Instructions for the MT-JS-340 Cover Crop Design Workbook

Version 1.00 -January 2012

MT-JS-340 consists of three worksheets and one reference Table (1); Design Sheet, Certification Sheet and Grazing Inventory Sheet. Sheets should be done in order starting with Design Sheet and ending with Grazing Inventory Sheet if cover crop is to be grazed. Table 1 provides information on individual cover crop species and is used to calculate seeding rates. All sheets should cleared of data before starting designing a new cover crop mix. Start with original file and "save as" another filename before entering data or use "Clear Worksheet" at the top right of each sheet to clear data from each sheet.

Macros must be enabled to allow calculations to run. To enable macros in Excel go to "Security Warning- Options" check "enable this content"

Sheets are set up to enter data required for documentation or design in the yellow-colored cells. Blue colored cells are for optional documentation that may be helpful to report or track data.

Sheets are protected and includes some choice lists, look up functions and calculations to assist the planner in designing a successful cover crop planting and to provide guidelines for grazing.

Use the tab key to move thru the worksheets, hitting {ENTER} after data entry or with the mouse by clicking on the cell that you want to work in.

Help comments are noted with the small red triangle in the upper right-hand corner of a cell.

The MT-JS-340 will print out on three pages, the Cover Crop Design Sheet, the Cover Crop Certification Sheet and the Cover Crop Grazing Inventory Sheet(if needed).

Table 1 can be printed out for reference, printing on 11 x 17 paper should show entire table. Can filter table by clicking on drop down menus on line A3 for each column heading. Example: if you wish to show only those species that are in current cover crop mix click on drop drown menu in cell A3 and chose those species desired. REMEMBER TO CHECK (Select all) SO ALL SPECIES ARE SHOWING IN TABLE AFTER SELECTING BY ATTRIBUTES.

You may save the MT-JS-340 to the producer file as needed. Use "Save As" and use another name for the file so you do not overwrite the original workbook file.

Use the "Clear Worksheet" tab at the top right of each worksheet to clear all data from all worksheets before designing a new cover crop mix.

Cover Crop Design Sheet

Producers Objective(s) and Resource Inventory

Enter producers information on top of Design sheet, information will be carried over to other sheets. Must enter number of acres of planned cover crop in cell K8, this is used to populate table 2.

The Producer provides his or her top resource concern(s) to be addressed by use of a cover crop. Usually a cover crop will address more than one resource concern. Have the producer indicate the primary resource concern (with the number 1), then any additional concerns with 2, 3, etc. You do not have to indicate more than one.

Enter the predominate and/or the most limiting soil mapunit name and/or symbol in cells C-

Include appropriate soil loss estimates (before and after installation of the cover crop). These numbers are entered in Cells C-F line 21 and G-L line 21.

Enter the Soil Conditioning Index prior to and after installation of the cover crop in Cells C-F line 22 and G-L line 22.

Planned Cover Crop Species, Composition and Seeding Rates Table 2.

In order to get the cover crop species mix design area to work, the planner must enter the acres in cell K8 in the top section. This will populate the acres in this section. The same acres will be applied to each cover crop species in the seeding mix.

In column A (Species), select the cover crop species and enter the variety if desired in column B. The seeding depths (Col C) and full seeding rates(Col D) are populated from Table 1. The average seeding depth in inches is given in cell C42. This is a straight average of the recommended seeding depths for each species.

In column E (% mixture) enter percent of mixture as a decimal (10 % = .1)

Percent of mixture for all species is totaled in cell E42, percent does not have to equal 100%

In column F the recommended seeding rate (lbs/ac) is calculated from full seeding rate (d) x % mixture (f).

Repeat for each species to be included in the mix.

The recommended seeding rates are for a single species seeding that would be drilled, not broadcast. If broadcasting or spreading the cover crop on the surface and following with light incorporation, double the seeding rates to ensure an even, effective cover. The worksheet does not account for this increased seeding rate, it is the responsibility planner / producer to ensure adequate seed will be planted to meet the site conditions and planned purpose.

Enter planned inoculants or seed treatment, seeding dates, termination methods and dates, seedbed preparation, nutrient management, grazing and other information as needed. Producer and NRCS planner needs to sign and date sheet.

