

CULTIVATING HEALTHY COMMUNITIES

# COVER CROPS NO-TILL & DIVERSITY

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UVM Extension Agronomy

Feb 2014

**Champlain Valley**  
Crops, Soil & Pasture Team

**EXTENSION**  
CULTIVATING HEALTHY COMMUNITIES



# WHY COVER CROPS ?

- Hold and Recycle Nutrients
- Reduce Erosion
- Add Fertility
- Suppress Weeds
- Increase Organic Matter
- Improve Soil Structure
- Transition to No-Till
- Save \$\$ on Inputs
- Spring Harvest for Forage

WHY  
Not ?







Single Species: Winter Rye after Corn

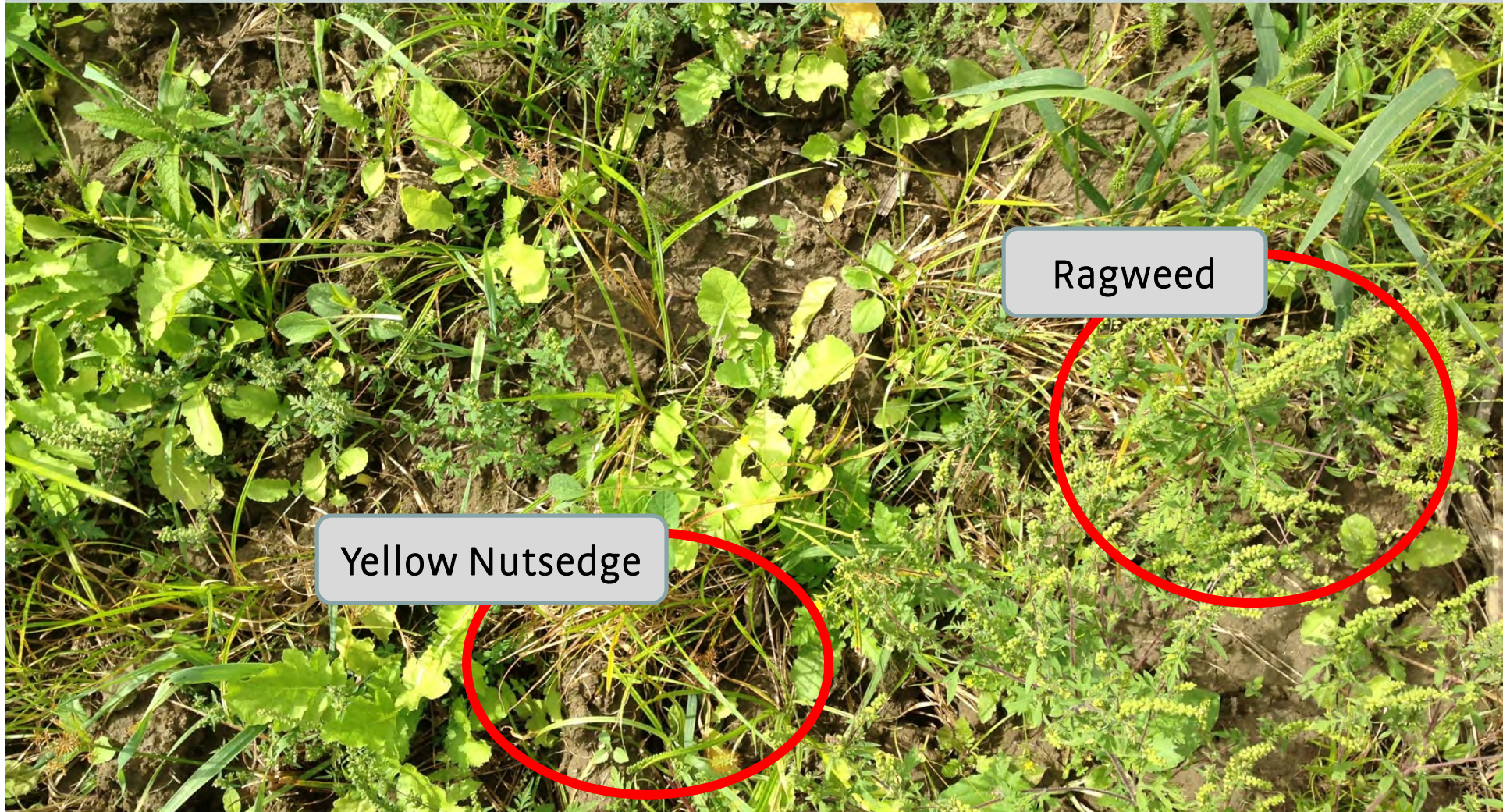




Mixed Species: Oats & Soybeans & Tillage Radish



# Crop Failure Is NO FUN!



Yellow Nutsedge

Ragweed

Due to equipment breakdowns and weather this half of the field did not get rolled after seeding...that was the only difference in how it was planted...quite a different outcome.



# Plant it Like a Crop

## Measure Results



Oat/Soybean/Tillage Radish Cover Crop...Forage Value				
Sample Date	9/3/2013	9/30/2013	10/25/2013	Average
Yield (DM Ton/ac)	0.58	0.80	0.95	
%DM	11.60	12.50	17.10	
% Crude Protein	22.90	15.10	15.60	17.87
%ADF	28.20	28.50	30.80	29.17
%NDF	36.40	43.30	47.60	42.43
%TDN	61.00	63.00	62.00	62.00
NEL	0.65	0.65	0.63	0.64
RFV	171	143	127	147
lbs N/acre	42.25	38.76	47.66	42.89
lbs P/acre	4.73	4.97	5.92	5.21
lbs K/acre	30.79	42.67	35.71	36.39





# Planting Methods





## No-Till Grain Drills

Haybuster Grain Drill  
w/legume box





# FM-750 Steering Guidance & Juno GPS

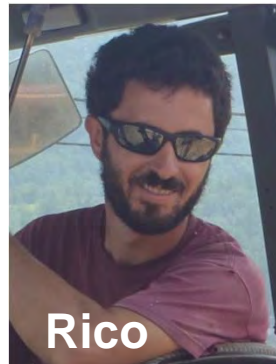




# CHAMPLAIN VALLEY CROP, SOIL AND PASTURE TEAM

- Jeff Carter, UVM Extension Agronomist
- Agronomy & Conservation Assistance Program

