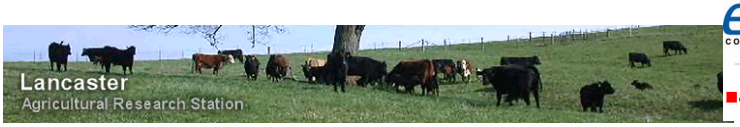
Seven Habits for Highly Productive Pastures

Rhonda R. Gildersleeve
Associate Professor & Extension Grazing Specialist
Ag & Natural Resources Program Area
Office: UW Lancaster Ag Research Station
7396 State Hwy 35 & 81
Lancaster, WI 53813
rhonda.gildersleeve@ces.uwex.edu **(608) 723-6243**
http://fyi.uwex.edu/grazres



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Seven Habits:

- Match pasture management goals with herd needs
- Optimize soil fertility
- Go for legumes
- Add diversity to pasture/forage systems
- Manage your grazing system
- Fill seasonal forage gaps
- $how me the money!

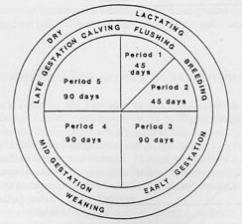
Habit 1: Pasture Budgeting Goals

- What production do you need from your pastures?
- When do you expect to get it (seasonal aspects)?
- How do you plan to deal with forage deficits?
- How do you plan to deal with surplus forage production?

- **UW Extension Pasture Budgeting Spreadsheet:**

http://www.uwex.edu/ces/forage/pubs/PASTURE_NEEDS.XLS

Run the numbers to prevent overstocking and assist with budgeting your forage resources

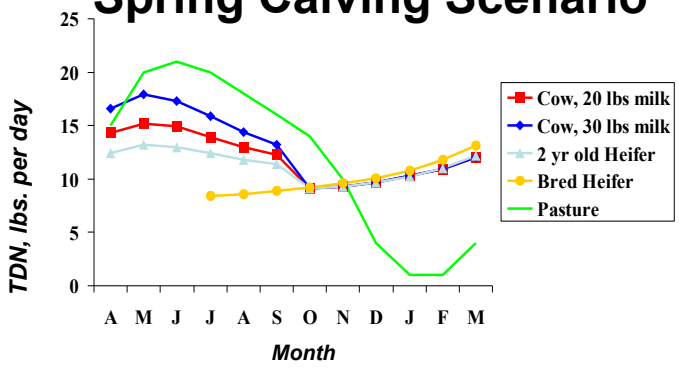


Habit 1: Match Pasture Management Goals with Herd Nutrient Demands

Beef Cow Production Cycle (365 days) *Dunbar & George, 1986.*

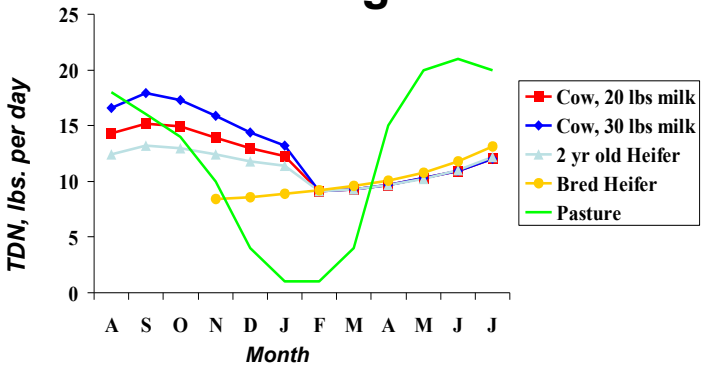
Stage/days	Demand Level	Nutrient Demands for:	Goals
1 & 2 (0 – 90 days)	Very High	Calving; early lactation; estrus/ breeding; growth (heifers)	BCS 5-6 at calving; cycles and breeds within 90 days
3 (90 – 180 days)	Moderate	Lactation; 1st trimester fetus; growth (heifers)	Maintain milk supply for calf; begin to replace body condition lost in Stage 1
4 (180 – 270 days)	Low	Late lactation; weaning; 2nd trimester fetus; growth (heifers)	Improve BCS to 5-6; utilize least cost feeds/forages
5 (270 – 365 days)	Moderately High	Dry, but preparing for next lactation; 3rd trimester fetus undergoes rapid growth; growth (heifers)	At least BCS 5-6 at calving; calve as close to 365 days as possible