Cover Crop Certification Sheet

The top section with producer information is automatically populated from the data entered in the Design section. **Enter number of acres actually planted in cell LMNO10**

Table 3. Columns a, b and c and d will be populated from MT-JS-340 worksheet. Enter % of mixture actually planted in column d for each species and of % purity and germination in cols e and f. Enter # of seeds per pound from seed tag or use estimate from table 1 in column h. # of plants/ ft2 will be calculated in col I. Total PLS planted per acre for each species will be calculated in column j based on the number of acres entered in cell LMNO10 and total PLS for the mixture is calculated in cell N29.

Fill out seed analysis date, seeding rate, seedbed preparation, nutrient management, weed control, irrigation, grazing, termination date and method and comments sections as needed.

The person completing the checkout / certification will fill out the necessary blanks in order to document the installation of the practice.

There is space for both the producer and NRCS signatures at the bottom, along with an area for comments or notes.

Cover Crop Grazing Worksheet - MTJS340C

The top section with producer information is automatically populated from the data entered in the Design section.

Table 4. Enter individual species production information (if available) in column D, **Must enter total production /acre in cell G-H line 26**. # of acres to be grazed is populated from cell K8, total production will be calculated in column F. Enter % residue remaining (column G) and stubble height (column H) for each species(if available) and the average in cells N26 or O 26 respectively.

Enter method(s) used to calculate production of cover crop, i.e.. Five random 4.8 ft2 hoops in field, air dried for two weeks and weighed.

Table 5. Enter weight of cow/calf, dry cow, yearlings and heifers that will graze field.

Table 6. Choose animal type and enter # animals that will graze field. Enter dry weight production of individual species in column e or total production in cell I-J line 65. Enter # of acres to be grazed by each animal type, total AUM'S for each animal type and estimated number of days for the acres grazed are calculated in column I.

Suggested Stocking Rate: Enter type, number of animals and number of days animals selected to graze field.

NOTE: Stocking Rate is a planned or estimated rate only, amount of cover crop removed will depend on site specific details and should be used as a tool only. Animals should be removed to ensure soil quality objectives are meet. Follow "Take half and leave half" philosophy with a minimum of six inches of residue remaining.

Consider dividing pasture or adjusting stocking rates to ensure animals graze pasture efficiently. Monitor grazing, animal numbers and residue levels to ensure soil health and animal health objectives are met.

To protect and ensure animal health, test for nitrate concentration of cover crop mix prior to grazing. Test for Prussic acid if sorghum, sudan grass or sorghum sudan hybrids are in mix.

There is space for both the producer and NRCS signatures at the bottom.

TABLE 1 Cover Crop - Common Species and Properties

This table provides information on common cover crop species for use in Montana. This list is not all inclusive however, but it intended to give sufficient guidance to producers and planners to design an effective cover crop system for their operation. Consult the state agronomist for species not on the list.

There are two macro buttons available, they are located on the upper left-hand corner.

Sort for Purposes - This will sort the table by the planned purpose indicated on the MT-JSS-340 sheet. This will sort the species list by the rating (i.e.. Good to Poor) for the purpose, to aid in the selection of the cover crop species.

Return to Alphabetical Order - Clicking this button will simply return Table 1 back to alphabetical order by species.

Cover Crop Design Worksheet - Montana- MT-JS340A

Note: Yellow areas indicate required data. Blue areas indicate optional data.

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Name: | **Program:**
Address: | **Contract #:**
Field Number: | **Contract Item Number:**
Section: | **Township:** | **Range:** | **Acres:**

Indicate the decision-maker's objective(s) for applying cover crop, in priority order (1, 2, 3,etc.)

