

# Yield and management of Roundup Ready alfalfa

*What have we learned over 11 years (-4)*



# Roundup Ready® Alfalfa Timeline



# Roundup Ready alfalfa varieties available

- Seed fields for new varieties planted in 2011-12
  - could not be planted before APHIS approval in 2011
- New varieties available in 2013
  - Needed to increase breeder's seed
  - Needed to establish grower zones
  - Most new RR seed fields will be planted in 2012

# Roundup Ready alfalfa use recommendations

- Spray regardless of weed population
  - Eliminate non-resistant seedlings (<10%)
- Application timing:
  - emergence - 5d before harvest
  - Applications must be at least 7 days apart
- Rate restrictions:
  - Each application: **no more** than 1.5 lbs ae/A
  - Over the entire year: **no more** than 4.64 lbs ae/A per year
- glyphosate must be registered for use on RR alfalfa

# What herbicide options do I have during establishment?

Herbicide	Type	Legume tolerance	Grass control	Broadleaf control	Harvest restriction
Eptam	PPI	F/G	Y	Y	14 days
Treflan	PPI	G	Y	Y	21 days
Buctril	Post $\geq$ 4TL	F/G	N	Y	30 days
Butyrac	Post	G	N	Y	60 days
Glyphosate	Post	E	Y	Y	5 days
Poast	Post	E	Y	N	7-14 days
Prowl	Post 2TL	E	Y	Y	28-50 day
Pursuit	Post $\geq$ 2TL	G	Y	Y	30 days
Raptor	Post $\geq$ 2TL	G	Y	Y	0 days
Select	Post	G	Y	N	15 days

# Benefits of Roundup Ready alfalfa

1. Herbicide is cheap compared to standards
2. Flexible application timing (crop and weed stage)
3. Avoid potential yield loss from standard treatments
4. Control ALS resistant weeds
5. Convenient
6. An option for perennial weeds in established stands that don't have long plant-back intervals

# Costs of Roundup Ready alfalfa

1. Seed is more expensive
2. Recommend an application of glyphosate
3. No residual weed control
4. May increase potential for gly resistant weeds
5. Limited varieties available
6. Future litigation and regulation?

# Why manage weeds in alfalfa?

1. Risk of establishment failure
2. Reduce biomass of alfalfa
3. Reduce forage quality
4. Affect animal health



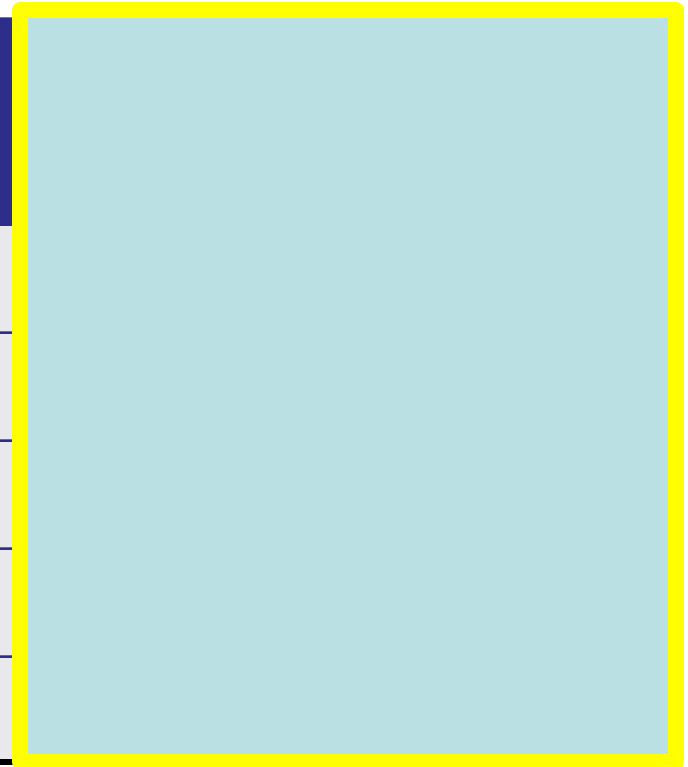


# Benefits of Roundup Ready alfalfa

1. Reduces risk of establishment failure due to weeds
  - equivalent or superior control of wide spectrum of weed species when using RR alfalfa compared to conventional herbicides
  - Results in minimal competition and allows alfalfa to establish

