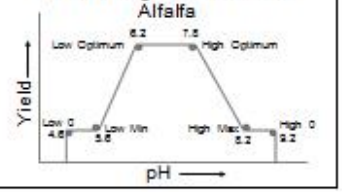
1 Soil Drainage influences:

A. Species selection.
B. Persistence of perennials.
C. Water requirements..



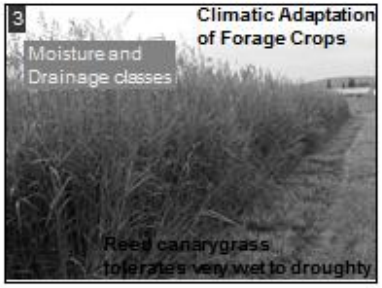
1 Recommended pH Ranges

Clovers 6.0 – 6.8
Perennial grasses 5.6 – 6.8
Alfalfa



3 Climatic Adaptation of Forage Crops

Moisture and Drainage classes



Reed canarygrass tolerates very wet to droughty

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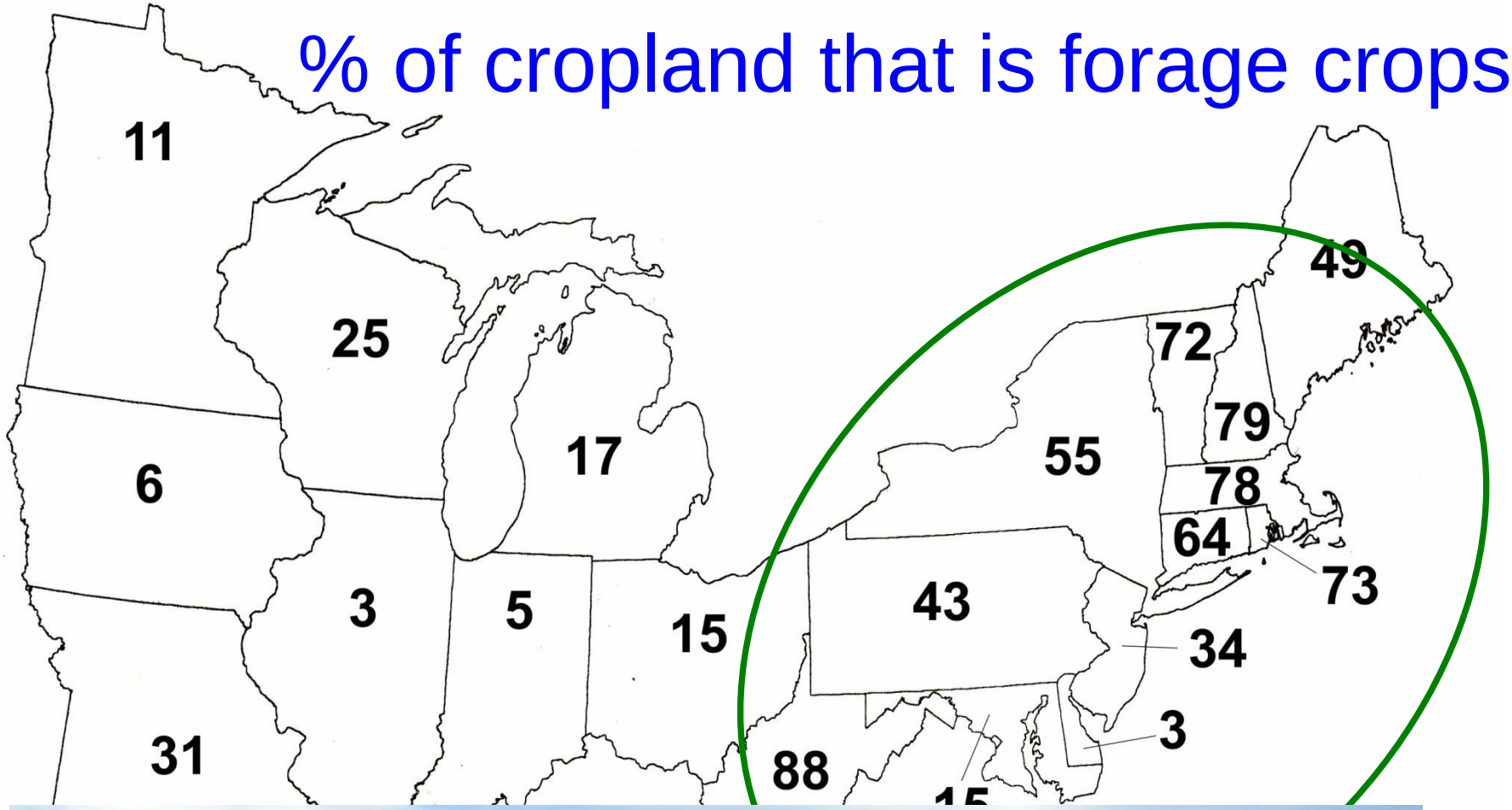
(37 Performance Objectives)

% of cropland that is forage crops



Primarily Dairy forage in Northeast

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High quality forage

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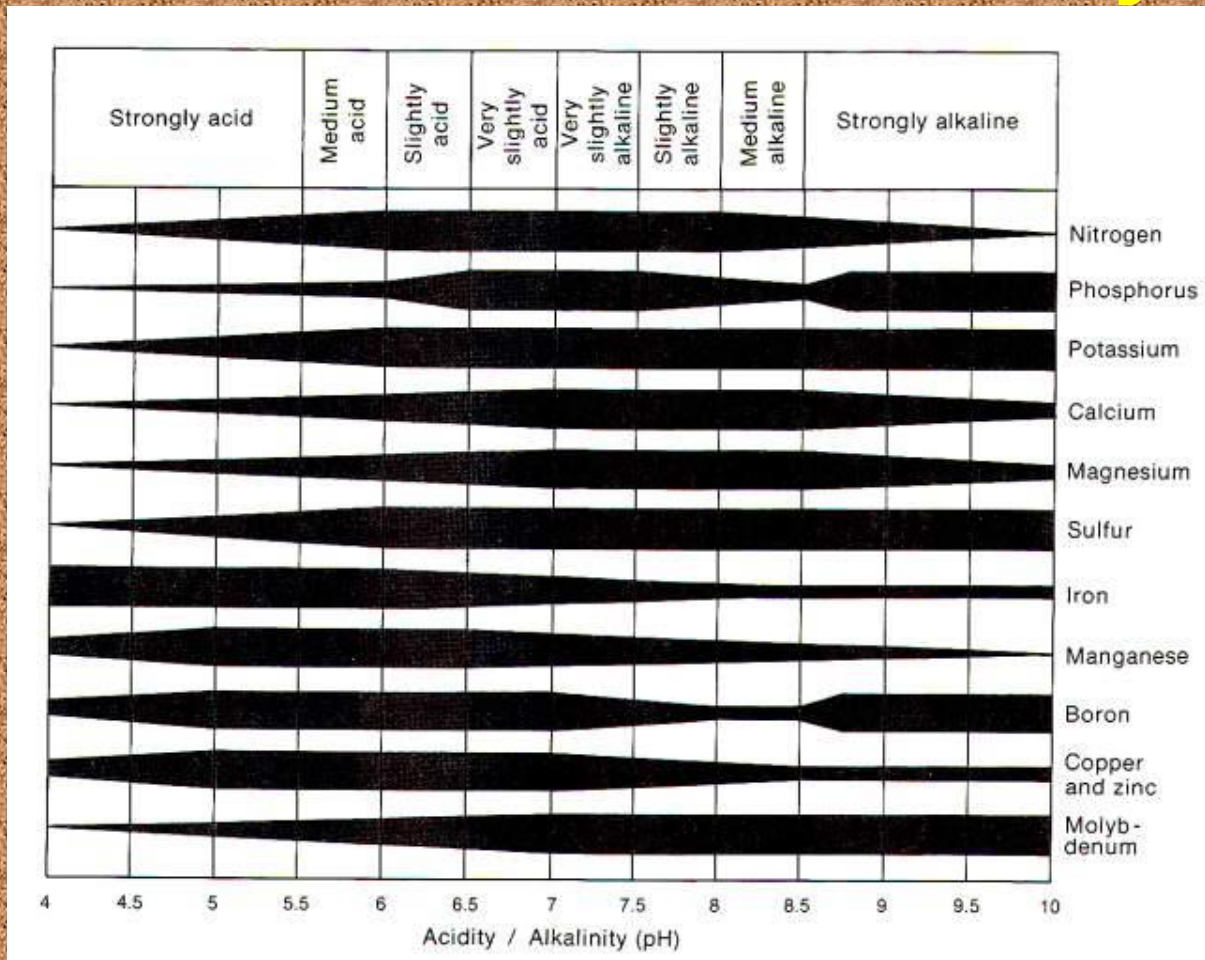

