

## **Chouteau County Winter Wheat is in Excellent Condition for Soil Moisture**

The Chouteau County Soil Moisture Survey was started by Judee Wargo in 1993 to assist farmers with determining recropping potential on cereal grain stubble. After 25 years, the Chouteau County Extension Office continues to compile data for determining recropping potential and providing the state drought committee with soil moisture information.

Due to extended frost, soil moisture monitoring was one month late for 2018. Testing for soil moisture took place in Chouteau County on April 16<sup>th</sup> – April 18<sup>th</sup>. All winter wheat and fallow locations exceeded 3.5 feet of stored soil moisture, which is equivalent to approximately 5.25 inches of available water in a sandy loam soil. A medium textured soil like a silt loam would have approximately 7 inches of available water. A moderately fine soil like sandy clay loam would have almost 8 inches of available water, and a fine textured soil like sandy clay would have 7 inches of available water in the soil. A winter wheat crop in medium textured soils and favorable weather conditions will require only two inches of growing season precipitation to yield a 42 bushel crop.

The majority of stubble plots in Chouteau County have excellent recropping potential. Soil with excellent recropping potential under favorable conditions will require only four inches of growing season precipitation for 25-37 bushel per acre spring wheat crop. Under the same conditions, barley will require four inches of growing season precipitation for a 33-54 bushel per acre crop.

Five stubble locations in Northwest and Northcentral Chouteau County scored in the fair range (4-4.9 inches of available water) in recropping potential. Recropping areas scoring in the fair range will require 5-6 inches of growing season precipitation to yield a 30-bushel per acre spring wheat crop.

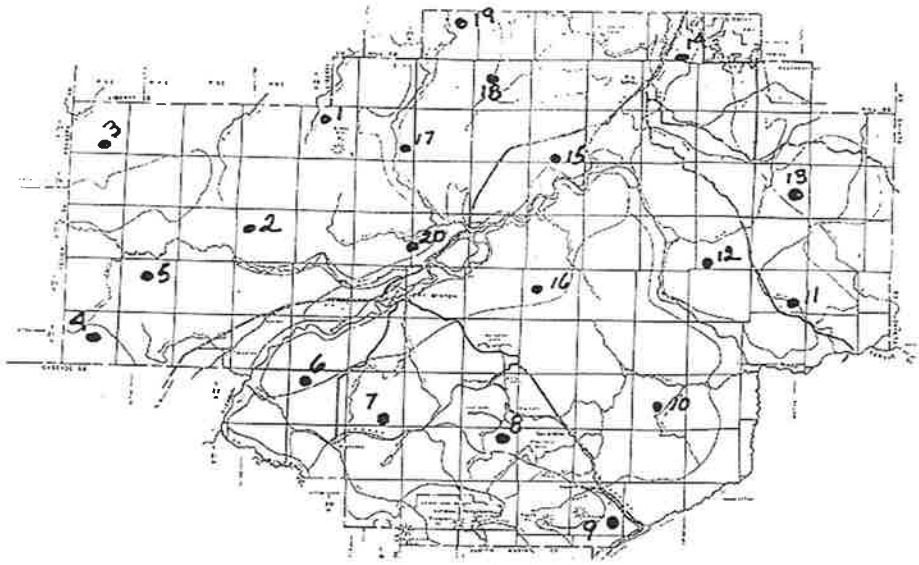
Hard copies of the 2018 Soil Moisture Survey are available at the Chouteau County Extension Office.

*Montana State University, U.S. Department of Agriculture and Montana Counties Cooperating. MSU Extension is an equal opportunity/affirmative action provider of educational outreach.*

# MSU Extension Chouteau County 2018 Soil Moisture Survey

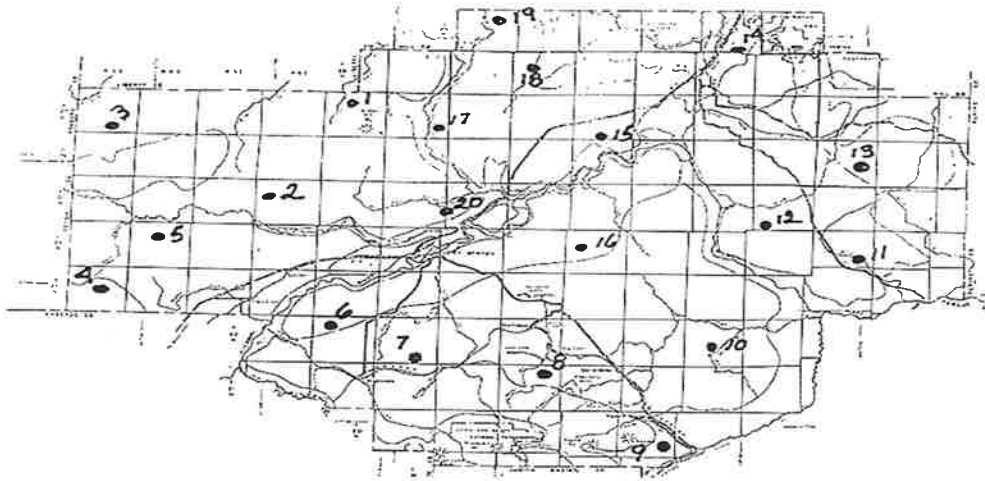
Testing for soil moisture took place from April 16-18. All winter wheat and fallow locations exceeded 3.5 feet of stored soil moisture. A crop in medium textured soils will require only 2 inches of growing season precipitation to yield a 42 bushel per acre crop.