# Effect of management method on stand density fall of seeding year

study	Gly vs UTC
Wisconsin	NS
Nebraska	26% less in UTC
Missouri	11-33% less UTC
Michigan	NS
5 state	13% less in UTC



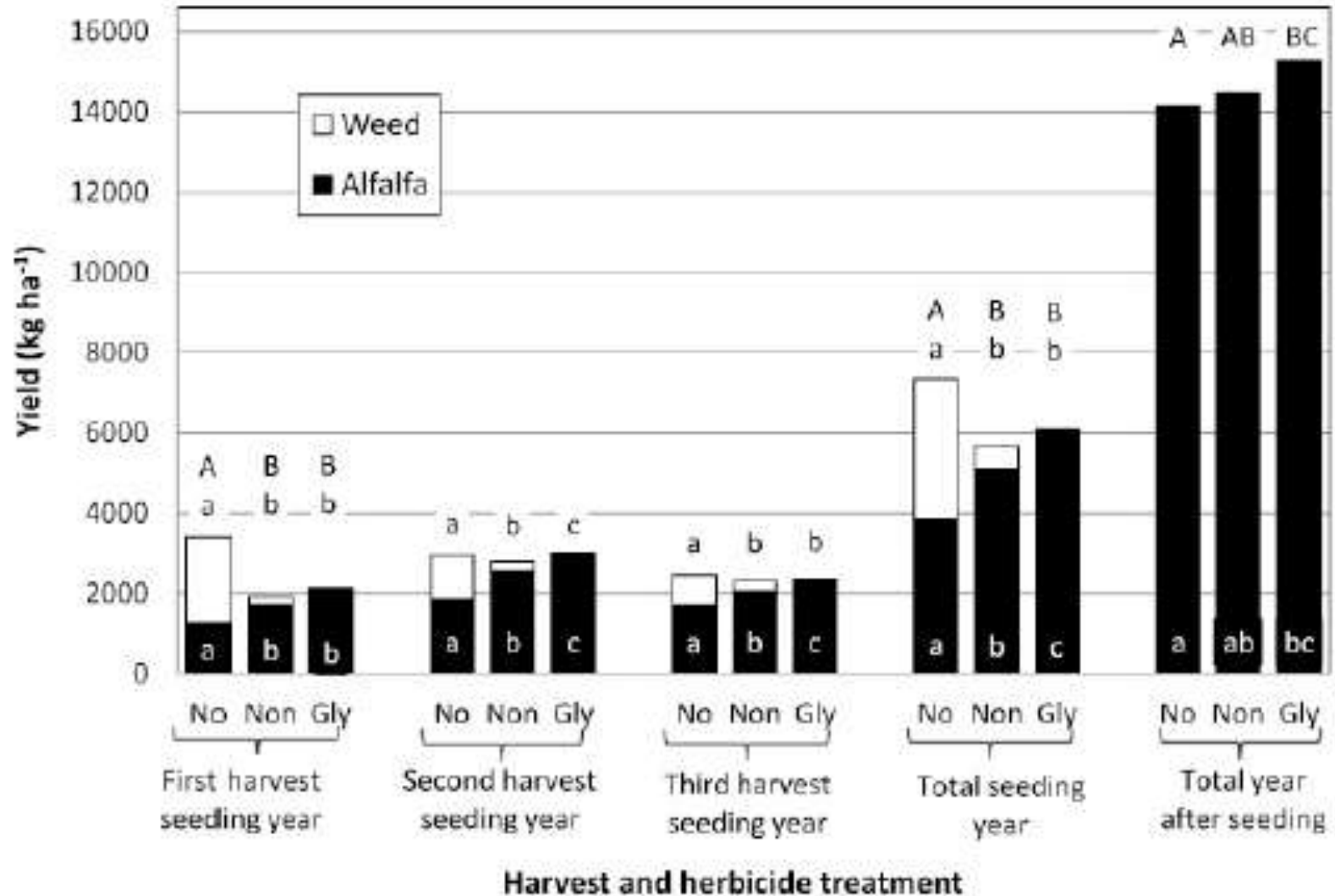
# Benefits of Roundup Ready Alfalfa

## 2. Maximizes yield of alfalfa biomass

- Timing of application flexible
  - allow for removal of weed species at critical period (3-5 weeks after planting)
- Increases are NOT seen in overall forage biomass, but in alfalfa biomass
  - Removing weed biomass
- Differences are rarely seen past 1<sup>st</sup> cutting