Recommended pH Ranges

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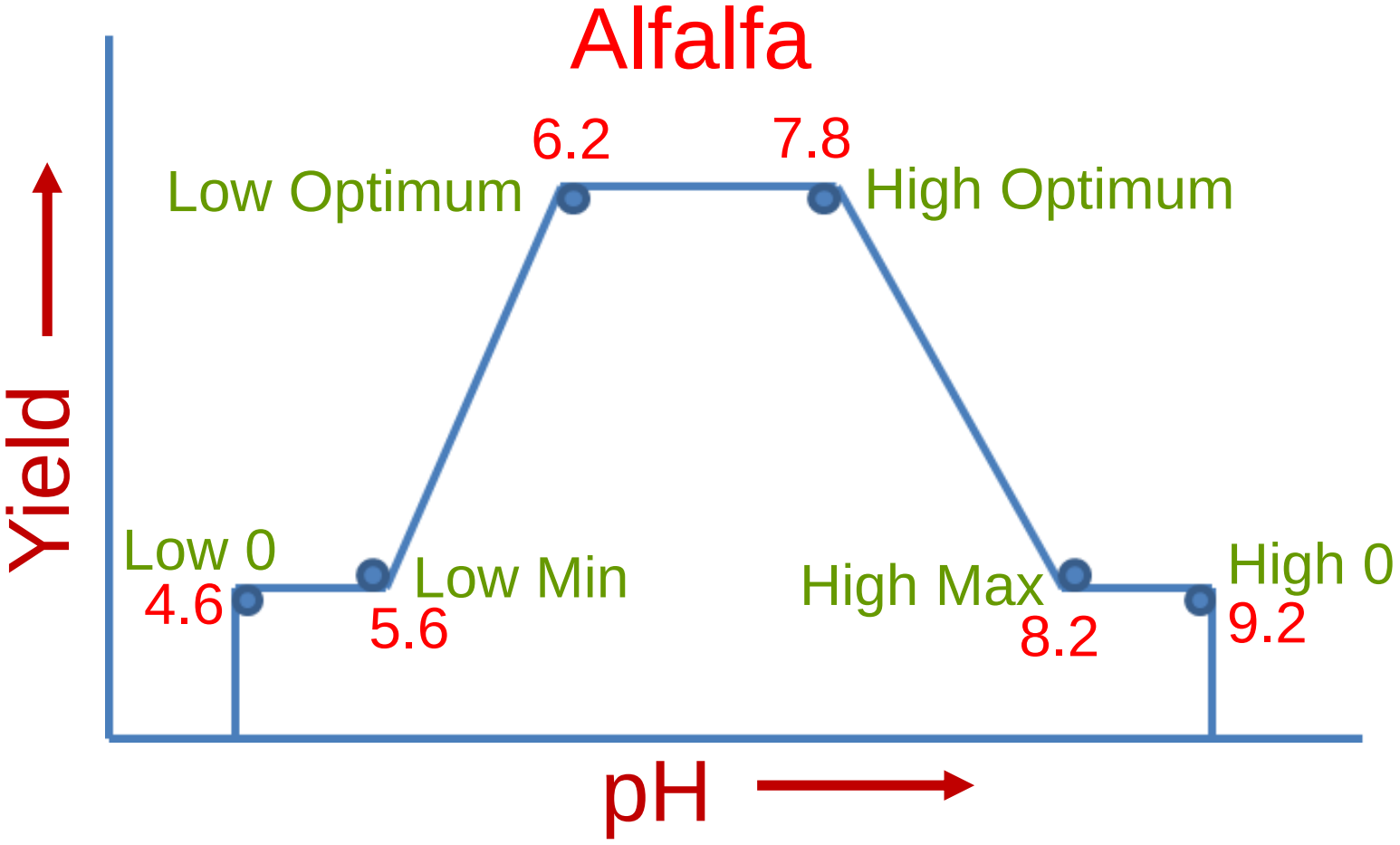

1
Tolerance to Wet Soils
Reed Canarygrass
Meadow Fescue
Tall Fescue
Smooth Bromegrass
Orchardgrass
Timothy

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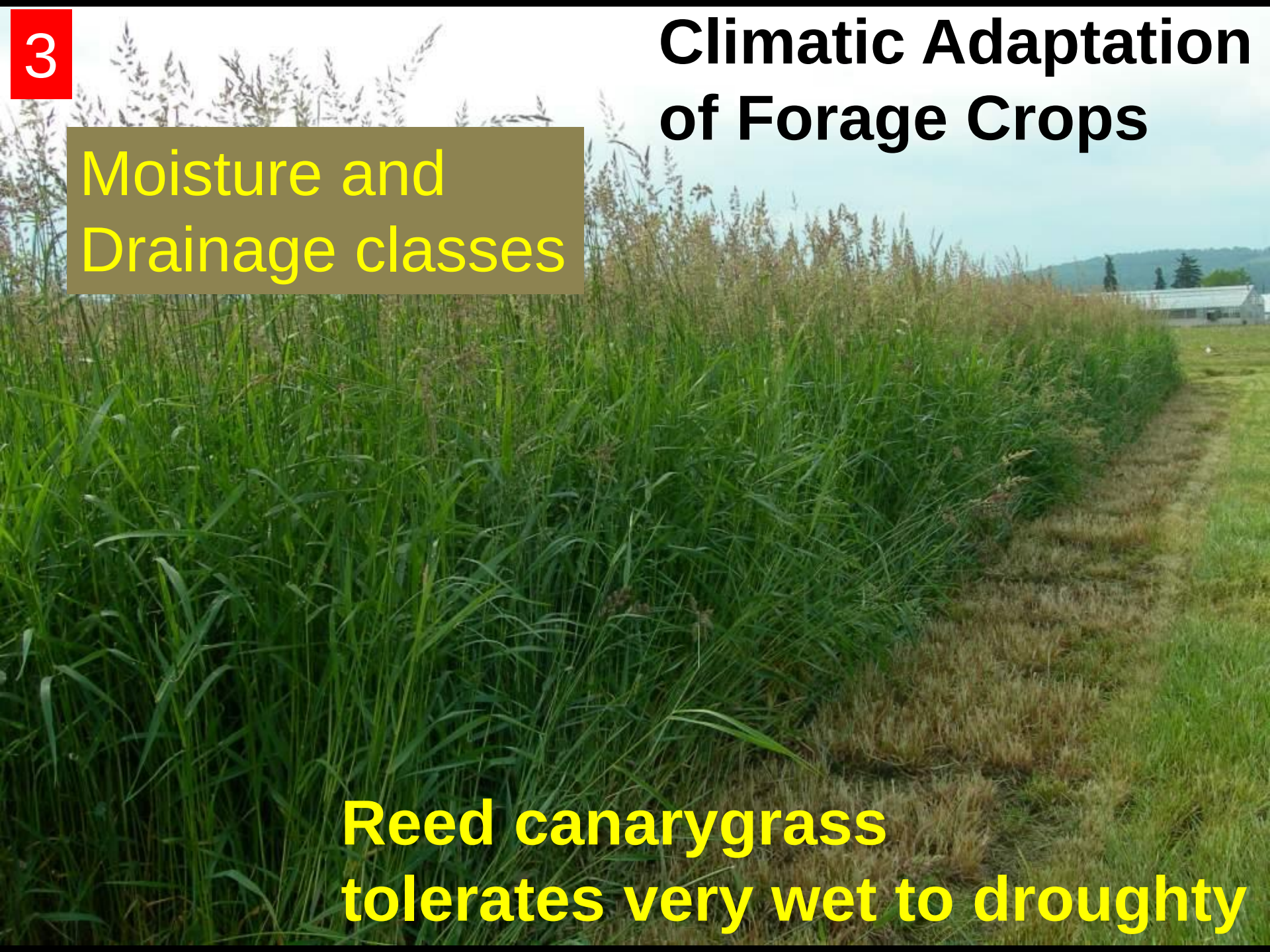
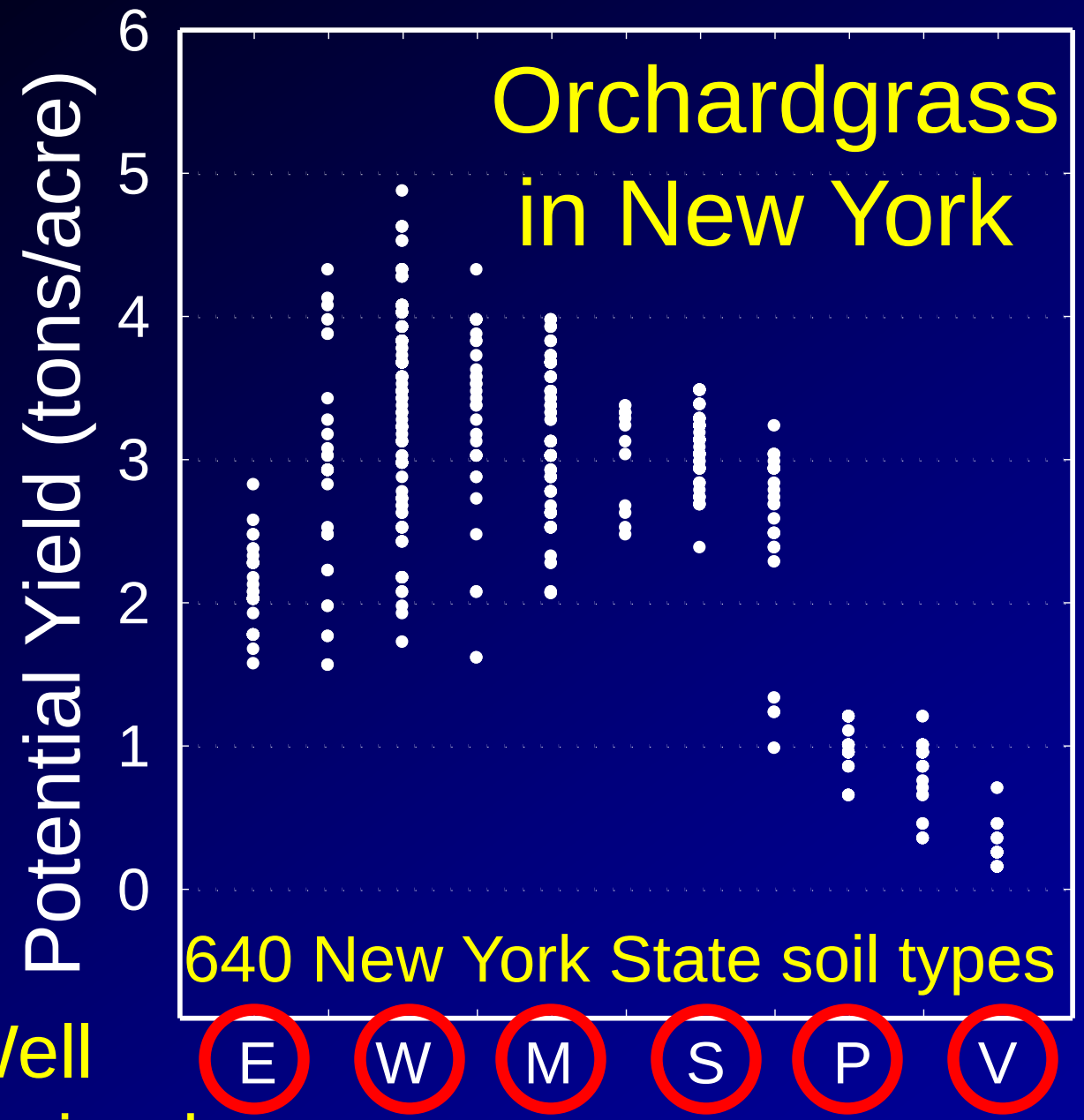
Climatic Adaptation of Forage Crops