Beef Cow TDN Requirements: Spring Calving Scenario



Opportunities: most closely matches pasture forage resource production, so least cost alternative for feeding lactating cows, use lower quality forages/crop residues for part of winter feeding period
Challenges: market disadvantage (?) if selling feeder calves, cull cows in fall months

Beef Cow TDN Requirements: Fall Calving Scenario



Opportunities: Harvest excess pasture as quality forage, graze feeders; realize market premiums for feeders, cull cows; cows/calves utilize stockpiled forages, crop residues, fall annuals
Challenges: Early winter feeding period requires quality forage supplies, supplementation, feeding/facilities investments(?)

Habit 2: Optimize Soil Fertility

- **Soil test pastures every 3 to 4 years**
- **Know your legume percentages:**
  - < 30%, fertilize as a grass pasture
  - > 30%, fertilize as a legume pasture
- **pH:** 6.0 + for grasses; 6.3 – 6.5 for legumes
- **Potassium and Phosphorus:** maintain at optimum as recommended by soil tests, example (Wisconsin):
  - **Phosphorus: 15+ ppm as measured by Bray P_1**
  - **Potassium: 120+ ppm**
- **Trace minerals** as needed: sulfur, boron are especially important for legume growth

Optimize Soil Fertility…

Nitrogen:

- If > 30% legumes, no additional N is recommended
- Grasses are most responsive to first 40 – 60 lbs per acre
- Use split applications to stage production, example of recommended rates (Iowa State):

Dominant Grasses:	Responsive Seasonal N, *lbs/acre*	Split Rate Scenarios, *lbs per acre*		
		Early Spring (March - April)	Late Spring (May - June) Optional	Late Summer (Aug - Sept) Optional
Kentucky bluegrass	150	60 – 80	30 – 40	30 – 40
Orchardgrass, tall fescue, bromegrass, etc.	240	80 - 120	40 – 60	40 – 60

Habit 3: Go for Legumes

Legumes have important roles in pasture systems:

- Source of high quality feed
- Nitrogen fixation capacity
- Help "smooth out" seasonal pasture production curves
- Species diversity

Kura clover

And…legumes can be a challenge to establish and maintain in pasture systems!

Rhizobium nodule on soybean (photo by Jennifer Dean)

Legume Nitrogen Contributions

- Nitrogen available to grasses = 1/3 – 1/2 of N fixed **(50 – 80 lbs/year)**
- Legumes fix more N in **mixtures** with grasses
- **Use the right rhizobial strain for the legume species!!**

Nitrogen fixation ranges of legumes grown in Upper Midwest and the rhizobial strain needed for effective nodulation.

Legume	N fixed, lbs/A /yr	Rhizobial Strain
Alfalfa Sweet clover	80 – 190 80 – 120	Alfalfa group: *Rhizobium meliloti*
Alsike, red, white clovers	65 - 150	Clover group: *Rhizobium trifolii*
Birdsfoot trefoil	44 - 150	Species' specific: *Rhizobium loti*
Crown vetch	50 - 100	Species' specific: *Rhizobium varia*
Kura clover	65 - 150	Species' specific: *Rhizobium ambiguum*
Lupine	50 - 150	Species' specific: *Rhizobium lupini*
Field & Austrian Winter Peas Hairy & Common Vetches	50 - 150	Pea & Vetch group: *Rhizobium leguminosarum*

Legumes Contribute Production and Quality

Holstein stockers
1998-2000, Lancaster

Treatment	ADG, lbs/day	Gain/acre, lbs
Kura clover + grass	2.66	909
Red clover + grass	2.18**	713**
**P < 0.01		

Crossbred beef stockers
2010-2011, Arlington

Treatment	ADG, lbs/day	Gain/acre, lbs
Tall Fescue + N	1.55	648[b]
Tall Fescue + Clover	2.02	740[a]
Meadow Fescue + N	1.86	628[b]
Meadow Fescue + Clover	2.24	779[a]
SEM	0.04	26

Choosing Legumes

Considerations:

- Yield
- Compatibility with dominant grass species
- Grazing tolerance
- Persistence
- Production system needs (grazing, forage, both?)

