Special thanks to:

Dr. Dan Undersander
University of Wisconsin
For providing slides
Special thanks to:

Paul Peterson
University of Minnesota
For providing slides
Cover Crops for Alfalfa

Why cover/nurse crop?

- Erosion control
- Weed suppression
- Drying wet soils
- Nitrogen management
- Improving soil quality
Changes in Alfalfa Establishment Practices

- Prior to 1990, greater than 90% of alfalfa seed with oat cover crop
- Now less than 40% of alfalfa is seeded with oat cover crop

Planted Oat Acreage in Wisconsin
General Considerations

- Too much competition to the young alfalfa seedlings can stunt their growth and or kill them.
- Alfalfa stressed in the seeding year will never yield as well in future years
- Higher than necessary plant populations of the cover crop add to establishment cost without producing additional return.
Cover Crop - Oats

- establishes easily
- grows well under a wide range of conditions
- Avoid high seeding rates to reduce competition to alfalfa
  - recommended seeding rate is 1 bu (32 lb) per acre.
  - This provides about 12 seeds per square foot.
  - Higher seeding rates will increase grain yield (but not forage yield).
  - higher seeding rates will add stress on the alfalfa seedlings and may reduce stands and hurt the alfalfa yield in future years.
Effect of cover crop competition on alfalfa yield

- Drilled with Pursuit: 1.53
- Drilled with Poast: 1.67
- Drilled control: 1.78
- Oats for silage: 1.02
- Oats for grain: 0.96
- Oats with Poast: 1.54

Conventional oat nurse crop

Roundup oat takeout
Cover crop - Oats sprayed at 6-inch height

- Oats seeded at 1 bu/acre
  - will provide good ground cover, early weed control,
  - when sprayed at 6 inches will die leaving alfalfa to yield the same as if no cover crop had been planted
- The oats has been taken out with Poast+ and Select
- Can use roundup ready alfalfa

Conventional oat nurse crop
Roundup oat takeout
Forage yield of alfalfa either seeded direct (1), with oats over-seeded and sprayed at 6 inches (2) or oats harvested at boot stage (3).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Arlington, WI</th>
<th>Rosemount, MN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
<td>2004</td>
</tr>
<tr>
<td>(1) Alfalfa seeded direct</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>(2) Oats sprayed at 6 inches</td>
<td>3.0</td>
<td>2.3</td>
</tr>
<tr>
<td>(3) Alfalfa + Oat haylage</td>
<td>2.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Oat</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>0.7</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Cover Crop - Barley

- is somewhat more difficult to grow.
- Forage yield is less than oats
- crude protein is slightly higher
- matures a week or more earlier than oats.
Cover Crop - Small grain/pea mixes

- Improve palatability and forage quality over pure small grain cover crops.
- Peas, seeded alone or with too few small grain, will lodge and smother the alfalfa.
- Pea seed is also much more expensive than oats so must balance the benefit against the cost.
- Peas do not dry as fast after cutting as small grain forage.
Cover Crop - Italian ryegrass

- Good rapid ground cover
- High quality and palatable forage
- Choose a variety that does not head in the seeding year
- Plant at a sufficiently low seeding rate to reduce competition with the alfalfa (4 lb/a of Italian ryegrass)
- Does not do well on course textured soil especially in dry conditions
Effect of cover crop competition on alfalfa yield

Seeding year yield

First production year yield
Grass-Legume Mixtures

- At one time grass-legume mixtures were the norm
- Herbicides and adoption of NIR testing using NDF and ADF reduced grass-legume mixtures
- Grasses don’t always reduce quality and yield
- Presently over 80% of alfalfa grown in New York State is grown with a companion crop, Wisconsin is probably closer to? (20%).
Alfalfa-Grass Mixtures: Going Backwards?

- Alfalfa is losing ground; grasses may help
- Persistence and ground cover
  - Greater snow catch; better insulation w/ or w/o snow
  - Reduced alfalfa heaving
  - Insurance where alfalfa does winter kill
- Greater harvested yield and quality
  - More rapid hay/haylage drying (with some grasses)
  - RFV vs. RFQ (higher fiber digestibility of grass)
  - Less potential for traffic damage, wider harvest windows
  - Decreased need for long-term persistence
- What quality do modern dairy rations need? Straw?
- Diversification, nature’s model
Why Mix Grasses with Legumes

- More rapid hay drying
- Higher yield potential
- Less weed encroachment
- Insurance against legume winterkill
- Helps to fill in areas of field that are not suited for legumes
- Greater traffic tolerance
- Greater response to manure
Forage Quality of Alfalfa Grass Mixes

Higher NDF with grass
But higher NDFD
Forage Quality of Alfalfa Grass Mixes

[Bar chart showing RFV or RFQ values for different percent legume.]
Yield of alfalfa-grass mixtures in 2006