Moisture and Drainage classes



Reed canarygrass tolerates very wet to droughty

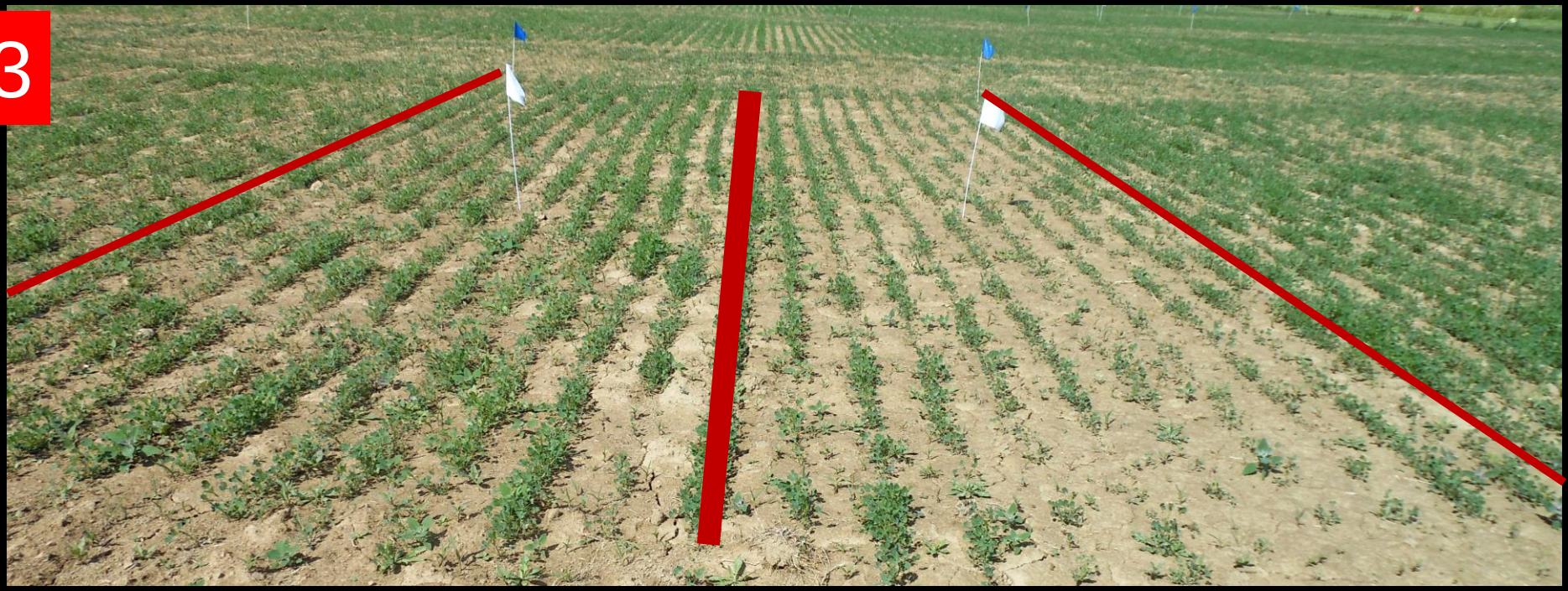
3



Well drained

Poorly drained

3



WL355RR *HarvXtra*

2016 seeding

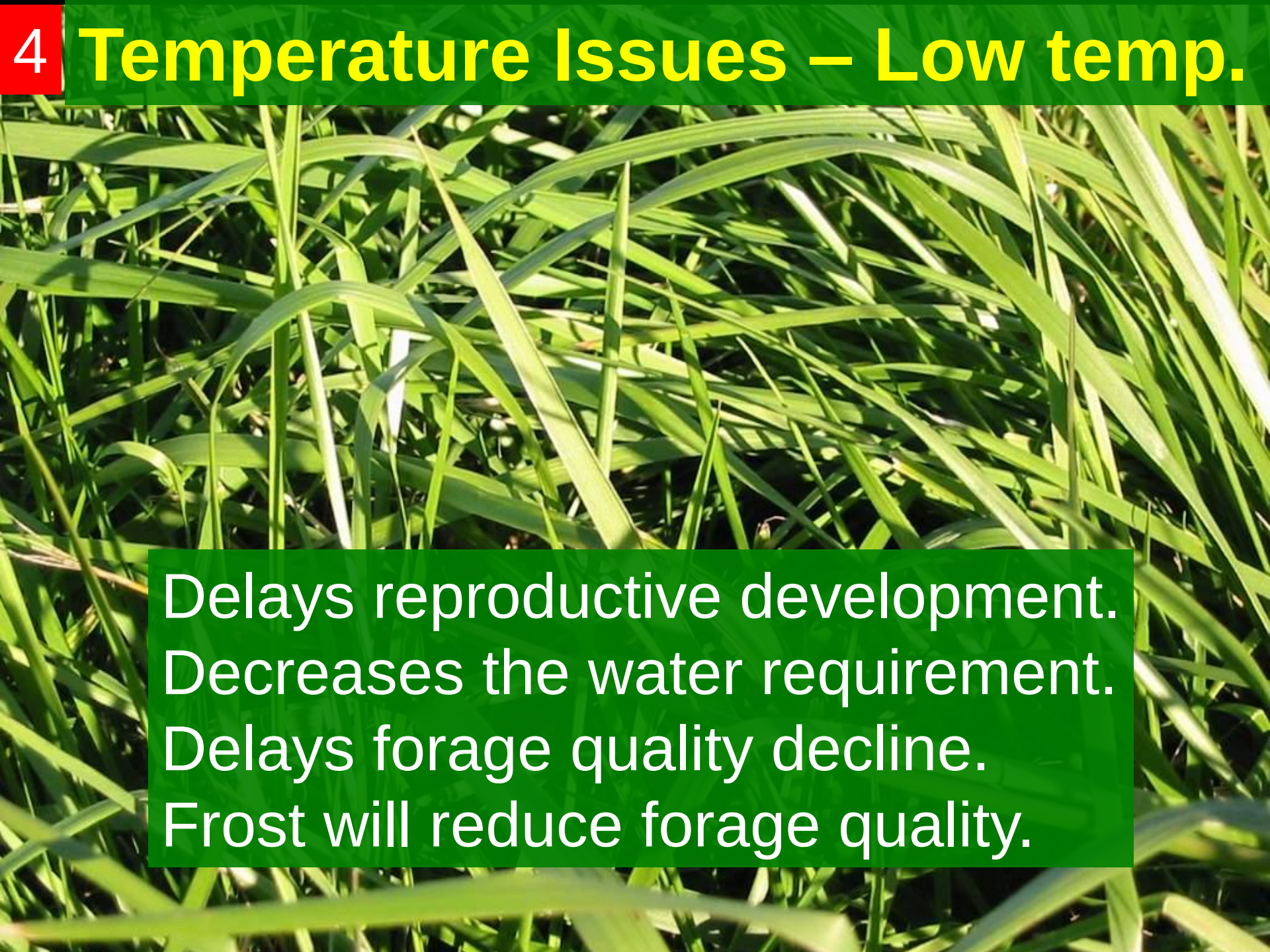
Interaction of cultivar and drought

3
HarvXtra Air Seeding, northern NY, Spring, 2016

3 Drought + high temp. => hastens flowering

4 but drought increases leaf:stem ratio.

4 Temperature Issues – Low temp.



Delays reproductive development.
Decreases the water requirement.
Delays forage quality decline.
Frost will reduce forage quality.

4 Persistence Issues - Alfalfa

Stand Age
Variety
Soil pH
Soil K
Soil drainage
Fall Soil moisture
Harvest frequency

Heaving

Stubble height after last harvest

Seeding Factors – Ideal Seedbed Conditions

Smooth
Firm
Free of clods
Some residue

Footprint in seedbed no more than 1” deep.

Seedbed Preparation

Fine, Firm and Smooth

Excess amount of large clods

Too fluffy

12

- Drainage tolerance
- Winter hardiness
- Disease resistance
- Yield and quality
- Recovery rate

How do we select Species & Varieties?

12 Species Selection Program on WWW

www.forages.org

Need to match species to the site.

In PA:
http://www.forages.psu.edu/selection_tool/index.html

12 **Species selection is based on primarily on soil drainage, but also is use-specific.**

Species Selection Program

Select soil type.

Select hay/silage or pasture use.

Select Animal type:
Dairy, Sheep, Beef, Horse

Site-specific, Use-specific forage species recommendation is provided.