- Rico Balzano
- Dan Infurna
- Jennifer Alexander



- Lake Champlain Strategic Watershed Action Team
- Kirsten Workman
- Cheryl Cesario



Justin



# REDUCE SOIL & P LOSS USING NO-TILL GRAIN DRILLS



## Project Goals:

1,000 acres / 20 farms

Improve Hay & Pasture

Repair Damaged Fields

Winter Cover Crops after Corn

## Project Outcomes:

3,421 acres / 143 farms

- 1,318 ac Hay at 53 farms
- 1,225 ac Pasture at 46 farms
- 137 ac Cereal Grain at 6 farms
- 742 ac Cover Crops at 38 farms

2012-13 Agency of Natural Resources  
Ecosystem Restoration Program



## Ray Brands – Deer Valley Farms



November 2012 - Drilled Winter Rye





**Incorporated Rye  
Early Planted Corn**

**Harvested Rye  
Late Planted Corn**

**May 2013**



# Double Crop for Spring Harvest

Site Location	Deer Valley- Little Chicago	Deer Valley- Fort Cassin	Average
<i>Crop</i>	<i>Rye</i>	<i>Rye</i>	
%DM	15.00	16.00	15.50
Yield (DM Ton/ac)	1.81	1.77	1.79
Yield (silage equiv.)	5.17	5.06	5.11
% Crude Protein	15.20	16.60	15.90
%ADF	33.80	32.00	32.90
%NDF	58.50	56.20	57.35
%TDN	66.00	65.00	65.50
NEL	0.61	0.62	0.62
RFV	99	106	102.50
% N	2.43	2.66	2.54
% P	0.29	0.30	0.30
% K	2.56	2.71	2.64
% S	0.18	0.21	0.20
lbs N/acre	88.04	94.02	91.03
lbs P/acre	10.498	10.62	10.56
lbs K/acre	92.672	95.934	94.30



Single Species: No-Till Planted Winter Rye after Corn in Mid-September @ 150 lb/ac  
Harvest Mid May at Boot Stage for Silage, Then plant Corn







# You Decide – Does it Fit Your System

- But if I wait to harvest my cover crop as forage, won't I lose yields on my summer crop?
- What about my nitrogen credit??
- Won't I miss out on early spring field prep?