Habit 4: Increase Pasture Diversity

- **Diversity**: having several species of forage plants well represented in a pasture
- **Two strategies:**
  - Diversity within pastures
  - Farm diversity: mixtures may differ between pastures
- **Desired outcomes:**
  - More consistency in seasonal production, pasture quality
  - Increase management flexibility of grazing system
  - Dense swards
  - Fewer weeds

Habit 4: Increase Pasture Diversity

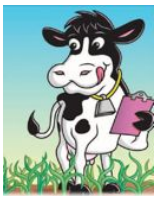
- **Goal:** at least two **functional groups** represented by 3 – 4 compatible species:
  - Cool season grasses
  - Warm season grasses
  - Legumes
  - Palatable forbs (examples: chicory, dandelions, etc.)
  - Annuals
- **Compatibility criteria to consider:**
  - Adapted to site conditions (fertility, drainage, etc.)
  - Growth habits
  - Grazing tolerance
  - Winter hardiness
  - Palatability
  - Seedling vigor/ease of establishment
  - Mechanical harvest suitability

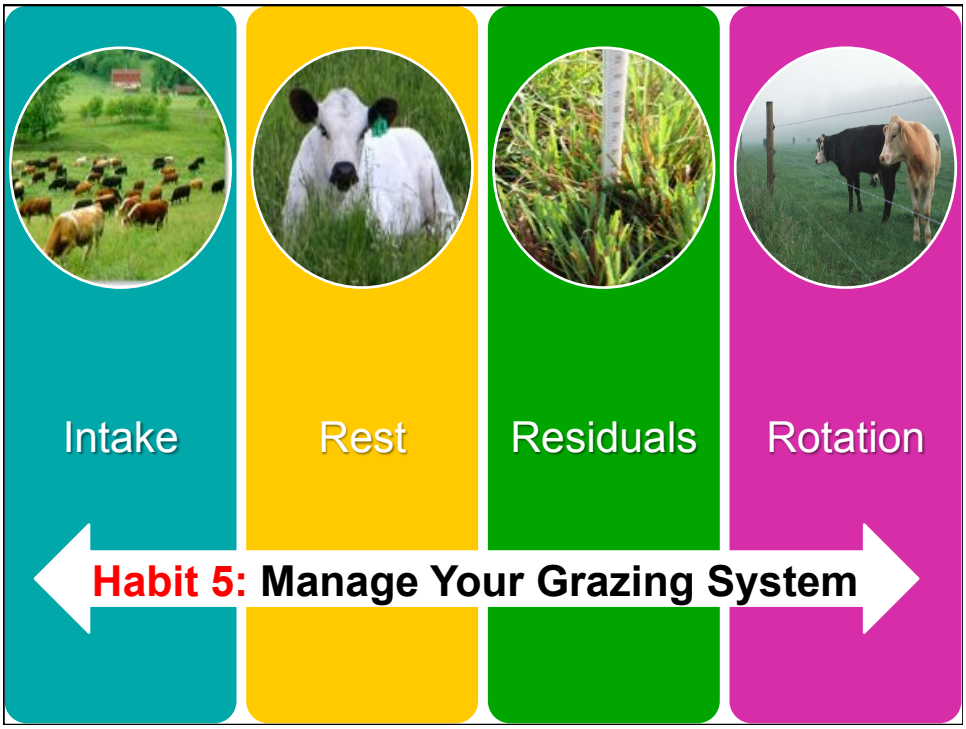
Example: Grazing Tolerance

Excellent:
- Kentucky bluegrass
- Ryegrasses
- **Kura clover**
- **White clover**

Fair:
- Meadow bromegrass
- Smooth bromegrass
- Timothy

Good:
- Festulolium
- Meadow fescue
- Orchardgrass
- Reed canarygrass
- Tall fescue
- **Alfalfa**
- **Birdsfoot trefoil**
- **Red clover**
- **Alsike clover**





Rotational Grazing Considerations

When is the paddock "ready" to be grazed?