Soil Type: Palms

Recommended for Lactating Dairy Pasture:

Species	Tons/acre	Pounds DM/acre/month					
		May	Jun	Jul	Aug	Sep	Oct
Reed canarygrass	2.1	915	1098	549	366	549	183

(Reference corn yield is Grain, 60 bu/a, Silage, 10.2 tons)

12 Soil Type: Palms (Optimum artificial drainage)

Recommended for Lactating Dairy Pasture:

Species	Tons/acre	Pounds DM/acre/month					
		May	Jun	Jul	Aug	Sep	Oct
Reed canarygrass	4.4	1936	2323	1162	774	1162	387
Orchardgrass	4.4	2323	2323	774	774	1162	387
Orchard/Ladino	2.8	1342	1541	845	497	497	249
Timothy/Ladino	2.6	1140	1369	684	456	684	228
Timothy/Brome/Ladino	2.9	1260	1512	756	504	756	252
Timothy/Reedcanary/ Ladino/Alsike	3.0	1490	1703	798	532	532	266

(Reference corn yield is Grain, 150 bu/a; Silage, 25.5 tons)

Factors that influence species selection: Grass Species

12

Ease of Establishment

Timothy

Orchardgrass

Tall Fescue

Meadow Fescue

Smooth Bromegrass

Reed Canarygrass

12

Regrowth Potential

Tall Fescue

Orchardgrass

Meadow Fescue

Reed Canarygrass

Smooth Bromegrass

Timothy

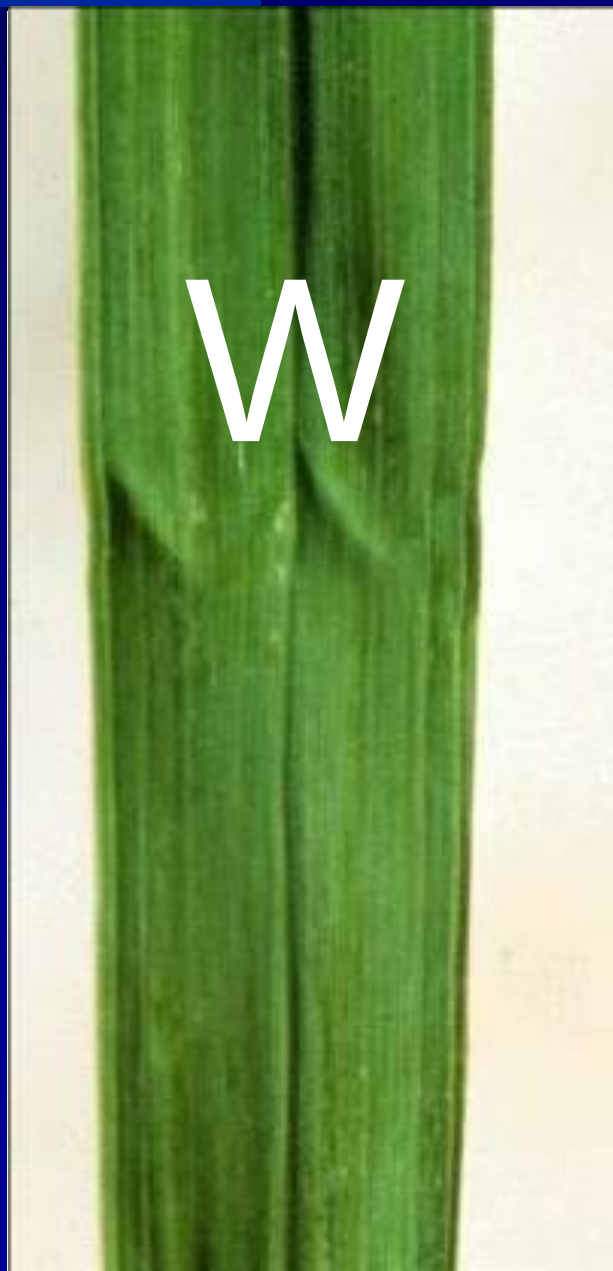
Timothy

All cool season grass species respond well to N fertilizer

- Shallow root system
- Low K content.
- Not drought tolerant.
- Persistent, easy to establish.
- Noncompetitve grass.
- Lower in protein than other grasses..

Smooth bromegrass

- Winter hardy.
- Early spring grazing.
- Tolerates hot, dry conditions.
- Damaged by harvest during stem elongation..



Reed Canarygrass

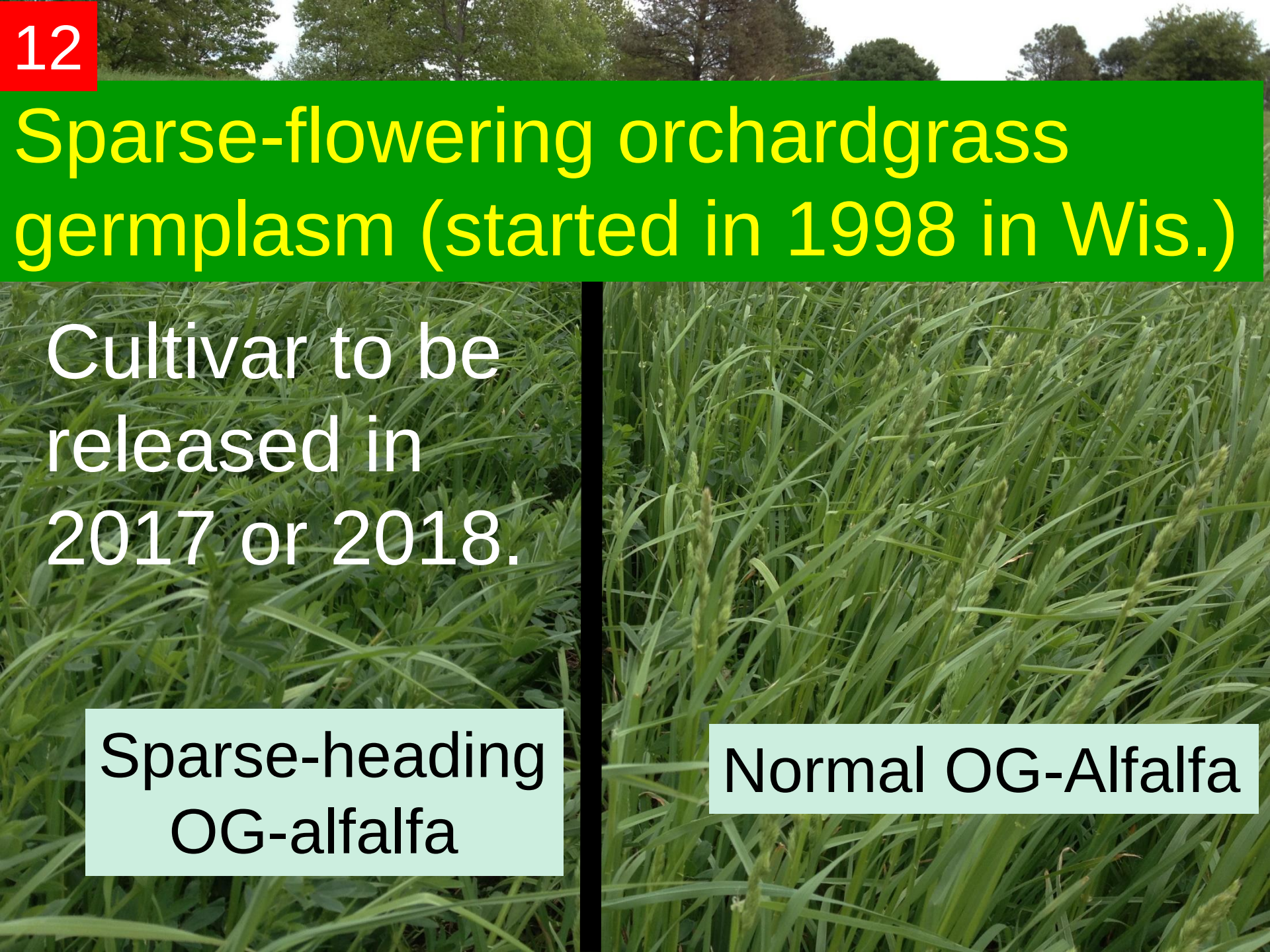
- Weak seedling.
- Adapted to wet & dry areas.
- Tolerates low pH and fertility.
- Need low-alkaloid variety..

Orchardgrass

- Withstands close grazing, but....
- Very competitive with legumes.
- Matures earlier than other grasses.
- High K content if soil K is available..

Sparse-flowering orchardgrass germplasm (started in 1998 in Wis.)

Cultivar to be released in 2017 or 2018.