# What about Species & Varieties

Winter Triticale

May 8, 2013

Winter Rye



AVERAGES-Champlain Valley*		
	Rye	Triticale
%DM	16.25	18.96
Yield (DM Ton/ac)	1.58	0.96
% Crude Protein	16.35	17.00
%ADF	32.90	31.16
%NDF	57.05	55.26
%TDN	67.00	66.40
NEL	0.63	0.63
Relative Feed Value	103	110
% N	2.62	2.72
% P	0.29	0.28
% K	2.53	2.23
% S	0.18	0.22
lbs N/acre	82.15	53.90
lbs P/acre	9.16	5.61
lbs K/acre	80.18	44.68

**170**

**\$85**

**105**

**\$52**

\*all values are on a dry matter basis

Winter Rye & Winter Triticale Drilled into Pasture			
Crop	Rye Average	Triticale Average	
%DM	17.00	17.50	
Yield (DM Ton/ac)	1.37	0.90	
% Crude Protein	16.80	20.20	
%ADF	32.90	27.30	
%NDF	56.75	49.15	
%TDN	68.50	70.00	
NEL	0.65	0.71	
RFV	104	128	
lbs N/acre	73.26	57.83	
lbs P/acre	7.76	5.73	117
lbs K/acre	66.07	53.54	

**147**



May 11, 2013





# CHAMPLAIN VALLEY CROP, SOIL & PASTURE TEAM

## 2013 On-Farm Research & Demonstration

- Tillage Radish in Pastures
- Summer Annuals
- Double Cropping
- Cover Crop Mixtures

Year 1: Winter Triticale  
*Winter 2012*

R1	150# Triticale
	100# Triticale
	Control
R2	150# Triticale
	100# Triticale
	Control
R3	150# Triticale
	100# Triticale
	Control
R4	150# Triticale
	Control
	100# Triticale

Year 2: BMR Sudangrass  
*Summer 2013*

SG 32#	SG 55#	SG 32#	SG 55#
SG 32#	SG 55#	SG 32#	SG 55#





# Summer Annuals for Grazing





# Other Stuff Planted as Strip Trials

Wonderleaf Pearl Millet @ 20 lbs
Wonderleaf Pearl Millet @ 30 lbs
Summer Feast Mix* @ 20 lbs
Summer Feast Mix* @ 30 lbs
Japanese Millet @ 20 lbs
Japanese Millet @ 30 lbs
Homestead Mix** @ 15 lbs
Homestead Mix** @ 25 lbs