# Yield differences in establishment year

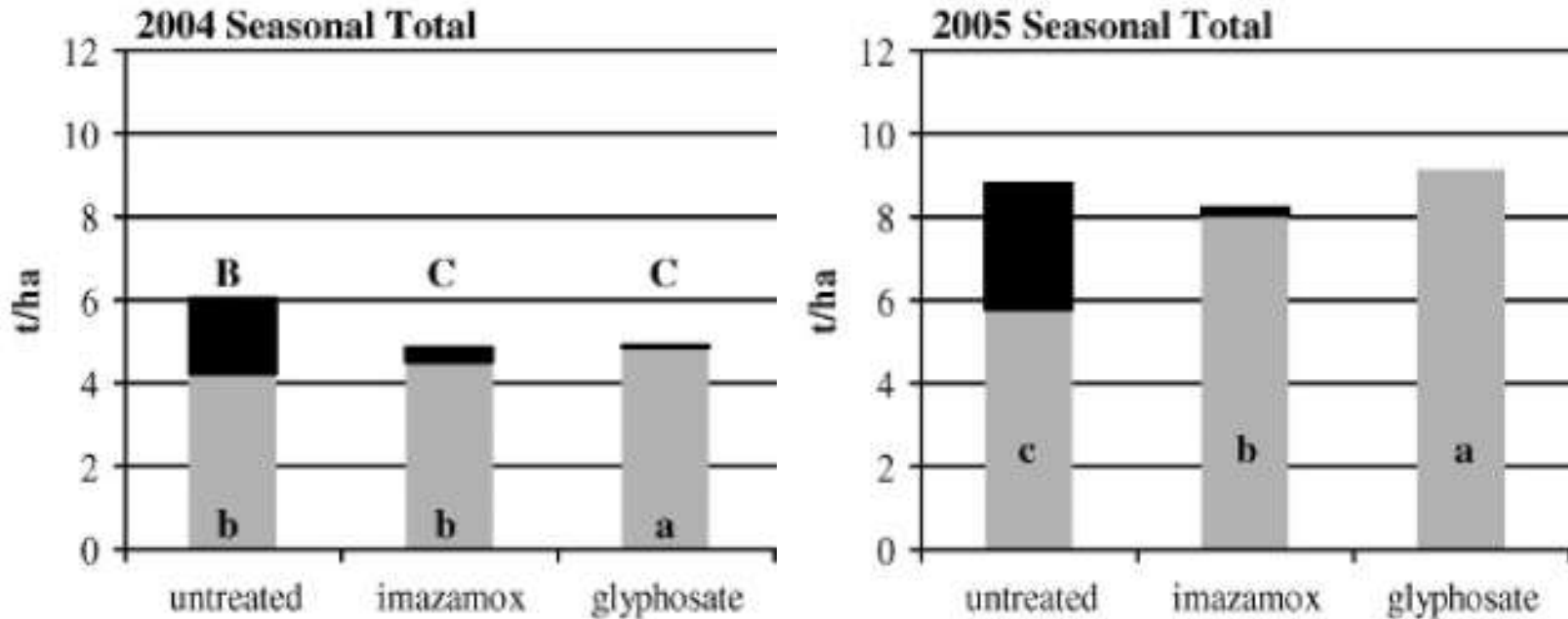
## *5 states including Wisconsin*



# Seeding year forage and alfalfa yield

*Michigan State University*

McCordick et al. 2008



# Yield in Seeding Year of RR Alfalfa – 2006

Table 3b

	<b>Marshfield</b>		<b>Lancaster</b>	
<b>Variety</b>	<b>Glyphosate</b>	<b>Conv</b>	<b>Glyphosate</b>	<b>Conv</b>
	<b>Tons/acre</b>			
<b>425RR</b>	<b>1.91</b>	<b>1.68</b>		
<b>4G18RR</b>	<b>2.00</b>	<b>1.76</b>	<b>4.79</b>	<b>3.71</b>
<b>6443RR</b>	<b>2.04</b>	<b>1.61</b>	<b>4.75</b>	<b>3.69</b>
<b>DK41-18RR</b>	<b>1.82</b>	<b>1.71</b>		
<b>Liberator RR</b>	<b>1.95</b>	<b>1.72</b>		
<b>WL 355 RR</b>	<b>2.02</b>	<b>1.74</b>		
<b>MEAN</b>	<b>1.95</b>	<b>1.70</b>	<b>4.77</b>	<b>3.70</b>
<b>Difference</b>	<b>0.25</b>		<b>1.07</b>	

Roundup Weathermax applied at 44 oz./ac at 4<sup>th</sup> trifoliolate

Raptor and Poast Plus applied at 6 oz/ac and 24 oz/ac respectively at 4<sup>th</sup> trifoliolate

Marshfield – 2 cuts

Lancaster – 3 cuts

# RR Alfalfa Yield Trials in WI

## 2006 summary

- Seeding year 0.25-1.07 tons d.m./acre yield advantage (6-16%) for using glyphosate compared to raptor
- Subsequent yield through the first three production years did not differ
- There were significant differences in yield among the RR varieties

# Yield in Seeding Year of RR Alfalfa – 2011

Table 3

	<b>Marshfield</b>		<b>Arlington</b>	
<b>Variety</b>	<b>Glyphosate</b>	<b>Conv</b>	<b>Glyphosate</b>	<b>Conv</b>
	<b>Tons/acre</b>			
<b>54VR03RR</b>	<b>2.1</b>	<b>2.1</b>	<b>2.8</b>	<b>3.0</b>