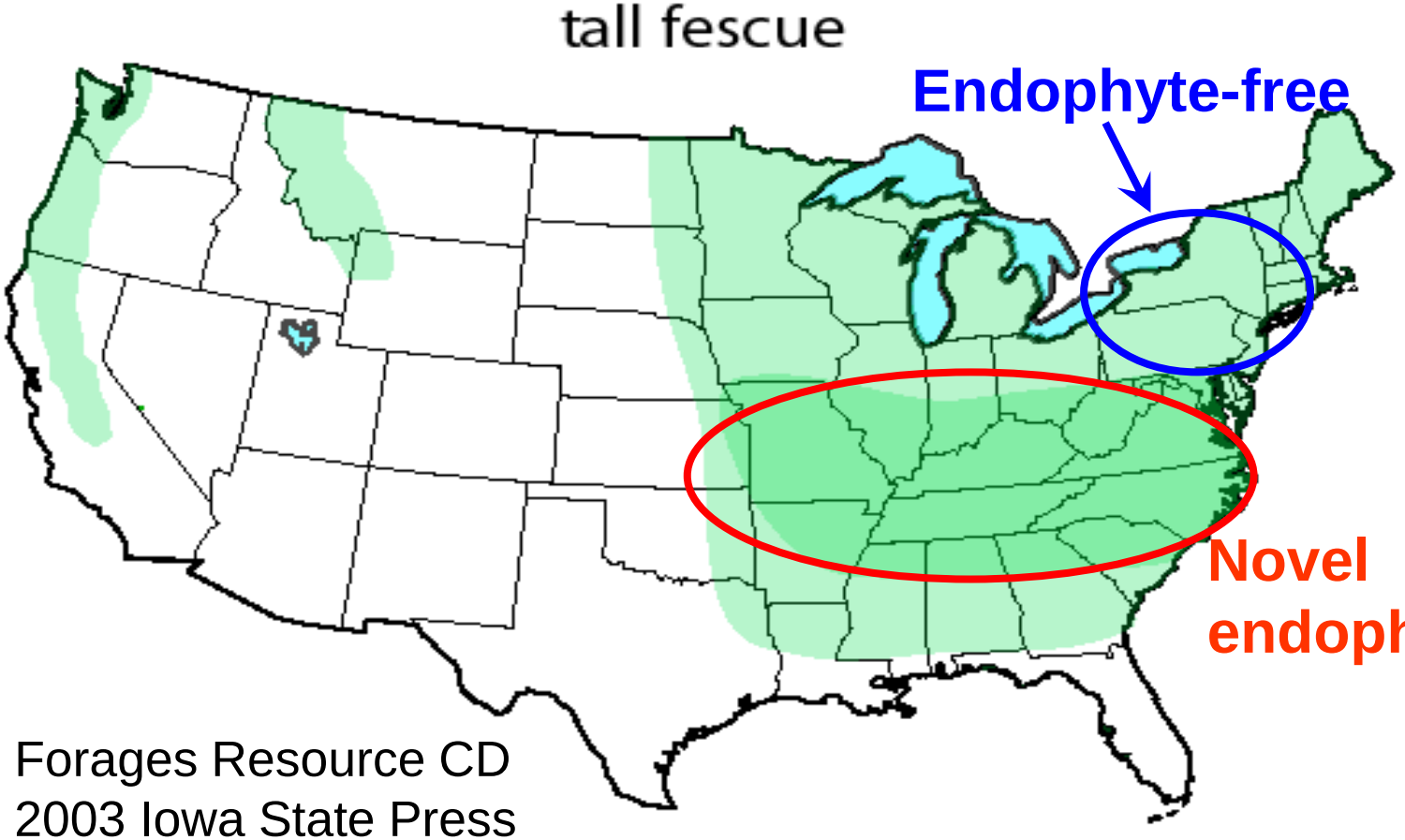
Sparse-heading OG-alfalfa

Normal OG-Alfalfa

Tall Fescue

- Withstand heavy traffic.
- Need low-endophtye variety.
- Establishes easy.
- Regrowth good..

Novel Endophyte was developed to fight stress: drought in the mid-South USA, and insect predation in NZ/Australia.

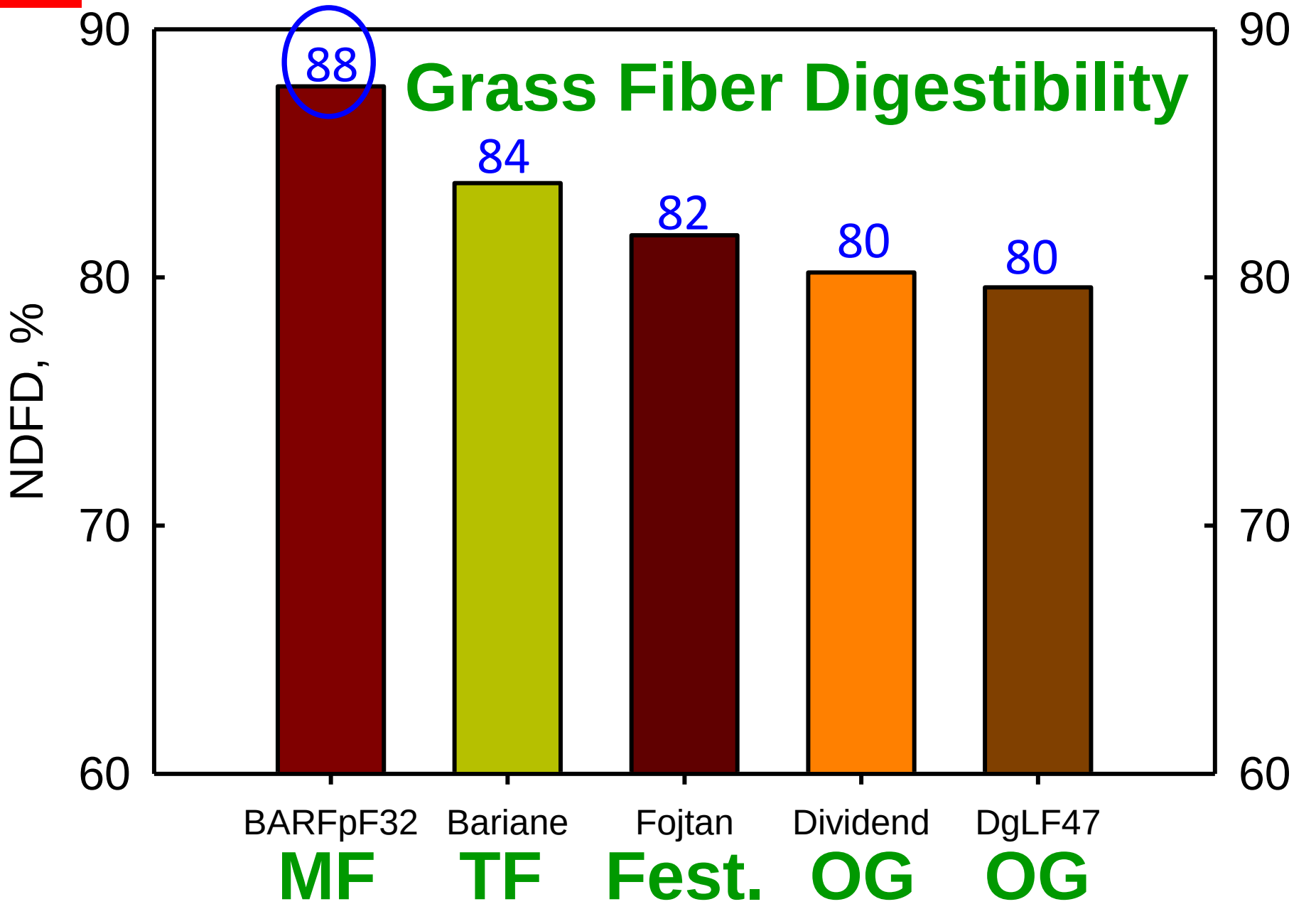


Forages Resource CD
2003 Iowa State Press

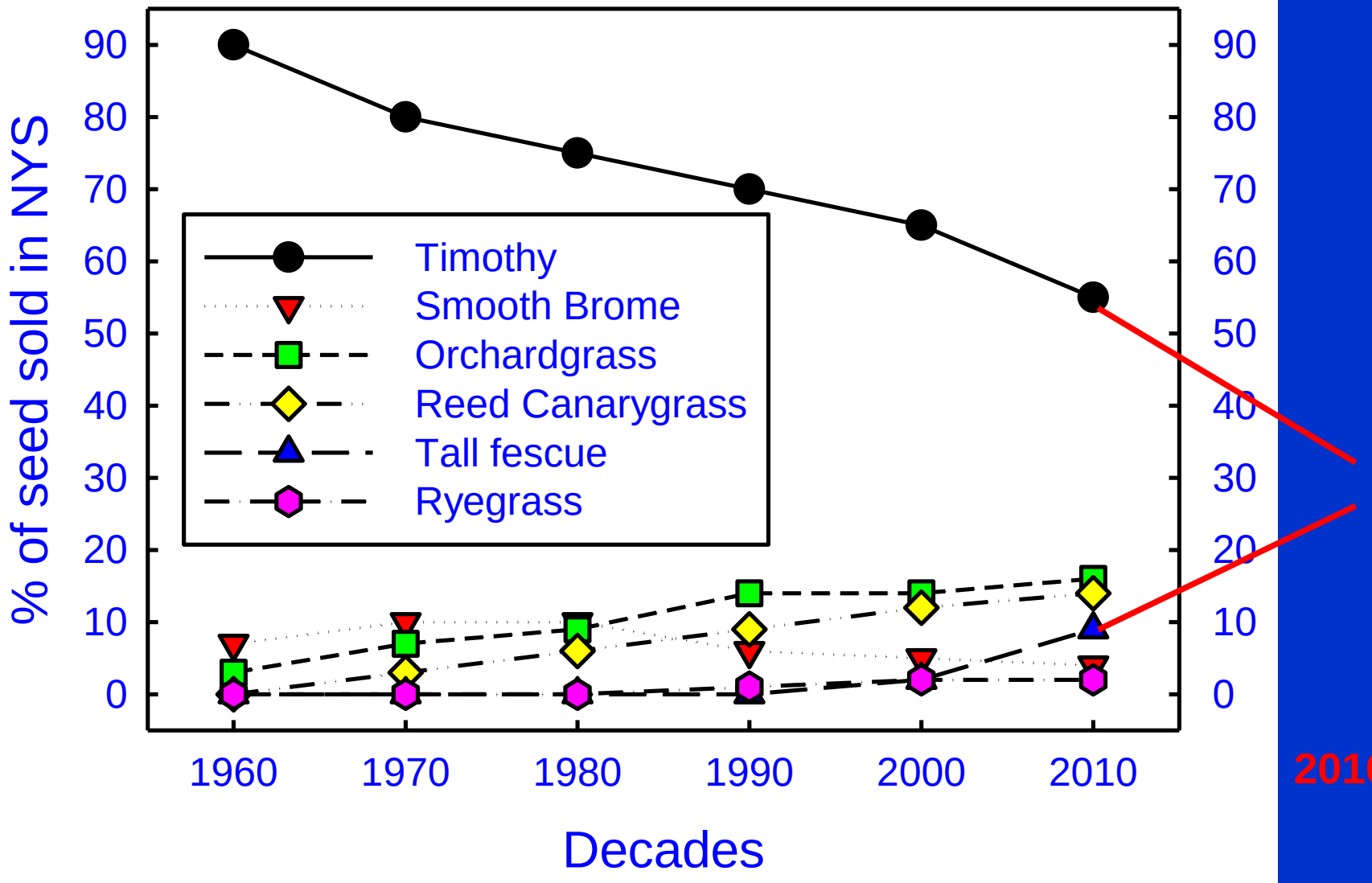
Meadow Fescue

- Establishes easy.
- Not susceptible to TF endophyte.
- Tolerant to acid/poorly-drained soils.
- Tolerant to close grazing.
- Lower yielding than tall fescue.
- Higher forage quality than others.
- Very winter hardy..