*repeated in tilled plots side-by-side*

*\*Summer Feast Mix: Pearl Millet/Forage Brassica*

*\*\*Homestead Mix: Japanese Millet/Tillage Radish/SunnHemp*

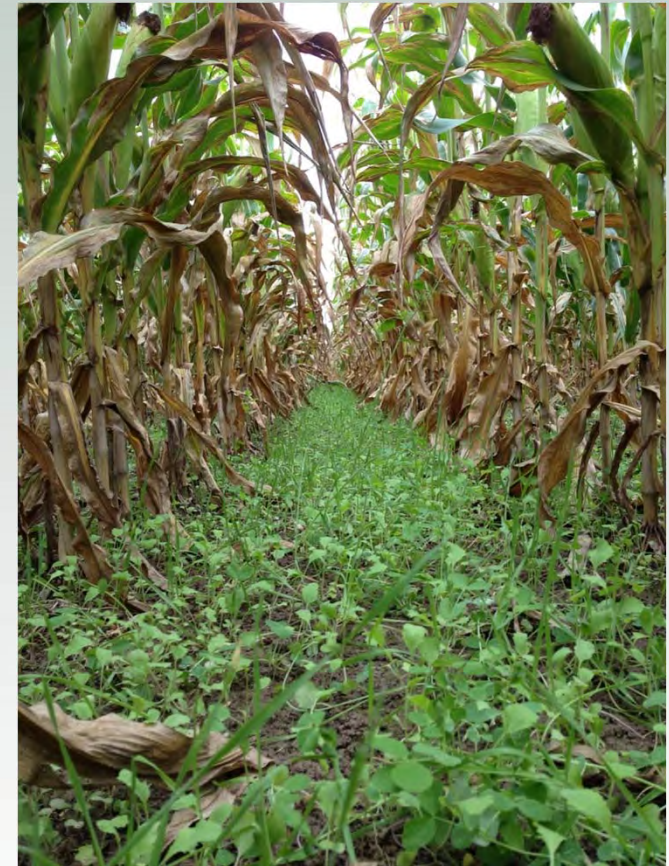
Barkant Turnip @ 12 lbs
Windham Winter Pea @ 50 lbs
Southern Clay/Iron Pea @ 50 lbs
Radish/Turnip/Forage Brassica @ 15 lbs
Sunn Hemp @ 60 lbs
Forage Oats @ 75 lbs
Winter Triticale @ 112 lbs
Winter Rye @ 150 lbs





# Cover Crop Diversity in No Till Systems

R1	Mix 1 @ 116 lbs
	Mix 2 @ 116 lbs
	Mix 2 @ 50 lbs
	Control ( <i>Winter Rye @ 100 lbs</i> )
	Mix 1 @ 50 lbs
R2	Mix 2 @ 116 lbs
	Mix 2 @ 50 lbs
	Control ( <i>Winter Rye @ 100 lbs</i> )
	Mix 1 @ 50 lbs
	Mix 1 @ 116 lbs
R3	Mix 2 @ 116 lbs
	Mix 1 @ 116 lbs
	Mix 2 @ 50 lbs
	Mix 1 @ 50 lbs
	Control ( <i>Winter Rye @ 100 lbs</i> )