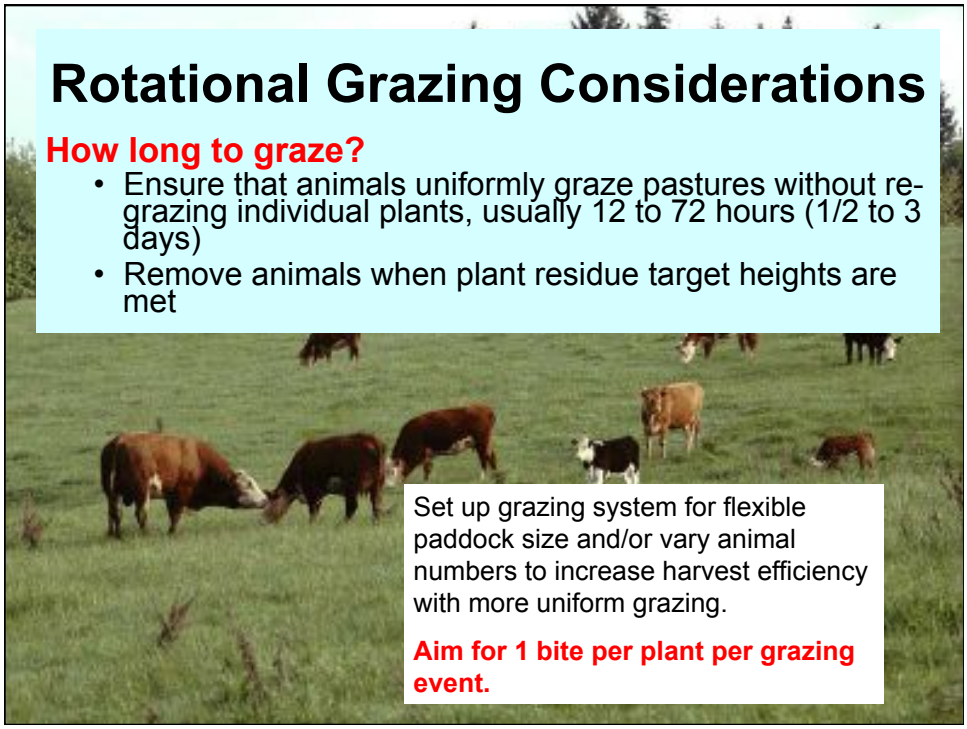
- Enough forage is available to satisfy animals' dry matter intake needs for grazing period
- Plant is physiologically capable of regrowth after defoliation

	Plant Height (inches)	
Grass Species	**Spring**	**Summer/Fall**
Orchardgrass, smooth bromegrass, tall fescue, timothy, reed canarygrass	**10 - 12**	**10 +**
Perennial ryegrass, Kentucky bluegrass	**6**	**6 +**

Rotational Grazing Considerations

How long to graze?

- Ensure that animals uniformly graze pastures without re-grazing individual plants, usually 12 to 72 hours (1/2 to 3 days)
- Remove animals when plant residue target heights are met

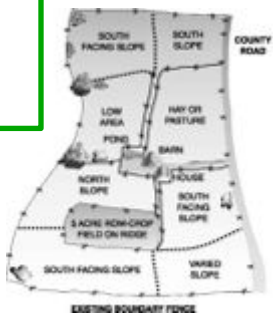


Set up grazing system for flexible paddock size and/or vary animal numbers to increase harvest efficiency with more uniform grazing.

Aim for 1 bite per plant per grazing event.

Harvest Efficiency: Match amount of pasture offered to daily animal dry matter intake needs

Number of Paddocks	Grazing Period	Paddock Rest, %	Utilization Rate
1	Continuous	0	30%
4	7 – 10 days	75	35%
8	3 – 5 days	86	50%
12	2 – 4 days	91	65%
28	1 day	96	70+%



Long grazing periods decrease pasture harvest efficiency!!

Rotational Grazing Considerations

How Long to Rest?