	Reduce Erosion wind and water		Increase soil organic matter
	Capture and recycle or redistribute nutrients		Biological Nitrogen fixation
	Increase biodiversity		Suppress weeds
	Manage soil moisture		Minimize and Reduce Soil Compaction

Design soil mapunit: ssssss

	Existing Condition Without Cover Crop	**Planned Condition** With Cover Crop
Erosion rates (water, wind):		
Soil Condition Index:		

Table 2. Planned Cover Crop Species, Composition and Seeding Rates

Plant Species (a)	Cultivar (b)	Average Seeding Depth (Inches) (c)	Full Seed Rate #/ac (d)	% of Mixture (enter as a decimal) (e)	Rate PLS LBS./Ac (f)	# Acres (g)	Total PLS Planned (lbs/acre) (h)
Mixture Total	**All Species**						

Inoculant/ Seed Treatment Needed

Plant Species: | **Inoculant Type/Name:**
Plant Species: | **Inoculant Type/Name:**
Plant Species: | **Inoculant Type/Name:**

Planned Seeding Date: | **Planned Seeding Depth:**
Termination Method: | **Seeding Method:**
Fertilization: | **Termination Timing:**

Estimated seeding rate (lbs/acre):

NOTE: Double the seeding rate if seed is broadcast

Seedbed Preparation:

Nutrient Management: Follow 'Fertilizer Guidelines for Montana Crops' MSU Extension Publication #EB161.

Soil Test Analysis: Date: N; **lb/ac** P; **ppm** K; **ppm**

Recommendation: Date: N; **lb/ac** P; **lb/ac** K; **lb/ac**

Weed Control:

Irrigation: No Yes

Cover Crop to be Grazed? **No** **Yes**

Grazing: Planned percent to be grazed and cover crop height after grazing.

Other:

Producer Signature **Date**

I hereby certify that this practice has been installed in accordance with NRCS standards and specifications.

NRCS Signature **Job Class** **Date**

Planned By: _____ **Date:** _____

Cover Crop Certification Worksheet - Montana- MT-JS340B

Note: Yellow areas indicate required data. Blue areas indicate optional data. Version 1.00- January 2012

Name: _____ **Program:** _____

Address: _____ **Contract #:** _____

Field Number: _____ **Contract Item Number:** _____

Section: **Township:** **Range:** **Acres:** _____

Instructions: Document producer's actual cover crop planting information below. Attach photos of the cover crop in producer's file

Table 3. Actual Cover Crop Species, % Compostion, Seeding Rates and Plants /ft2

Plant Species (a)	Cultivar (b)	Full Seeding Rate (lbs/ac) (c)	Actual % of Mixture (d)	From Seed Tag (1) (Enter as a decimal)		PLS Actual Rate lbs./ac (3) (g)	# Seeds/lbs (h)	Estimated # of Plants/ft2 (i)	Total PLS Planted (lbs/ac) (j)
				% Pure (2) (e)	% Germ (2) (f)				
Mixture Total	**All Species**	0.0	0%			0.00	0.00	0.0	0.0

1. Date of Seed Analysis (from tag): _____

2. Convert to decimal form for calculations. 97.00 % germ = .97

3. PLS (Pure Live Seed) Actual Rate = Rate (lbs/ac)/(Germination (% in decimal form) x Purity (% in decimal form))

Actual seeding rate (PLS lbs/acre): _____

Actual Seeding Depth (inches): _____

Actual Seeding Date: _____

Seedbed Preparation:

Nutrient Management: Follow 'Fertilizer Guidelines for Montana Crops' MSU Extension Publication #EB161

Soil Test Analysis:		N;		P;		K;	
	Date:		**lbs of actual N/ac**		**ppm**		**ppm**
Recommendations:		N;		P;		K;	
			lbs of actual N/ac		**lbs $P_2 0_5$/ac**		**lbs $K_2 0$/ac**
Actual Applied (lbs/acre)		N;		P;		K;	
	Amount & Formulation		**lbs of actual N/ac**		**lbs $P_2 0_5$/ac**		**lbs $K_2 0$/ac**

Weed Control:

Irrigation: No Yes **Amount Applied (in.)**

Grazing: Planned percent to be grazed and cover crop height after grazing.

Termination Date

Termination Method:

Cover crop height at termination (inches): Actual

Cover Crop Production at Termination (lbs/ac): Actual

Comments:

Producer Signature **Date**

I hereby certify that this practice has been installed in accordance with NRCS standards and specifications.

NRCS Signature **Job Class** **Date**

Cover Crop Grazing Worksheet - Montana- MT-JS340C

Note: Yellow areas indicate required data. Blue areas indicate optional data.