<b>Ameristand 405T RR</b>	<b>2.0</b>	<b>1.8</b>	<b>2.7</b>	<b>2.8</b>
<b>Consistency 4.10RR</b>	<b>1.9</b>	<b>1.8</b>	<b>2.8</b>	<b>2.7</b>
<b>DKA41-18RR</b>	<b>2.0</b>	<b>1.9</b>	<b>2.9</b>	<b>2.8</b>
<b>WL 355 RR</b>	<b>2.1</b>	<b>1.9</b>	<b>2.6</b>	<b>2.8</b>
<b>MEAN</b>	<b>2.0</b>	<b>1.9</b>	<b>2.8</b>	<b>2.8</b>
<b>Difference</b>	<b>0.1</b>		<b>-0.1</b>	

Roundup Weathermax applied at 44 oz./ac at 4<sup>th</sup> trifoliolate

Raptor and Poast Plus applied at 6 oz/ac and 24 oz/ac respectively at 4<sup>th</sup> trifoliolate



# Why the difference between 2006 and 2011?

- Growing conditions
  - Marshfield had cool weather & late planting
  - Arlington had dry summer

- Weed pop.



# 2011 Alfalfa variety trial planting, Arlington

2011 Harvest  
(tons/acre)

Released Varieties with Conventional herbicide	2011		2011 Total^
	4-Jul	31-Jul	
HYBRIFORCE-2400	1.71	1.56	3.21
54VR03RR	1.57	1.55	3.04
AMERISTAND 407TQ	1.47	1.42	2.93
55V50	1.33	1.56	2.86
5312	1.50	1.44	2.84
AMERISTAND 405T RR	1.54	1.39	2.80
DG 4210	1.45	1.36	2.80
SONIC	1.41	1.42	2.80
WL 354 HQ	1.45	1.36	2.80
DKA41-18RR	1.51	1.39	2.79
ONEIDA VR	1.33	1.40	2.78
WL 355 RR	1.48	1.31	2.78
CONSISTENCY 4.10RR	1.31	1.44	2.71
GUNNER	1.26	1.27	2.65
LANCER	1.18	1.44	2.64
VERNAL	0.89	1.27	2.21
Mean	1.45	1.44	2.88
LSD 5%			0.44
CV %			8.4

- 16 varieties
- 5 RR varieties

# 2011 Alfalfa variety trial planting

## Marshfield

### Commercially Released Varieties

with Conventional (CONV) 2011 Harvest (tons/acre) 2011  
 or RoundUp (RU) herbicide 26-Jul 25-Aug Total<sup>^</sup>