**Mix 1** = (*winter kill*)

**Mix 2** = (*winter hardy*)

**Control** = 100 lb/ac

**Oat / Cow Pea / Tillage Radish**

**Triticale / Winter Pea / Forage Brassica**

**Winter Rye**

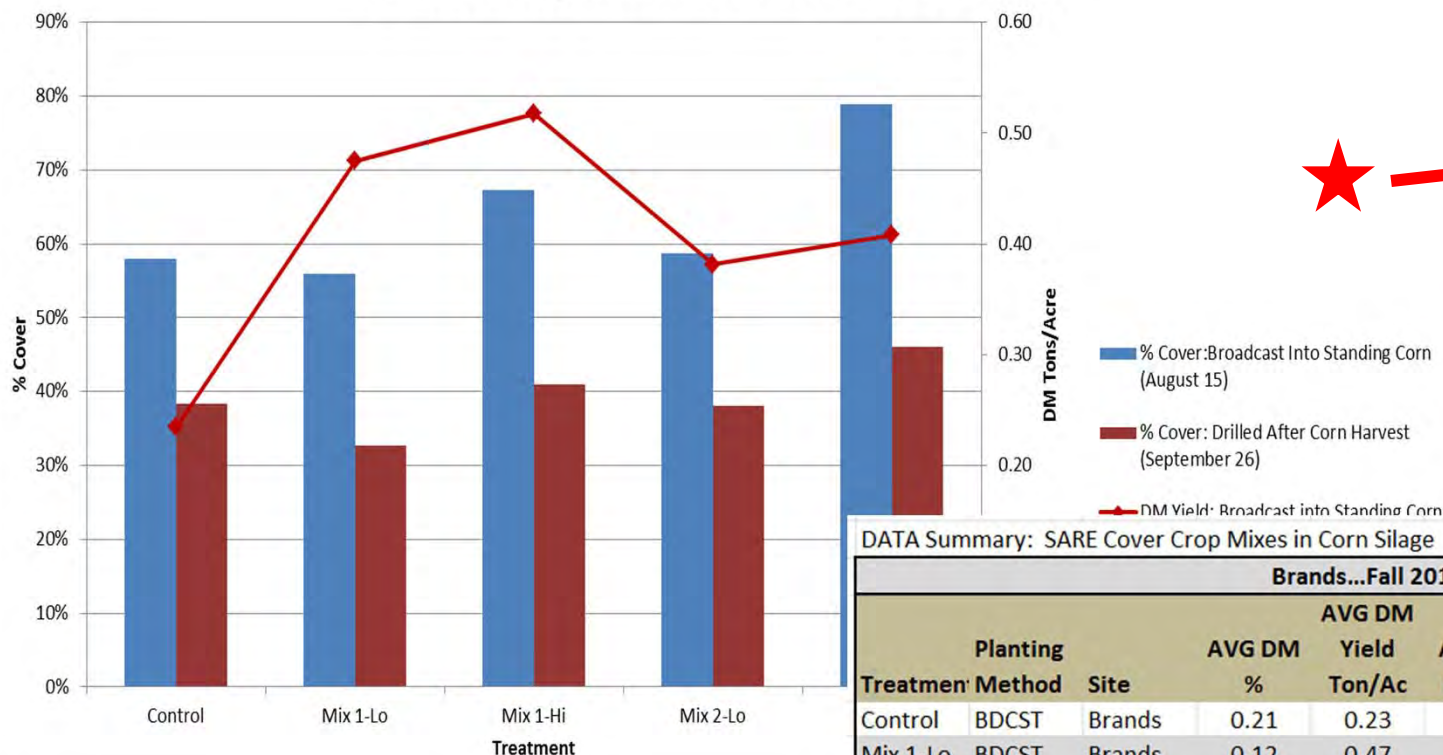
First planting date = August 16<sup>th</sup> (*broadcast into standing corn*)

Second planting date = September 26<sup>th</sup> (*after corn silage harvest with no-till drill*)



# Cover Crop Diversity in No Till Systems

% Cover & Dry Matter Yield: Measured 11-01-2013



DATA Summary: SARE Cover Crop Mixes in Corn Silage

Brands...Fall 2013								
			AVG DM					
Treatment	Planting Method	Site	AVG DM %	Yield Ton/Ac	AVG lbs N/acre	AVG lbs P/acre	AVG lbs K/acre	AVG % Cover
Control	BDCST	Brands	0.21	0.23	18	2	17	58%
Mix 1-Low	BDCST	Brands	0.12	0.47	34	3	32	56%
Mix 1-High	BDCST	Brands	0.12	0.52	36	4	39	67%
Mix 2-Low	BDCST	Brands	0.14	0.38	31	3	25	59%
Mix 2-High	BDCST	Brands	0.12	0.41	29	3	23	79%
Control	DRILL	Brands	N/A					38%
Mix 1-Low	DRILL	Brands						33%
Mix 1-High	DRILL	Brands						41%
Mix 2-Low	DRILL	Brands						38%
Mix 2-High	DRILL	Brands						46%

- Percent Ground Cover
- Biomass Yield
- Nutrient Recovery
- Forage Value



## Better Cover Crop Mixes in Vermont

Seed Budget 2014:

## Vermont NRCS Cover Crop Standards

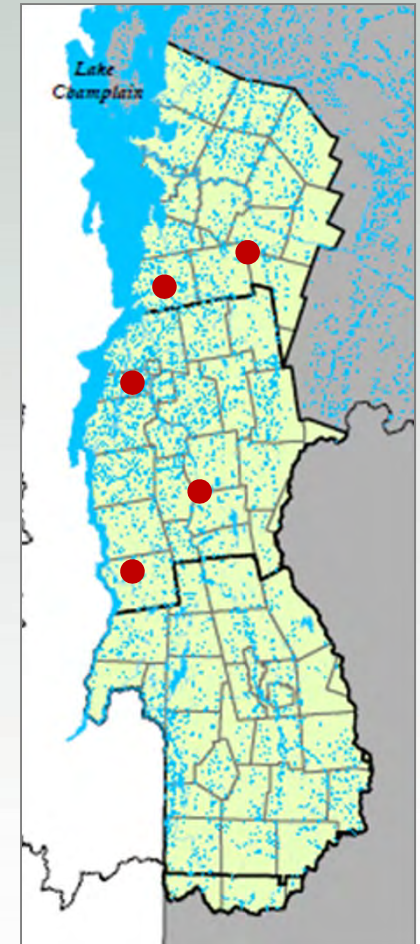
Mix	Cereal Grain		Legume		Brassica		TOTAL (Mix)	Seed Price
	Species	lb/ac	Species	lb/ac	Species	lb/ac	lb/ac	\$/ac
1	Forage Oats	25	Field Peas	15	Tillage Radish	5	45	\$ 29.80
2	Winter Triticale	25	Aust. Winter Peas	15	Rapeseed	5	45	\$ 21.25
3	Annual Ryegrass	10	Aust. Winter Peas	15	Tillage Radish	5	30	\$ 32.50
4	Winter Wheat	25	Aust. Winter Peas	15	Tillage Radish	5	45	\$ 31.25
5	Annual Ryegrass	10	Clover-Berseem	5	Tillage Radish	5	20	\$ 35.00
6	Winter Triticale	25	Clover-Berseem	5	Forage Turnip	5	35	\$ 36.25
7	Forage Oats	25	Hairy Vetch	5	Caliente Mustard	5	35	\$ 37.60
8	Winter Triticale	25	Hairy Vetch	5	Caliente Mustard	5	35	\$ 37.60
9	Winter Rye	25	Aust. Winter Peas	15	Forage Turnip	5	45	\$ 32.75
10	Winter Rye	25	Clover-Crimson	5	Rapeseed	5	35	\$ 20.50



# Better Cover Crop Mixes in Vermont

## 2014 - 2016

<b>Mix #1</b>	<b>Forage Oats</b>	<b>25 lb/ac</b>	<b>Mix #6</b>	<b>Winter Triticale</b>	<b>25 lb/ac</b>
	<b>Field Peas</b>	<b>15 lb/ac</b>		<b>Berseem Clover</b>	<b>5 lb/ac</b>
	<b>Tillage Radish</b>	<b>5 lb/ac</b>		<b>Forage Turnip</b>	<b>5 lb/ac</b>
<b>Mix #2</b>	<b>Winter Triticale</b>	<b>25 lb/ac</b>	<b>Mix #7</b>	<b>Forage Oats</b>	<b>25 lb/ac</b>
	<b>Austrian Winter Peas</b>	<b>15 lb/ac</b>		<b>Hairy Vetch</b>	<b>5 lb/ac</b>
	<b>Rapeseed</b>	<b>5 lb/ac</b>		<b>Caliente Mustard</b>	<b>5 lb/ac</b>
<b>Mix #3</b>	<b>Annual Ryegrass</b>	<b>10 lb/ac</b>	<b>Mix #8</b>	<b>Winter Triticale</b>	<b>25 lb/ac</b>
	<b>Austrian Winter Peas</b>	<b>15 lb/ac</b>		<b>Hairy Vetch</b>	<b>5 lb/ac</b>
	<b>Tillage Radish</b>	<b>5 lb/ac</b>		<b>Caliente Mustard</b>	<b>5 lb/ac</b>
<b>Mix #4</b>	<b>Winter Wheat</b>	<b>25 lb/ac</b>	<b>Mix #9</b>	<b>Winter Rye</b>	<b>25 lb/ac</b>
	<b>Austrian Winter Peas</b>	<b>15 lb/ac</b>		<b>Austrian Winter Peas</b>	<b>15 lb/ac</b>
	<b>Tillage Radish</b>	<b>5 lb/ac</b>		<b>Forage Turnip</b>	<b>5 lb/ac</b>
<b>Mix #5</b>	<b>Annual Ryegrass</b>	<b>10 lb/ac</b>	<b>Mix #10</b>	<b>Winter Rye</b>	<b>25 lb/ac</b>
	<b>Berseem Clover</b>	<b>5 lb/ac</b>		<b>Crimson Clover</b>	<b>5 lb/ac</b>
	<b>Tillage Radish</b>	<b>5 lb/ac</b>		<b>Rapeseed</b>	<b>5 lb/ac</b>