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Name: _____ **Program:** _____
Address: _____ **Contract #:** _____
Field _____ **Contract Item Number:** _____
Section: _____ **Township:** _____ **Range:** _____ **Acres:** _____

Table 4. Cover Crop Species, % Composition, Production and Residue Remaining

Species (a)	Cultivar (b)	% Composition (c)	Production Per Acre (lbs/ac Dry Wt.) (d)	# acres (e)	Total Production (f)	% residue Remaining (g)	Stubble Height inches (h)
Total:		0.0%				Avg:	Avg:

Production Calculation Method: Enter hoop size or method of calculating cover crop production

Table 5. If animal type is cow/calf, dry cow, yearlings or heifers enter average weight of animal in table 5.

Notes: The general rule of thumb for animal unit month (AUM) forage requirements varies roughly between 790 to 915 pounds, This can vary depending upon many factors including animal intake and efficiency, physiological crop stage and nutritional value of forage This worksheet uses 1 AUM = 915 pounds and a harvest efficiency of 30% or .30. Reference: NRPH Chapter 6.

*For a cow/calf the AU factor is 1.0 + .1 for the calf. For a 1000 lb cow with calf would be 1.0 x 1.1 = 1.1 AUE

MT-JS-340C Grazing sheet (cont)

** For a dry cow, multiply the AU factor of the cow, without the .1 added in for the calf, by .83 to get the AUE. (For example, A 1200# cow would be 1.2 x .83 = 1 AUE).

*** For yearling cattle and heifers, figure 0.1 of an AU per 100# of body weight. (For example, A 950# yearling would be 0.95 AU).

Table 5.

Animal	Weight
Cow/calf*	
Cow, Dry**	
Yearlings*	
Heifers***	

Table 6.

Animal Type(a)	AUE (b)	# of Animals (c)	Au's (d)	Production Dry Weight # per ac	AUMs/Ac (f)	Acres (g)	Total AUM's (h)	Estimated # days Grazing (i)
			Total:					

Total # of Acres: _____ Total Cover Crop Production: _____

Selected Stocking Rate

Animal Type: _____ # of Animals: _____ # of Days _____ Aums/ac _____
Animal Type: _____ # of Animals: _____ # of Days _____ Aums/ac _____
Animal Type: _____ # of Animals: _____ # of Days _____ Aums/ac _____

NOTE:

Nitrate levels in cover crop mixes can vary depending upon species and site growing conditions, test for nitrate levels before cutting or grazing. If sorghum, sudangrass or sorghum-sudangrass hybrids are present in mix test for prussic acid before grazing. Be careful of turning livestock into lush cover crop mixes if current diet is mostly dry forage.

Comments:

APPROVALS:

Producer Signature **Date**

I hereby certify that this practice has been installed in accordance with NRCS standards and specifications.