- Length of rest needed changes seasonally and in response to weather conditions: **Increase rest when growth slows**
- Plants must rest to replace stored energy reserves and grazed leaf area
- Forage species' also vary in days of rest needed:

Category	Cool Weather *(days)*	Hot Weather *(days)*
Cool season grasses	**14 - 21**	**35 – 50**
Warm season grasses	**35 – 40**	**21**
Legumes*	**21 – 28**	**21 - 28**

Residual Forage

…the amount of forage remaining after grazing...

- **Impacts leaf area**
  - **Need to retain a high proportion of green leaves in residual canopy for efficient growth rates**
  - **Optimum residual differs by species**
  - **Rule of thumb:** Remove ≤ 50% of leaf area
- **Impacts animal intake**
  - **Bite size becomes limited with low pasture residuals: intake declines and animal production will be limited**
  - **Use residual forage as your guide that livestock are ready to move on to fresh feed**

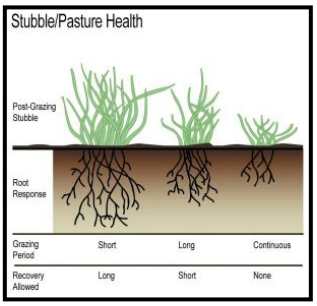
Residual Height: Effects on Future Growth

Residual height, inches	# Grazing Events during season	Ave. rotation period, days	Ave. yield per rotation	Annual yield	1st Grazing Date, following year
			pounds per acre		
6	6	24	750	4500	April 28
3	6	32	900	5400	May 4
1.5	4	44	1250	5000	May 11

Data courtesy of Geoff Brink, US Dairy Forage Research Center; grasses used in the study were: meadow fescue, orchardgrass, quackgrass and reed canarygrass

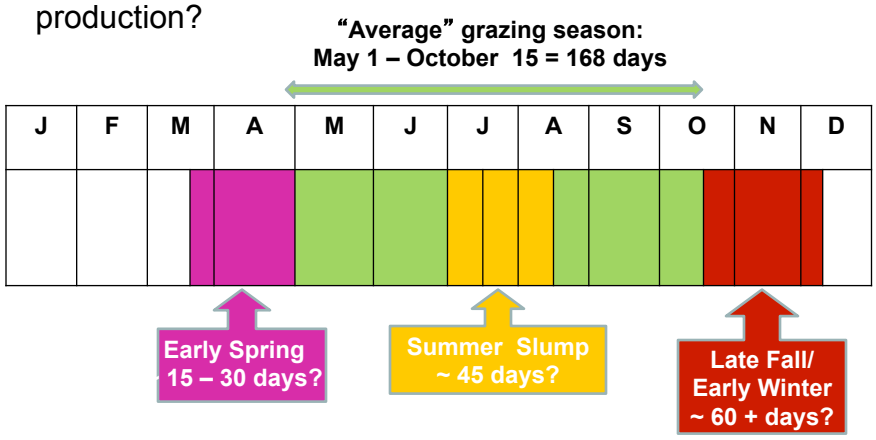
Rest and Residuals: Bottom Line

- Pasture swards can regrow more quickly after defoliation without depleting root reserves
- Other benefits from observing rest and residual targets:
  - **Less runoff, better moisture conservation**
  - **Fewer weed problems**
  - **Higher soil organic matter**
  - **Buffers soil temperatures**
  - **Wildlife habitat benefits**



Habit 6:
Fill Seasonal Production Gaps

How can we address these seasonal gaps in pasture production?



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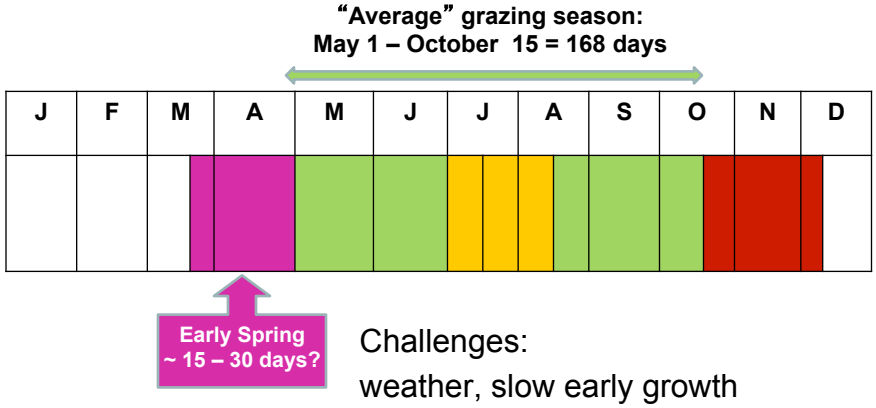