Lewis County, 2016



Grass seed sold in NY (estimate)



13 Time of Seeding (Region-specific)

Spring Seeding

As late as mid-May for grasses and early June for alfalfa.

Too early:
Cold, wet soils

Too late:
Multiple stresses
Temperature
Moisture
Weeds

13 Time of Seeding

Late Summer

As late as late August for grasses and mid August for alfalfa.

Too early:
Hot and dry

Too late:
Insufficient time to establish.

13 Time of Seeding

Frost seeding

Seeding prior to the onset of spring soil freeze-thaw cycles.

Cheap & Easy

Red clover

Higher risk of failure.

Reed canary, BFT: Don’t do it.

Factors Affecting Seeding Rate

- Seed size
- Pure Live Seed (PLS)
- Soil type
- Seedbed condition
- Seeding method

PLS = germination x purity

0.95 x 0.97 = 92% PLS

Recommended Seeding Rates

Species	lbs/a
Alfalfa	12-15
Perennial grass	10-14
Mixtures	
Alfalfa	10-12
+Perennial grass	3-6

18

Pure Alfalfa

Well drained soil.

Ability to use weed control (RR-alfalfa).

Yield & persistence on good land..

Pure Grass

Not optimum land for alfalfa.
Better manure management options.
Expand the spring harvest window.
Good yield if fertilized..

Alfalfa-grass mixtures

Reduce potential for alfalfa heaving.

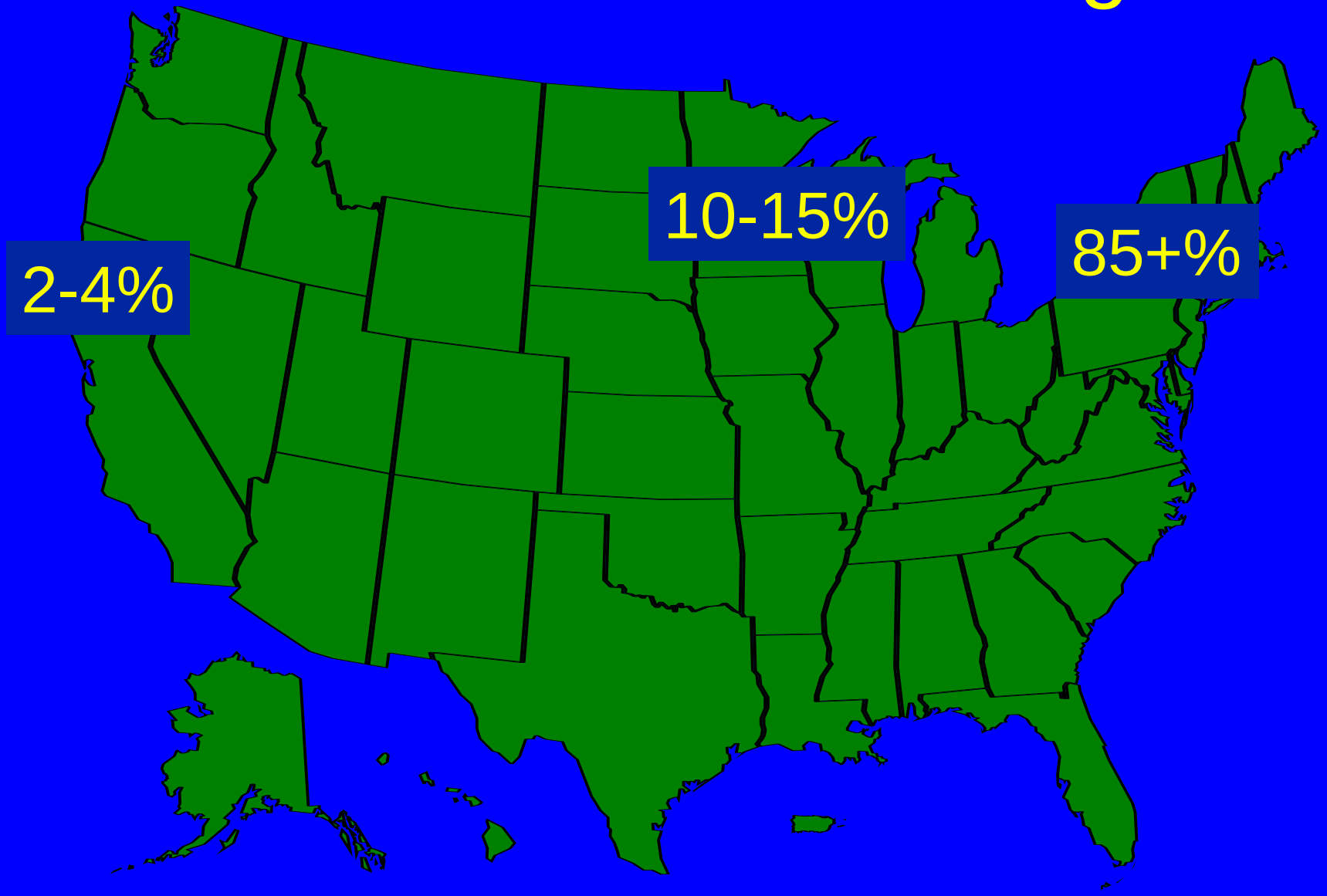
Eliminate need for commercial N.

Grass will fill void left by alfalfa decline.

Alfalfa-grass is higher yielding.

Alfalfa-grass can produce as much milk as pure alfalfa..

Alfalfa acres sown with grass

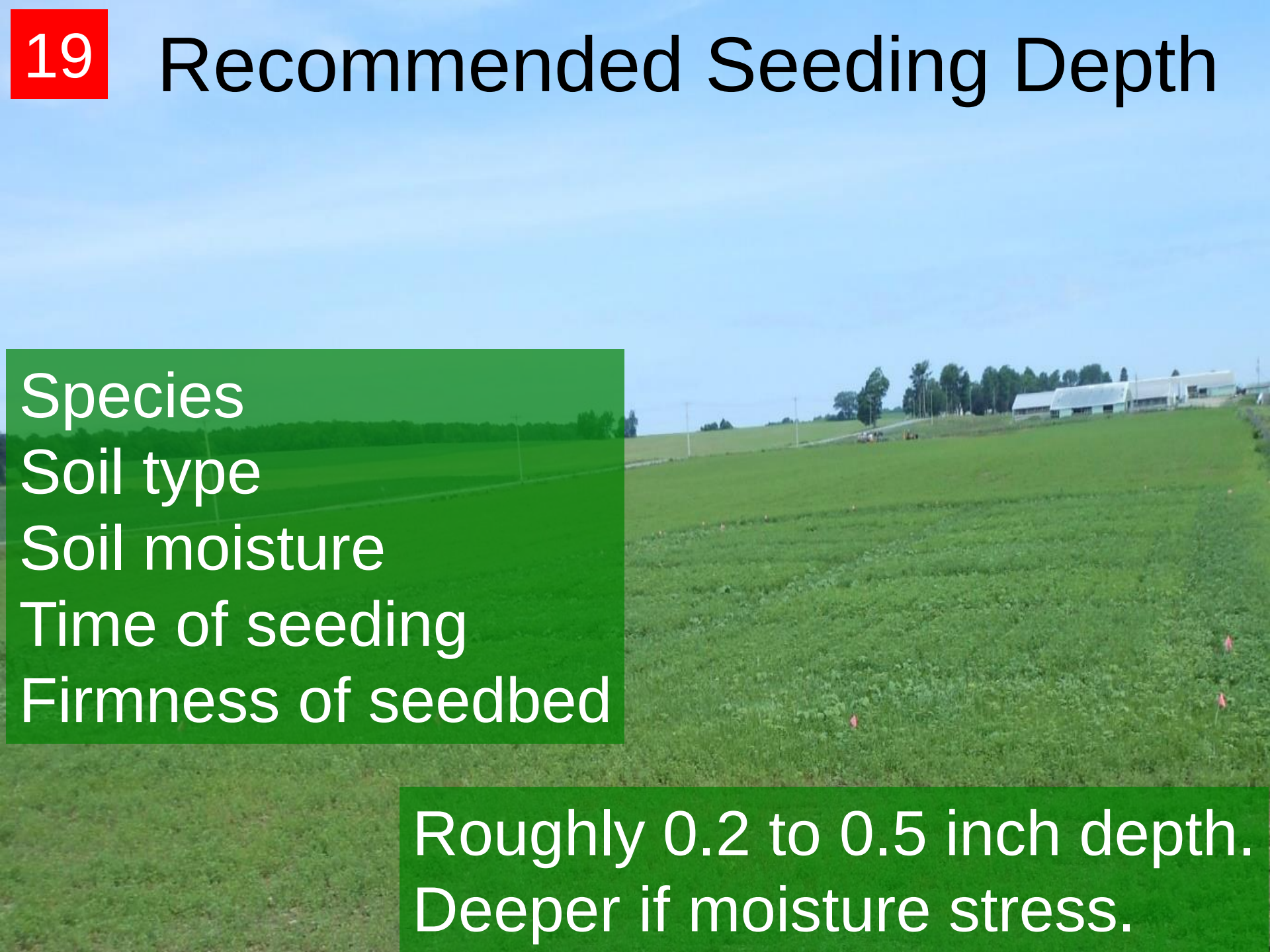


Mixed Alfalfa-Grass Stands

1. Ideal forage for lactating dairy cattle.
2. A Northeast USA phenomenon.
3. Manage like alfalfa if >50% alfalfa.
4. Manage like grass if <50% alfalfa.
5. Optimum spring harvest is after pure grass and before pure alfalfa.