Entry	Herbicide	26-Jul	25-Aug	Total <sup>^</sup>
SONIC	CONV	1.01	1.27	2.28
55V50	CONV	1.02	1.23	2.25
ONEIDA VR	CONV	0.94	1.26	2.20
WL 354 HQ	CONV	1.00	1.20	2.19
WL 355 RR	RU	0.93	1.19	2.12
54VR03RR	CONV	0.99	1.12	2.11
DG 4210	CONV	0.90	1.17	2.08
54VR03RR	RU	0.91	1.17	2.07
AMERISTAND 407TQ	CONV	0.90	1.15	2.05
REBOUND 6.0	CONV	1.00	1.05	2.05
DKA41-18RR	RU	0.90	1.13	2.03
AMERISTAND 405T RR	RU	0.87	1.12	1.99
5312	CONV	0.82	1.13	1.95
DKA41-18RR	CONV	0.86	1.06	1.93
WL 355 RR	CONV	0.82	1.07	1.90
VERNAL	CONV	0.79	1.11	1.89
CONSISTENCY 4.10RR	RU	0.89	0.99	1.88
AMERISTAND 405T RR	CONV	0.78	1.04	1.82
CONSISTENCY 4.10RR	CONV	0.76	1.03	1.78

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Mean				2.04
LSD 5%				ns*
CV%				14.5

- 15 varieties
- 5 RR varieties

# Summary of yield response

- An increase in alfalfa yield can occur in the establishment year with RR alfalfa
  - 0-1.06 tons d.m./acre (0-16%)
- Increases in yield in production years should not be expected
- RR varieties vary in productivity
- Future productivity is not clear
  - seeding year yield has no relationship to yield of alfalfa in the production years, will have to wait for first production year to evaluate.

# Benefits of Roundup Ready Alfalfa

3. CAN result in increased forage quality
  - Dependent on the weed species present, density, and stage of development
    - **Under certain situations some species can reduce feed quality below recommendations for Dairies**
  - Usually differences seen in 1<sup>st</sup> cut of seeding year
  - Rarely does quality differ between herbicide treatments

# Forage quality (RFV) changes from weed management

Location	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	3 <sup>rd</sup> cut
	% increase in RFV from herbicide treatment		
Wisconsin	37%	14%	2%
Nebraska	14 to 19%	0 to 4%	0 to 7%
Michigan	8 to 18%	-8 to 0%	-23 to 7%
Average	<b>19%</b>	<b>2%</b>	<b>0%</b>