Including grass had no effect on total season yield

<table>
<thead>
<tr>
<th>Site</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arlington</td>
<td>2005</td>
</tr>
<tr>
<td>Marshfield</td>
<td>2004</td>
</tr>
<tr>
<td>Spooner</td>
<td>2003</td>
</tr>
</tbody>
</table>
Issues with grass

- There’s great variation among grass species, thus it’s difficult to make general statements about grasses.
  - Re-growth characteristics, seasonal distribution, response to cutting and fiber digestibility all vary.
- Have been limited feeding studies in the USA.
- Best suggestion is probably to consider some on-farm research and experiment with grasses on a small scale on your own farm.
Selecting grasses

- Yield
- Palatability
- Maturity
- Rust Resistance
  - Orchardgrass
  - Tall Fescue
  - Ryegrass
- Yield distribution if grazing
Yield Difference between top and bottom entry in grass variety trials

- Orchard grass
- Smooth Bromegrass
- Timothy
- Tall Fescue
Palatability of Grass Species

- Perennial Ryegrass
- Tall Fescue
- Timothy
- Smooth bromegrass
- Orchardgrass

Palatability Scale: 0-4
Palatability of Different Orchardgrass Varieties

Palatability

ALPINE
BARIDANA
BENCHMARK
CAS-EG23
CONDOR
DAWN
DGL-M88-A
DP 6908
DUKE
EASTWOOD
ELSIE
HAYMATE
IOWA OG-1
KAY
MAMMOTH
MEGABITE
MOW TO GRAY
OG6501
POTOMAC
PROFILE
PROGRESS
STAMPEDE
TAKENA
TEKapo
WARRIOR
Rust on orchardgrass

Need Rust Resistant
Orchardgrass
Ryegrass
Tall Fescue
Seasonal Distribution
of Cool Season Grass Yield

[Graph showing seasonal distribution of cool season grass yield with peaks in June and September.]
Grass Options

- Cool-season annuals
  - Italian and annual ryegrass
  - Small grains
- Cool-season perennials
  - Timothy, smooth brome, K. bluegrass
  - Orchardgrass
  - Reed canarygrass
  - Tall and meadow fescue, perennial ryegrass
Italian Ryegrass in Stearns Co., Aug. 2004
Italian Ryegrass vs. Oats at Dan Miller Farm, 2004
Italian Ryegrass vs. Oats at Dan Miller Farm, 2004
Oats vs. IRG vs. Perennial Grass
Sod-forming Grasses

Smooth Bromegrass

Smooth bromegrass

Vegetative characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>growth habit</td>
<td>sod forming; shallow roots; rhizomes numerous but slender</td>
</tr>
<tr>
<td>leaf blade</td>
<td>‘M’ constriction midway between base and tip; about ½ inch wide</td>
</tr>
<tr>
<td>sheath</td>
<td>rolled in sheath; sides fused at top; rarely with short hairs</td>
</tr>
<tr>
<td>ligule</td>
<td>not prominent; ragged hairs</td>
</tr>
<tr>
<td>auricles</td>
<td>absent or very short</td>
</tr>
<tr>
<td>height</td>
<td>3–4 feet</td>
</tr>
<tr>
<td>seed head</td>
<td>seeds on long side branches; entire head frequently leans to one side</td>
</tr>
</tbody>
</table>
Sod-forming Grasses

Smooth Bromegrass

**PROs**
- Very winterhardy
- Sod-forming (loose)
- Persists through heat and drought
- Palatable

**CONs**
- Very uneven yield distribution
- Slow regrowth
- Poor summer productivity
- Poor persistence under continuous grazing
Bunch Grasses

Timothy

**Vegetative characteristics**

<table>
<thead>
<tr>
<th>growth habit</th>
<th>bunch type; plants have corms (enlarged base of stem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>leaf blade</td>
<td>flat; rolled within whorl</td>
</tr>
<tr>
<td>sheath</td>
<td>smooth; sides overlap near top</td>
</tr>
<tr>
<td>ligule</td>
<td>white; about ¼ inch tall</td>
</tr>
<tr>
<td>auricles</td>
<td>absent, occasionally present but small</td>
</tr>
<tr>
<td>height</td>
<td>2–2½ feet</td>
</tr>
<tr>
<td>seed head</td>
<td>heads dense cylinder, 2–3 inches long; produces heads on late-season growth</td>
</tr>
</tbody>
</table>
**Bunch Grasses**

**Timothy**

**PROs**
- Very winter hardy
- Late maturing - broad window for good quality and palatability
- Does well in cool, moist areas

**CONs**
- Very uneven yield distribution
- Slow regrowth
- Poor heat/drought tolerance
- Over-rated as horse feed
Sod-forming Grasses