NRCS Signature **Job Class** **Date**

Table 1: Cover Crop - Common Species and Properties - Montana

Cover Crop	Scientific Name	Seed size (Large or Fine)	Crop Type /2	Estimated # seeds/oz		Estimated # Seeds/LB	Seeding rate, lbs/acre			Seeding depth, inches			Salinity tolerance	C:N Ratio	Attract Beneficial Insects	Mycorrhizal fungi association
				Low	**High**		**Low**	**Mean**	**High**	**Low**	**Mean**	**High**				
		10	**11**				**12**					**13**	**14**	**15**	**16**	**17**
Alfalfa	*Medicago sativa*	**F**	**CB**	**14,175**		**226,800**	**5**	5		**0.25**	**0.63**	1	**F**	**L**	**N**	**M**
Barley, Spring	*Hordeum vulgare*	L	CG	850		**13,600**	50	55	60	0.75	**1.38**	2	G	M	Y	L
Beet	*Beta vulgaris*	L	CB	1530		**24,480**	2	2		0.50	**0.63**	0.75	F	L	N	L
Beet, Sugar	*Beta vulgaris*	F	CB	1530		**24,480**	2	2		0.25	**0.38**	0.5	G	L	N/A	L
buckwheat	*Fagopyrun esulentum*	F	WB	1275		**20,400**	40	45	50	0.50	**1.00**	1.5	P	L	Y	N/A
Camelina	*Camelina sativa*	F	CB	24970		**399,520**	5	5		0.25	**0.38**	0.5	N/A	M	N/A	N/A
Canola,spring	*Brassica napus, B. rapa, B. junceau*	F	CB	7200	11875	**152,600**	5	5		0.25	**0.50**	0.75	G	L	Y	N/A
Chickpea, desi	*Cicer arietinum L.*	L	CB	50	100	**1,200**	80	90	100	1.00	**1.50**	2	P	L	N/A	M
Chickpea, kabuli	*Cicer arietinum L.*	L	CB	100	125	**1,800**	125	138	150	1.00	**1.50**	2	P	L	N/A	M
Clover, Berseem	*Trifolium alexandrinum*	F	CB	12930		**206,880**	5	5		0.25	**0.63**	1	F	L	Y	L
Clover, Crimson	*Trifolium incarnatium L.*	F	CB	9360		**149,760**	5	5		0.25	**0.50**	0.75	P	L	Y	N/A
Clover, Red	*Trifolium pratense L*	F	CB	17010		**272,160**	4	4		0.25	**0.50**	0.75	P	L	Y	N/A
Clover, Strawberry	*Trifolium fragiferum L.*	F	CB	18000		**288,000**	4	4		0.25	**0.38**	0.5	G	L	Y	L
Clover, Sweet	*Melilotus lffkck a.ks(L.) Lam.*	F	CB	16,160		**258,560**	6	6		0.25	**0.63**	1	F	L	Y	M
corn	*Zea mays*	L	WG	85		**1,360**	10	20	30	1.00	**1.25**	1.5	P	H	N/A	H
cowpea	*Vigna unguiculata*	L	WB	225		**3,600**	20	30	40	1.00	**1.25**	1.5	P	L	Y	M
flax	*Linum usitatissimum L.*	F	CB	5,045		**80,720**	25	30	35	0.75	**1.13**	1.5	P	H	N/A	H
lentil	*Lens culinaris*	F	CB	395	650	**8,360**	40	45	50	1.00	**1.25**	1.5	P	L	N/A	M
Millet, Siberian or Foxtail	*Setaria italica*	F	WG	11510	15565	**216,600**	4	8	12	0.25	**0.50**	0.75	F	M	N/A	H
millet,Pearl	*Pennisetum americanum*	F	WG	5145		**82,320**	10	15	20	0.25	**0.50**	0.75	F	M	N/A	H
millet,Proso	*Panicum miliaceum*	F	WG	5300		**84,800**	15	23	30	0.25	**0.50**	0.75	F	M	N/A	H
millet		L	WG			**0**	15	15		0.25	**0.50**	0.75	F	M	N/A	H
Oat, Spring	*Avena sativa*	L	CG	1000	1425	**19,400**	50	60	70	0.50	**1.00**	1.5	P	M	N	L
Pea, Austrian Winter	*Pisum sativum subsp.arvense*	L	CB	1400	3500	**39,200**	80	100	120	1.50	**2.00**	2.5	P	L	Y	M
Pea, Field	*Pisum sativum L. subsp. sativum var. arvense (L.) Poir.*	L	CB	115		**1,840**	80	140	200	1.50	**2.00**	2.5	P	L	Y	M
radish	*Raphanus sativus*	F	CB	2,125		**34,000**	8	8		0.25	**0.38**	0.5	P	L	Y	N/A
safflower	*Carthamus tinctorius*	L	WB	825		**13,200**	15	23	30	1.00	**1.25**	1.5	F	M	N	H
soybean	*Glycine max (l.) Merr*	L	WB	175	435	**4,880**	20	20		1.00	**1.25**	1.5	P	L	N/A	M
sorghum,grain or forage	*Sorghum bicolor (L.) Moench subsp. Bicolor*	L	WG	850	2270	**24,960**	5	7	8	0.50	**1.00**	1.5	F-G	M	Y	H
sudangrass	*Sorghum bicolor (L.) Moench nothosubsp. Drummondii*	L	WG	2355	3175	**44,240**	25	28	30	0.50	**1.00**	1.5	F-G	M	Y	H