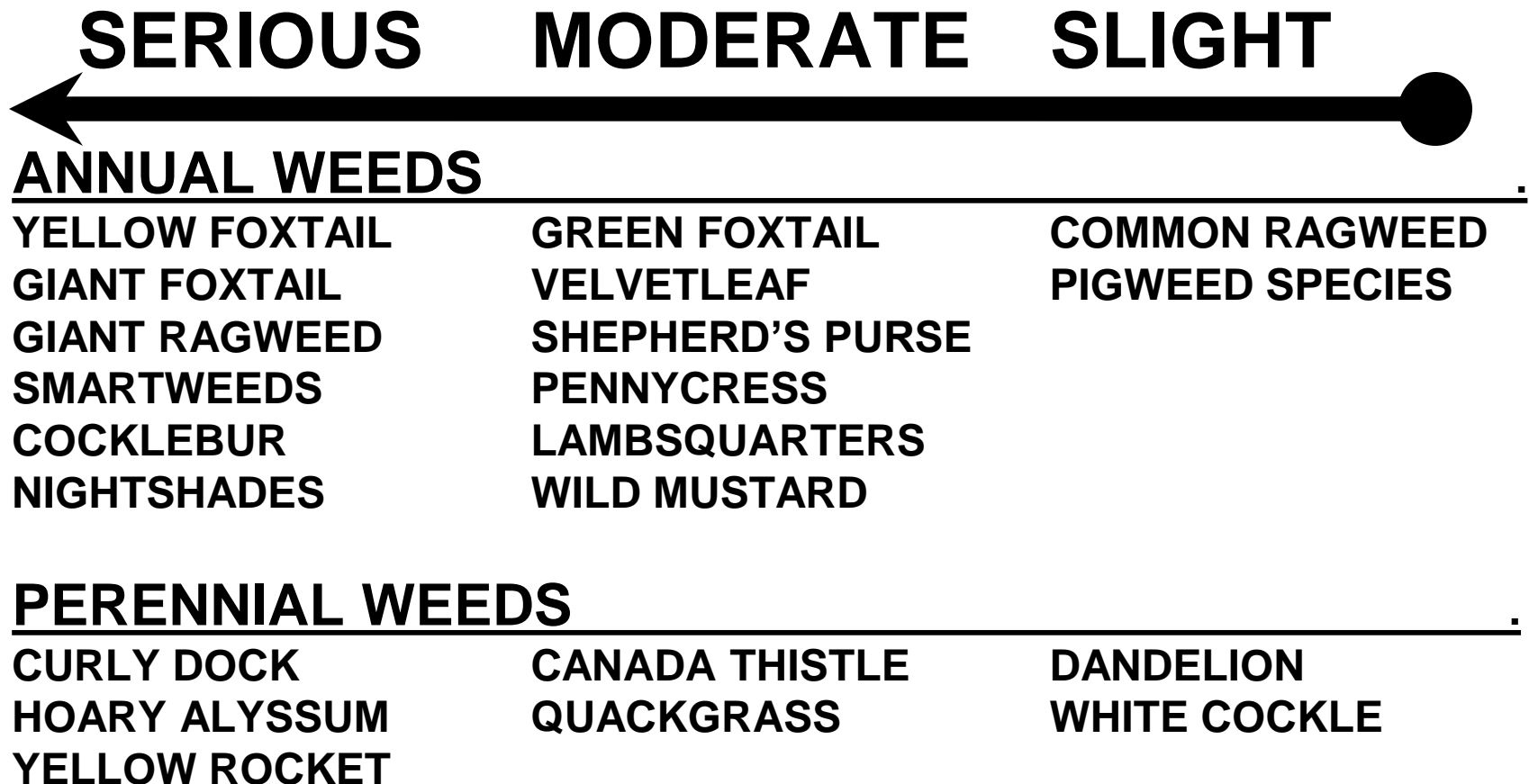
# Crude Protein and RFV 1<sup>st</sup> cutting

## *Michigan State University*

		2004		
Establishment system	MSC <sup>a</sup>	CP	RFV	Milk yield
		%		g milk/kg forage
<b>Clear-seeded</b>				
No herbicide	0.3	26	180	1570
Imazamox	0.2	30	230	1800
Glyphosate	0.4	29	220	1680
		2005		
Establishment system	MSC	CP	RFV	Milk yield
		%		g milk/kg forage
<b>Clear-seeded</b>				
No herbicide	1.3	15	110	895
Imazamox	1.7	25	140	1060
Glyphosate	2.6	22	120	990

McCordick et al. 2008

# Impact of Common Weeds on Forage Quality





# Benefits of Roundup Ready Alfalfa

4. Will minimize impact of poisonous plants
  - Few poisonous plants present in establishing stands of alfalfa
  - Glyphosate performance will be equivalent or better than other herbicides

# WEED MANAGEMENT IN ESTABLISHED STANDS



- Usually dominated by perennial weeds
- Current options have
  - ▶ poor performance on these species
  - ▶ Have long plant-back intervals.



- Glyphosate should improve control, but if stand density is too low, yields will remain low.



# Use of RR alfalfa in WI

RR alfalfa another tool in box

Useful for:

- Weedy/problematic fields
  - ALS resistant weeds, perennial weeds
- Oats/Italian ryegrass cover crop & early takeout (6")
- Late planted alfalfa
- Ease of use

# RR Calculator

- Excel spreadsheet that compares cost of RR vs. conventional alfalfa.
- Values are pre-entered that reflect Wisconsin's the costs, use patterns, and yield.
- User can change data specific for a field or farm and provide a more accurate analysis of the costs.

[http://www.uwex.edu/ces/forage/pubs/economics\\_RR\\_alfalfa.xls](http://www.uwex.edu/ces/forage/pubs/economics_RR_alfalfa.xls)