Challenges:
weather, slow early growth

Early Spring Forage Gap:

- A most challenging gap to fill!
  - Limited options
- Winter wheat or rye: sown the fall before, graze very early, then pull off for forage or grain production later in the spring
- Spring-seeded oats, Italian ryegrass—come on a little later, but may fill a gap as an emergency option if renovation or rest is needed for other pastures/forages

Habit 6:
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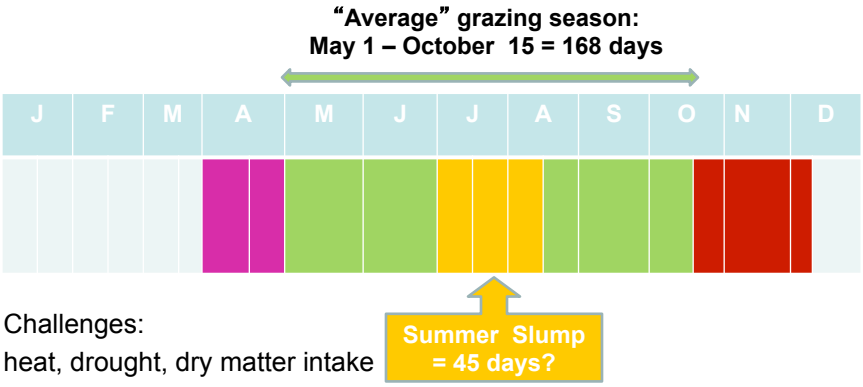

Challenges:
heat, drought, dry matter intake

Summer Forage Gap Options:

Summer "slump": period of slow growth due to hot and possibly dry weather conditions, usually mid-July to mid-August

"Speciality" options for summer gap: warm season perennials, sorghum- sudangrass, teff, corn, etc.

Permanent pastures: delay grazing on some pastures until later in the season:

- Outwintered areas reseeded and rested through the early months of the grazing season
- Hayfields grazed after winter feed needs are met
- Pasture forages that handle summer conditions: reed canarygrass, alfalfa, tall fescue

Habit 6:
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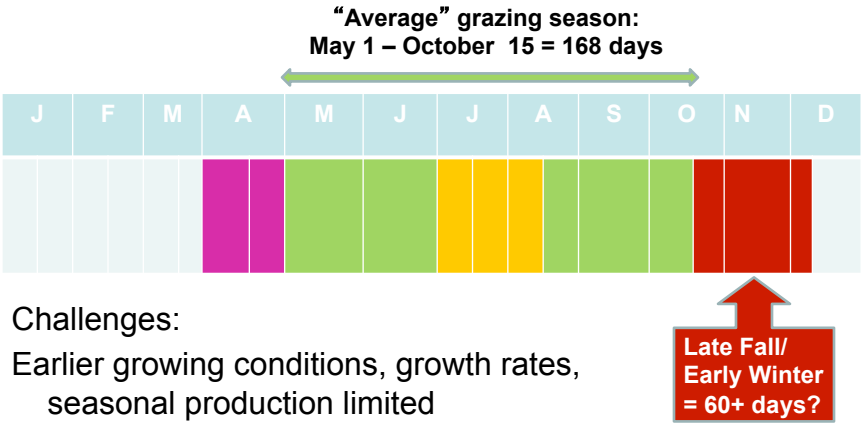