19

Recommended Seeding Depth



Species
Soil type
Soil moisture
Time of seeding
Firmness of seedbed

Roughly 0.2 to 0.5 inch depth.
Deeper if moisture stress.

Environmental Stress - Risk of Alfalfa Winter Injury

Stand age.
Winterhardiness & Disease resistance.
Soil pH and K level.
Soil drainage.
Soil moisture during fall/winter.
Harvest frequency.
Fall stubble left.

Mean Stage by Weight (MSW)

Crop Staging – Alfalfa Staging System

Mean state by count

- Vegetative (0-2)
- Bud (3-4)
- Flowering (5-6)
- Seed (7-9)

10 stems (Stage 3)

25 stems (Stage 4)

6 stems (Stage 5)

$$MSC = \frac{(10*3)+(25*4)+(6*5)}{(10+25+6)} = 160/41 = \mathbf{3.9}$$

25

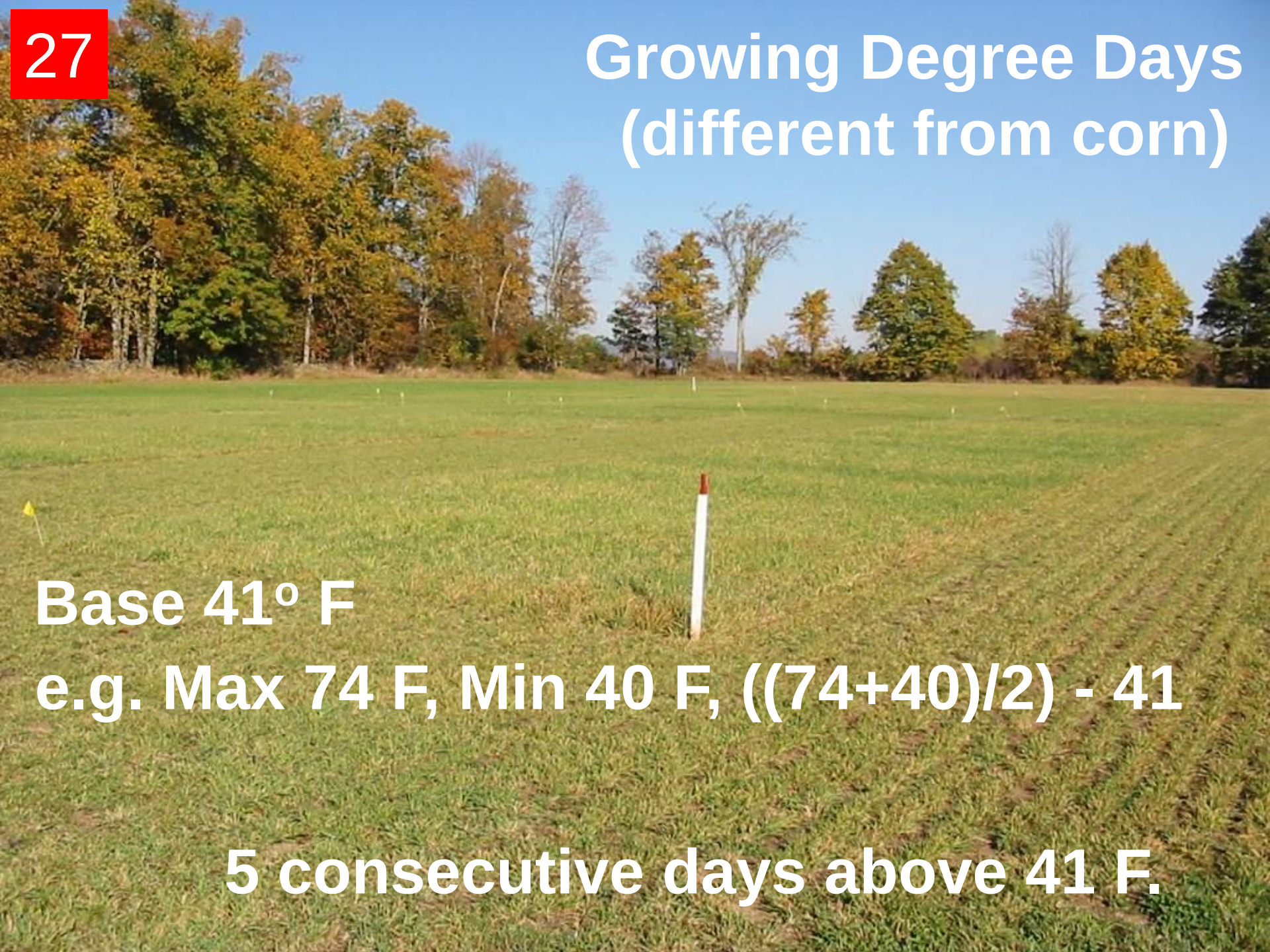
Perennial Grass Staging System

Continuous index

Germination (0-0.9)
Vegetative (1.0-1.9)
Elongation (2.0-2.9)
Reproductive (3.0-3.9)
Seed Ripening (4.0-4.9)

Stage designation (e.g. G0) and an index No.
MSC calculated like alfalfa MSC.

Growing Degree Days (different from corn)



Base 41º F

e.g. Max 74 F, Min 40 F, ((74+40)/2) - 41

5 consecutive days above 41 F.

Harvest and Forage Quality

Warm-season grasses:
Very poor forage quality

Remainder will deal with cool-season species.

K content (lowest to highest)

Timothy

Smooth Bromegrass

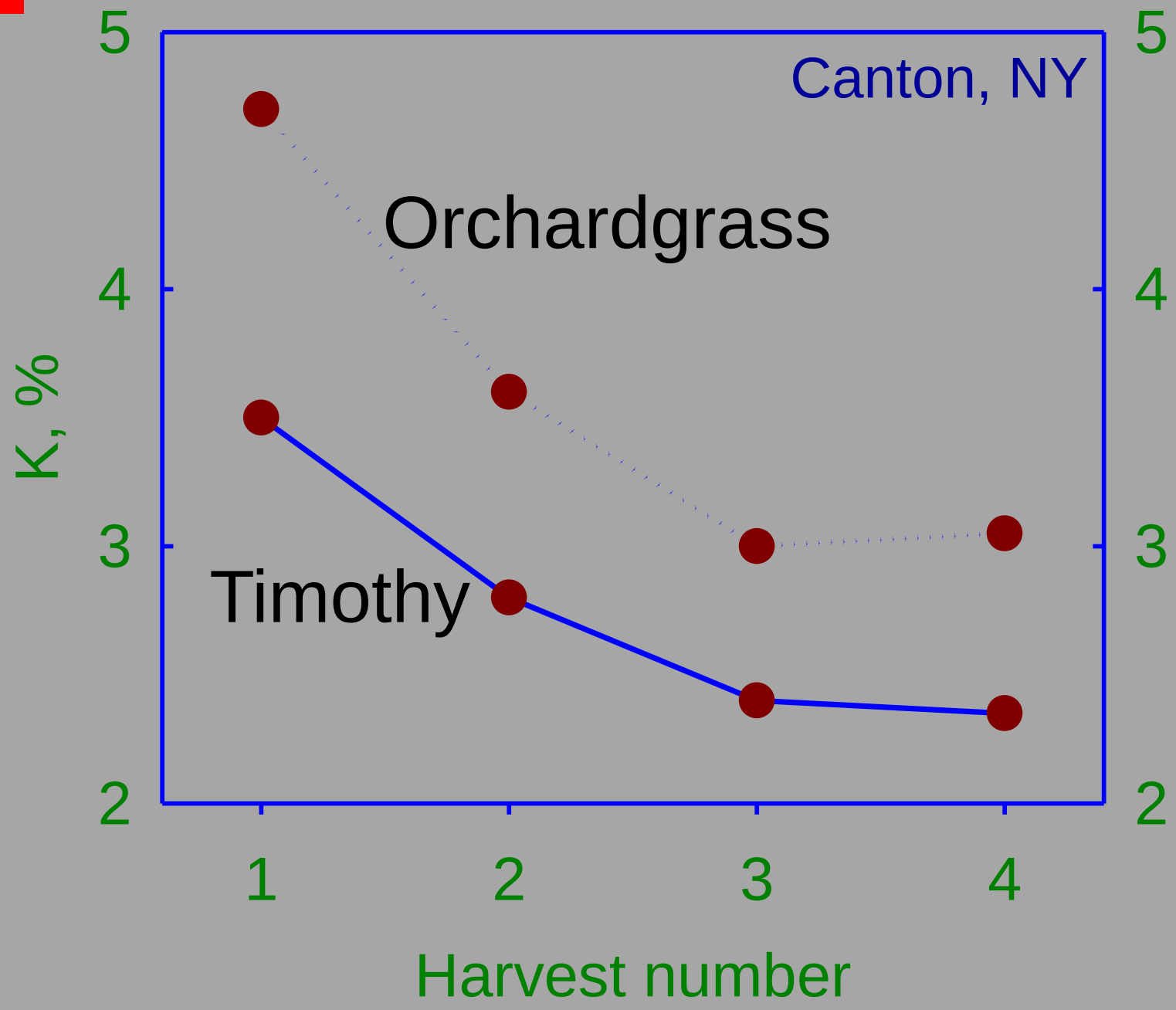
Reed Canarygrass

Meadow Fescue

Tall Fescue

Orchardgrass

Luxury consumption.
Assuming normal exchangeable soil K.