Reed Canarygrass

Reed canarygrass

**Vegetative characteristics**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth habit</td>
<td>sod forming; large diameter rhizomes</td>
</tr>
<tr>
<td>Leaf blade</td>
<td>rolled in whorl; flat, wide (1/2 inch) with rough margins; constriction more than 2 inches from tip or collar</td>
</tr>
<tr>
<td>Sheath</td>
<td>sides overlap near top</td>
</tr>
<tr>
<td>Ligule</td>
<td>prominent</td>
</tr>
<tr>
<td>Auricles</td>
<td>absent</td>
</tr>
<tr>
<td>Height</td>
<td>usually 4–6 feet</td>
</tr>
<tr>
<td>Seed head</td>
<td>slightly green or purple early then turning tan; seeds on short branches, spreading slightly as head matures</td>
</tr>
</tbody>
</table>
Sod-forming Grasses

Reed Canarygrass

**PROs**
- Sod-forming (loose)
- Flooding tolerant
- Relatively productive during heat/drought
- Compatible/even with alfalfa

**CONs**
- Relatively coarse/unpalatable when mature
- Slow to establish
- Alkaloids (use low-alkaloid Venture, Palaton, Chiefton)
Bunch Grasses

Orchardgrass

**Vegetative characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>growth habit</td>
<td>bunch type</td>
</tr>
<tr>
<td>leaf blade</td>
<td>v-shaped; bluish-green</td>
</tr>
<tr>
<td>sheath</td>
<td>flattened; sides overlap at top; rough</td>
</tr>
<tr>
<td>stem</td>
<td>prominently flattened</td>
</tr>
<tr>
<td>ligule</td>
<td>prominent with cuts or splits on whitish margin</td>
</tr>
<tr>
<td>auricles</td>
<td>absent</td>
</tr>
<tr>
<td>height</td>
<td>2–2½ feet</td>
</tr>
<tr>
<td>seed head</td>
<td>seeds on short side branches</td>
</tr>
</tbody>
</table>

*Image of Orchardgrass*
Bunch Grasses

Orchardgrass

**PROs**
- Rapid regrowth
- Leafy
- Good early/late season growth

**CONs**
- Very competitive with legumes
- Marginal winterhardiness w/o snowcover
- Bunchy
Perennial Ryegrass in Ireland
Perennial Ryegrass

**PROs**
- Rapid regrowth
- Leafy (highest quality grass)
- High palatability when vegetative
- High seedling vigor/easy to establish

**CONs**
- Marginal winter hardiness
- Limited heat/drought tolerance
- Rust susceptibility
Ryegrass and Festulolium Winter Injury at Grand Rapids, MN, Spring 2003
Tall Fescue
Bunch Grasses

Tall Fescue

**PROs**
- Grazing- and traffic-tolerant
- Excellent fall productivity ("stockpiling")
- Becomes “turfy” via short rhizomes in monoculture

**CONs**
- Marginal winter hardiness
- Relatively low palatability (coarse, waxy leaves)
- Bunchy in mixtures
- Purchase “low-endophyte” seed
Tall Fescue – Wilting Challenge?
Cornell Alfalfa vs. Tall Fescue Silage Feeding Trial (Cherney et al., 2002)

- **Kg/day or %**
- **Milk, kg/d**
- **DM Intake, kg/d**
- **Forage, %**
- **Corn, %**

Diets 1.1% BW Forage NDF
- Alf 34% NDF
- TF 56% NDF

**Diets Composition:**
- 100% Alf
- 2/3 Alf, 1/3 TF
- 1/3 Alf, 2/3 TF
- 100% TF
2007 Total-Season DM Yields (4 Harvests) and Species Composition of Alfalfa-Grass Mixtures at Rosemount, MN - seeded August 2006

DM Yield (Ton/ac, weed-free)

- Grass
- Alfalfa

Yield comparisons for various mixtures of alfalfa and grass species.
Season-average RFQ of alfalfa-grass mixtures at Rosemount, MN, in 2007
Season-total Milk per Acre potential of alfalfa-grass mixtures at Rosemount, MN, in 2007
Team Forage Web Page

http://www.uwex.edu/ces/crops/teamforage/index.html

The next Team Forage Meeting will be Friday, March 14, 2008
at the Hancock Research Farm

Team Forage Mission:
"To develop and disseminate research-based information that will enhance
profitable forage production and utilization while sustaining Wisconsin's natural
resources."
Central Wisconsin Agricultural Specialization
A Partnership with the University of Wisconsin - Extension and Member Counties: Adams, Green Lake, Juneau, Marquette, Portage, Waushara, and Wood

February 24, 2004

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Our mission is to be the primary source of research based agricultural information and education for the agricultural community in Central Wisconsin.

Member Wisconsin Counties:

- Adams
- Green Lake
- Juneau
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