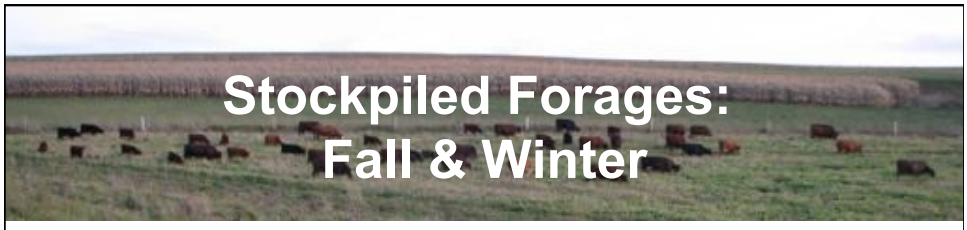
Challenges:

Earlier growing conditions, growth rates, seasonal production limited

- Allow growth to accumulate in hayfields at least 6 weeks before first killing frost
- Use strip grazing
- Avoid use during wet weather periods
- Legumes: use before stockpiled cool season grass pastures

Fall Annual Forages

- Primarily small grains and Brassica spp. (turnips, kale, etc.)
- Mixtures offer flexibility
- Dual purpose: grazing, harvested forage needs
- High forage quality, more like a concentrate, use as a supplemental forage to "stretch" other pastures
- 1 – 4 tons/acre DM yields
- Utilize in fall through early winter
- Use for crop rotation pastures or no-tilled into a light sod
- Good fertility, nitrogen or legume/manure credits needed
- Strip grazing system, ½ day grazing common



Stockpiled Forages: Fall & Winter

- Forage is accumulated on pasture in late summer and grazed after the growing season ends
- Rest some pastures for late-season use beginning in early August (southern WI)
- Apply 40 – 60 lbs. N to stimulate grass growth if needed
- CP may be 15 - 20% +
- High percentage of forage material is LEAVES
- .75 - 1.5 tons per acre yields

Use timothy, smooth bromegrass, quackgrass in fall and late maturing orchardgrass varieties by December

Use tall fescue, early-maturing orchardgrass, and reed canarygrass for grazing through late fall and winter

Managing Stockpiled Forages

- Plan on 20 – 30% of forage needs for fall stockpiling period
- Allocate in 1 – 3 day feed supply intervals:
  - Maintains forage utilization efficiency
  - Decreases unnecessary trampling/waste of standing forage
  - Prevents excess damage if conditions are wet
  - Distributes manure
  - Use harvested forages as a supplement to stretch stockpiled pastures

Corn Stalk Residues:

- Usually worth 45 – 60+ days grazing
- Cattle consume 30 – 40% corn stalk residues (1800 – 3200 lbs/ac)
- Select most palatable & highest quality portions first
- Make a protein supplement available
- Strip or rotational grazing recommended

	Husk	Leaf	Plant stem [a]	Parts Cob
% of residue DM	12	27	49	12
Crude Protein, % DM	3.6	7.8	4.5	2.2
IVDMD, %	67	47	45	35
Palatability	High	High	Low	Low

[a] includes leaf sheath
Wilson, C.B., et al. 2004. A review of corn stalks grazing on animal performance and crop yield. University of Nebraska 2004 Beef Research Report.

Habit 7: $how Me the Money!

We know that pasture can be our lowest cost feed resources, but how much is it really worth???

Assumption: each beef cow gets of 25 lbs. forage dry matter per day from pasture, savings are per cow in herd

Days grazed	SAVINGS, purchased hay equivalent, price per ton			
	$125	$150	$200	$250
60	94	112	150	188
90	141	169	225	282
120	188	225	300	375
150	234	282	375	469
180	282	338	450	562
210	328	394	525	656
240	375	450	600	750

WI Production Costs per Cow for MiG and non-MiG Beef Farms

Cost Category	MiG Beef Farms	Non-MiG Beef Farms	Percent MiG: Non-MiG
Hired labor	$258	$352	0.73
Feed cost	$144	$193	0.75
Equipment rent	$75	$118	0.64
C			
Chemical cost	$78	$98	0.80
Land & facilities rent	$190	$231	0.82
Depreciation	$207	$264	0.78
Fuel cost	$73	$88	0.83
Repairs cost	$110	$130	0.85
Fertilizer cost	$130	$171	0.76
Utilities cost	$40	$51	0.78
Total	$1359	$1776	0.77

COSTS reduced by ≥ 15% in EVERY CATEGORY!!

Source: 2007 US Ag Census