Canton, NY
Orchardgrass
Timothy
K, %
5
4
3
2
1
2
3
4
Harvest number

CP content (lowest to highest)

Timothy

Tall Fescue

Meadow Fescue

Smooth Bromegrass

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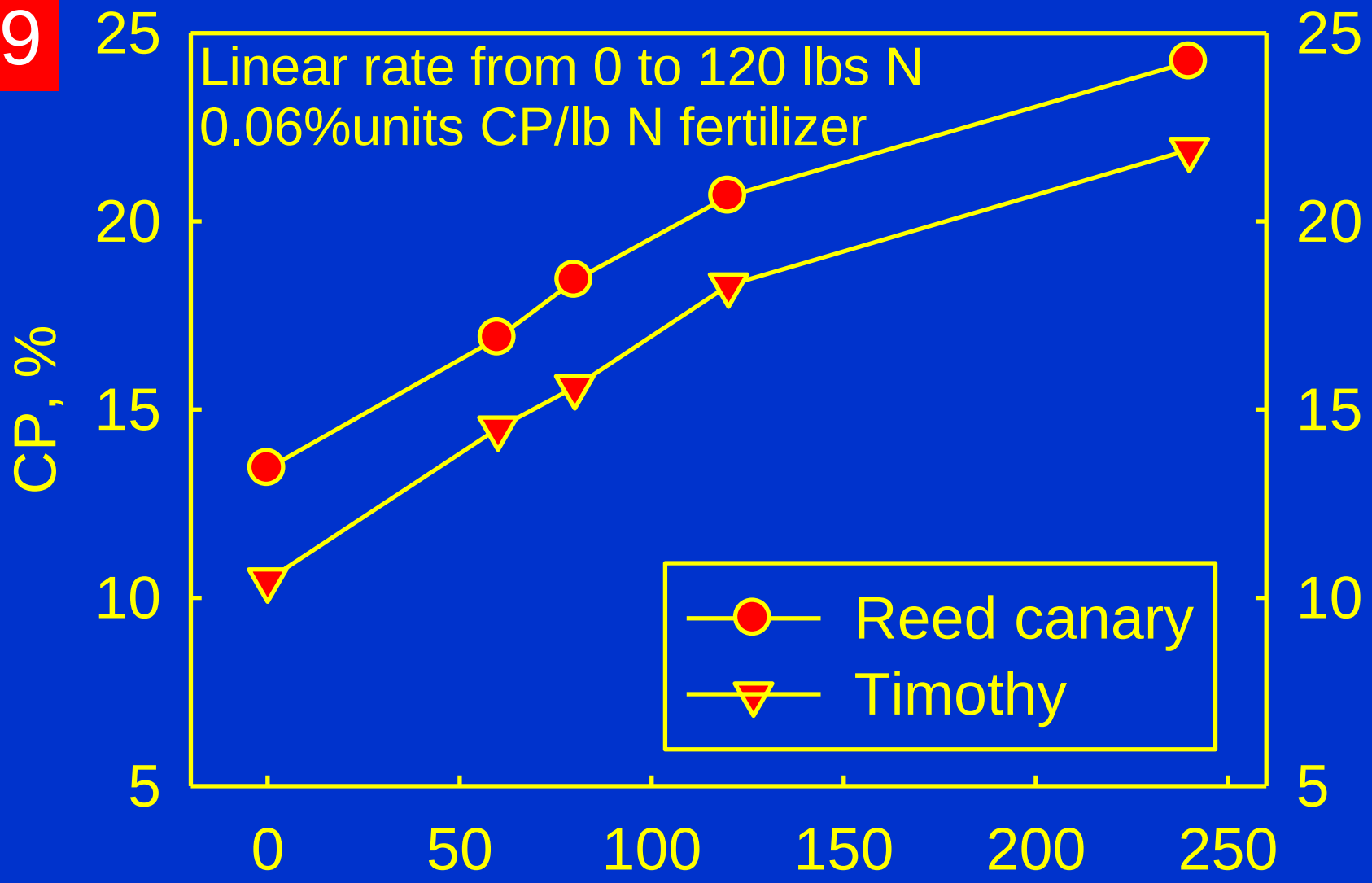
Orchardgrass



Spring N application, lbs actual N/acre

Reed canary is 2.5% units higher in CP.

(Average of 3 sites, 3 years, 4 reps)

Forage

Meets effective fiber needs of a dairy cow (when fed as the primary forage source in the diet).

NDF = Neutral Detergent Fiber

Optimum Quality

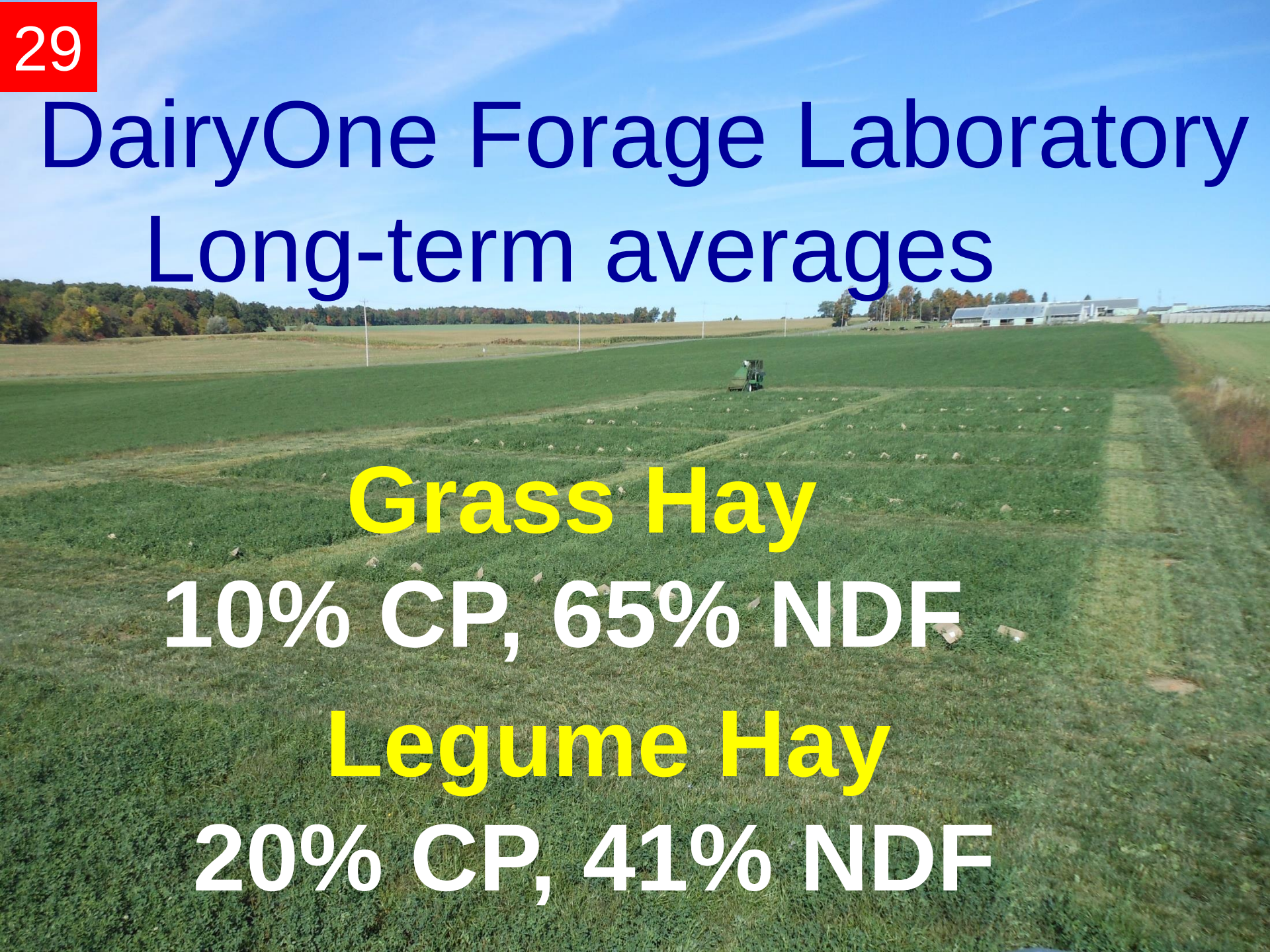
Alfalfa NDF = 38-42% (hay)
43-47% (silage)

Grass NDF = 50-55%

Alfalfa CP = 18-19%

Grass CP = 17-18%

DairyOne Forage Laboratory Long-term averages



Grass Hay

10% CP, 65% NDF

Legume Hay

20% CP, 41% NDF

29 Sampling is the largest source of variation in the analytical process.

29
Mixed Grass-Legume Stands
Spring harvest based on NDF
www.forages.org

Carbohydrate Storage

Understand how frequency of harvest is related to forage yield, quality, food reserves, and stand longevity

Grasses – Generally no root storage.
Storage in lower stems.
Short stubble can affect persistence.

Alfalfa – Root storage of carbohydrates.
Stubble height does not affect persistence.
Exceptions: heaving and snow cover.

THE END