# Winter Rye & Tillage Radish

## 2014-16 Trials:

- What's the right mix?  
**120 vs 75/2 vs 50/4**
- How early can we seed it into corn silage?
- Best of both worlds?
  - Quick cover and deep nutrient cycling
  - Winter rye there to take up nutrients released by radish
  - Less Cost and More Benefits ?





# DUAL PURPOSE FORAGE COVER CROPS

## Brassicas

Tillage Radish

Forage Brassica

Turnip

Rape

- Increase forage quality)
- Nematode suppression
- Bio-tillage (taproots)
- Turnip, swede, rape, kale, mustard, radish
- Select forage-type varieties



Seed at 1.5 – 2 lbs./ac (turnip/swede)

3 – 4 lbs./ac (rape/kale)

5 – 15 lbs./ac (tillage radish)



# DUAL PURPOSE FORAGE COVER CROPS

Annual Ryegrass *Lolium multiflorum*

## Italian Ryegrass

- Quick-growing, non-spreading bunch grass
- Reliable, versatile, affordable
- Erosion fighter, soil builder, weed suppressor, nutrient catch crop, nurse crop
- Good forage crop:
  - Palatable
  - Grazing and Hay
  - Grazing beef with corn ARG & corn stubble



Seed at 20 -25 lbs/ac alone  
*10-15 lbs/ac in mixture*



# DUAL PURPOSE FORAGE COVER CROPS

Field Peas

*Pisum sativum*

annual legume

## Austrian Winter Peas

- Winter hardy ... questionable in the northeast
- Heat sensitive
- Competitive in sod
- Top N producers
- Quick growing (plant spring, harvest Memorial Day for summer varieties)
- Forage booster (esp. w/ grains)
  - Significantly boost protein
  - Slight yield bump



Seed at 50 – 100 lbs./ac.



# DUAL PURPOSE FORAGE COVER CROPS

## Hairy Vetch *Vicia villosa* winter annual legume

- Fall planted slow to start, but vigorous in spring
- Usually planted with a cereal grain or in other mixtures, increases winter hardiness
- 10-20% hard seed = potential weed issue in subsequent seasons.
- Used in vegetable & no-till corn systems primarily
- 'tangled mass of mature vetch' can be difficult to terminate
- Grazing value....fair to good