Table 1: Cover Crop - Common Species and Properties - Montana

Cover Crop	Scientific Name	Seed size (Large or Fine)	Crop Type /2	Estimated # seeds/oz		Estimated # Seeds/LB	Seeding rate, lbs/acre			Seeding depth, inches			Salinity tolerance	C:N Ratio	Attract Beneficial Insects	Mycorrhizal fungi association
				Low	**High**		**Low**	**Mean**	**High**	**Low**	**Mean**	**High**				
		10	**11**				**12**					**13**	**14**	**15**	**16**	**17**
sorghum sudangrass hybrid	*Sorghum x drummondii (Steud.) Millsp. & Chase.*	L	WG	1080		**17,280**	15	15		0.50	**1.00**	1.5	F-G	M	Y	H
sunflower,conf.	*Helianthus annus L.*	L	WB	125	312.5	**3,500**	4	5	6	0.50	**0.75**	1	F	M	Y	H
sunflower,oil	*Helianthus annus L.*	L	WB	312.5	562.5	**7,000**	2	3	3	0.50	**0.75**	1	F	M	Y	H
Teff	*Eragrostis tef*	F	WG	81250		**1,300,000**	5	6	7	0.25	**0.38**	0.5	F	M	N	L
Triticale, Spring	*Triticosecale*	L	CG	769		**12,300**	50	60	70	0..75	**2.00**	2	G	M	N	L
Triticale, Winter	*Triticosecale*	L	CG	769		**12,300**	45	55	65	0.75	**1.38**	2	G	M	N	L
turnip	*Brassica rapa*	F	CB	15,195		**243,120**	8	8		0.25	**0.38**	0.5	P-F	L	N/A	N/A
Vetch, Chickling	*Lathyrus sativus*	L	CB			**3,300**	60	60		1.50	**2.25**	3	P	L	Y	L
Vetch, Hairy	*Vicia villosa Roth subsp. Villosa*	L	WB	1020		**16,320**	25	28	30	0.50	**1.00**	1.5	P	L	Y	M
Wheat, Spring	*Triticum aestivum*	L	CG	710		**11,360**	50	55	60	0.75	**1.38**	2	P	M	N	L
Wheat, Winter	*Triticum aestivum*	L	CG	710		**11,360**	40	50	60	0.75	**1.38**	2	P	M	N	L

Name changed
Variety Added
Value changed

/1 Rooting Depth/Water Use		/2 Crop types
SL=		
SM=		
SH=		
ML=		
MM=		
MH=		
DL=		
DM=		
DH=		

Ratings	
L = Low	G = Good
M = Medium	F = Fair
H = High	P = Poor
N/A = Not Available	

	12
barley	50
berseem clover	8
buckwheat	48
canola	5
corn	20
cowpea	30
flax	50
hairy vetch	15
lentil	80

Cover Crop Species	Seeding Rate lb/ac
barley	50
buckwheat	40
canola	5
corn	14
cowpea	30
flax	30
hairy vetch	15
lentil	50

Table 1: Cover Crop - Common Species and Properties - Montana

Cover Crop	Scientific Name	Seed size (Large or Fine)	Crop Type /2	Estimated # seeds/oz		Estimated # Seeds/LB	Seeding rate, lbs/acre			Seeding depth, inches			Salinity tolerance	C:N Ratio	Attract Beneficial Insects	Mycorrhizal fungi association
				Low	High		Low	Mean	High	Low	Mean	High				
		10	11				12					13	14	15	16	17
												medic	8		medic	10
												millet	25		millet	15
												mustard, tame	5		mustard	5
												oat	80		oat	80
												pea	50		pea	50
												radish	8		radish	8
												Red beet	8		red clover	10
												safflower	30		safflower	15
												sorghum	35		sorghum	10
												soybean	45		soybean	45
												spring rye or wheat	60		spring rye	60
												sudangrass, sudan-sorghum hybrid	35		spring wheat	60
												sugarbeet	8		sudan	20
												sunflower	4		sugar beet	6
												sweet clover	6		sunflower	4
												triticale	60		sweet clover	3
												turnip	8		triticale	60
												winter rye or wheat	60		turnip	8
															winter rye	60
															winter wheat	60

x

MT-JS-340 version 1.00 - January 9,2012

This worksheet was adapted from North Dakota Cover Crop Design Workbook (ND-CPA-305) and was changed to fit Montana NRCS guidelines. If you have questions about this worksheet please contact the Montana State Agronomist - patrick.hensleigh@mt.usda.gov