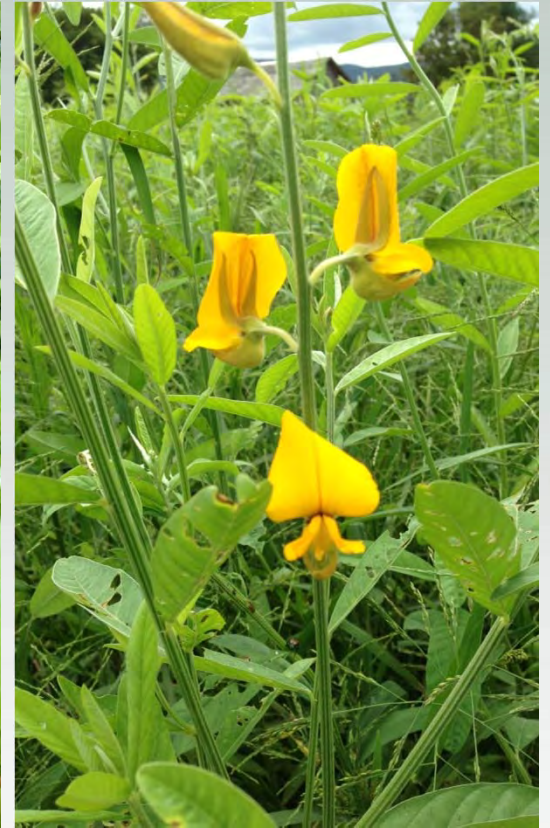
Seed at 15 – 30 lbs/ac



# DUAL PURPOSE FORAGE COVER CROPS

## Summer Annuals

- Millet (*does NOT compete drilled into sod*)
- Sorghum, Sudangrass, Sudex (*prussic acid*)
- Teff
- Sunn Hemp (*Crotalaria juncea*)
- MIXTURES!
- Good 'Emergency Forage' options and rotation crops





# DUAL PURPOSE FORAGE COVER CROPS

Cow Peas *Vigna unguiculata* summer annual legume

- Quick green manure
- IPM insectary crop (nectar)
- Good companion crop (shade)
- Easy to establish
- Drought tolerant, once established
- Forage Value:
  - Protein
  - Harvest/graze when pods fully formed
- We did NOT have good luck in 2013!



Seed at 30 – 90 lbs./ac (drilled)  
70 – 90 lbs./ac (broadcast)



# DUAL PURPOSE FORAGE COVER CROPS

Red Clover *Trifolium pratense* perennial legume

- Widely adapted
- Lots of uses
- Vermont State Flower!!
- Wide range of establishment options (germinates down to 41 degrees F, tolerance to shade)
- Great for frost seeding (cereal grains, pastures)
- Great rotation crop
- Multiple cuts/grazings
- Other CLOWERS: white, berseem,



Seed at 10 – 12 lbs./ac alone  
2 – 6 lbs./ac in mix/frost seeded



# DUAL PURPOSE FORAGE COVER CROPS

## Oats *Avena sativa*

cool season annual cereal

- Quick growing
- Affordable, versatile
- Nutrient catch crop
- Thrive in cool, moist conditions & well-drained soil
- Choose leafier, 'forage-type' varieties
- Great for early spring and late summer/early fall forage
- Common nurse crop selection
- Graze and/or mechanically harvest (oat hay, 'oatlage')



Seed at 3 bu/ac alone,  
1.5 bu/ac in pasture/nurse crop  
*32 lbs/bushel*



# DUAL PURPOSE FORAGE COVER CROPS

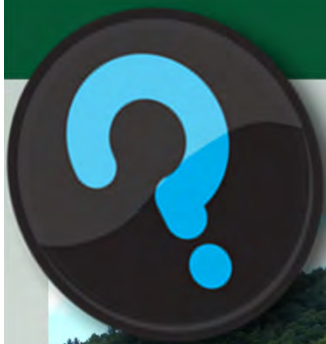
Winter Rye *Secale cereale* cool season annual cereal

- Easy to establish, longer planting window
- Great for 'double cropping systems'
- Nutrient scavenger
- Erosion control
- Higher yielding than other cereal grains
- Very winter hardy in VT
- Graze or cut in boot stage for best quality
- Spring termination can be tricky



Seed at 2-3 bu/ac alone  
1 – 2 bu/ac in mixtures  
*56 lbs/bushel*





# QUESTIONS??





# COVER CROPS



## *For More Information:*

UVM Extension  
23 Pond Lane, Suite 300  
Middlebury, VT 05753  
802-388-4969

[champlain.crops@uvm.edu](mailto:champlain.crops@uvm.edu)

<http://www.uvm.edu/extnson/cvcrops>

*Champlain Valley Crop, Soil & Pasture Team  
Helping You Put Knowledge to Work*

Information in this presentation  
was taken in part from:

*Managing Cover Crops Profitably  
(third ed.)*

SARE Handbook Series (#9)

*Midwest Cover Crops Field Guide*  
Midwest Cover Crop Council

*Description and Seeding Rates for  
Forage Crops in Vermont*  
Sid Bosworth, UVM