Recropping potential was excellent for 15 out of 20 stubble plots (Sheet 2). Plots 2,3, 15, 17 and 19 scored in the fair range for recropping potential. Poor recropping potential is less than 3.9 inches of available water. Fair recropping potential is 4-4.9 inches of available water. Excellent recropping potential is greater than 5.0 inches of available water.



Tyler Lane, MSU Extension Agent  
Chouteau County

DEPTH OF MOISTURE INCHES IN FALLOW OR WINTER WHEAT																										
#	Soil	93	94	95	96	97	98	99	2000	1	2	3	4	5	6	7	8	10	13	14	15	16	17	2018	25 year average	
1	Med	28	42	24	36	18	20	12	14	16	6	12	20	30	22	34	25	40	26	19	42	42	42	42	42	26.61
2	Modc	19	32	8	42	21	16	10	14	10	4	22	22	30	30	30	4	40	44	42	42	22	42	42	42	25.57
3	Modf	23	30	20	42	30	12	13	26	14	17	26	34	37	24	36	24	42	20	42	42	42	42	42	42	29.57
4	Modf	20	27	20	36	20	26	22	30	18	11	14	24	25	24	34	15	42	26	42	42	20	42	42	42	27.04
5	Modf	30	28	16	32	22	15	15	12	12	4	6	20	40	33	22	6	42	30	42	42	26	42	42	42	25.17
6	Modf	16	22	24	24	42	16	18	30	10	10	26	24	30	39	26	12	20	42	42	42	42	42	42	42	27.87
7	Modf	24	36	30	24	30	19	24	24	24	11	20	25	39	20	34	6	42	42	42	42	42	42	42	42	29.74
8	Modf	15	24	26	42	23	26	15	20	14	10	12	22	36	26	24	10	38	42	42	42	25	42	42	42	26.87
9	Modf	12	24	30	42	28	28	20	11	24	12	21	32	40	18	42	10	27	42	42	42	42	42	42	42	29.26
10	Modf	30	20	22	42	27	24	12	33	16	6	25	20	42	36	26	34	42	42	42	42	42	42	42	42	30.83
11	Modf	16	24	14	39	26	31	22	24	20	9	13	16	26	22	24	6	38	42	42	42	42	42	42	42	27.04
12	Modf	30	32	28	40	36	23	23	30	18	15	24	12	21	20	14	3	38	42	42	42	42	42	42	42	28.65
13	Modc	20	20	16	26	14	35	28	10	15	6	22	24	38	14	28	16	38	42	42	42	42	42	42	42	27.04
14	Modc	30	35	24	32	23	26	30	24	17	8	12	16	26	35	26	18	40	42	42	42	42	42	42	42	29.30
15	Modf	26	32	26	32	33	18	13	14	6	9	30	14	25	23	20	4	38	42	42	42	30	42	42	42	26.22
16	Med	26	36	42	36	33	24	28	26	13	8	12	34	37	36	30	26	42	42	42	42	42	42	42	42	32.22
17	Modf	18	24	26	32	24	20	10	18	14	12	30	22	36	24	32	8	42	42	18	42	42	42	42	42	26.96
18	Modf	24	30	20	36	30	19	34	22	20	14	25	34	42	30	39	6	42	42	42	42	42	42	42	42	31.26
19	Modf	27	24	20	32	26	22	26	11	14	12	17	32	30	24	23	4	42	42	26	42	42	42	42	42	27.04
20	Modf	24	26	24	34	26	22	14	24	14	14	23	30	30	20	32	4	38	30	20	42	17	42	42	42	25.74



**DEPTH OF MOISTURE INCHES IN STUBBLE**

#	Soil	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2013	2014	2015	2016	2017	2018	AVG
1	Med	42	26	10	32	23	15	13	12	11	12	11	15	23	18	36	8	42	16	19	42	25	41	35	22.91
2	Modc	14	26	10	32	27	12	10	11	12	4	22	20	19	28	14	12	42	14	17	42	12	34	33	20.30
3	Modf	42	26	10	40	24	22	9	15	12	12	12	14	31	13	23	24	42	16	20	42	18	42	34	23.61
4	Modf	24	30	10	26	24	14	16	20	16	18	13	12	26	20	13	12	42	19	24	42	20	42	42	22.83
5	Modf	24	24	10	24	18	14	12	15	13	4	12	14	24	24	18	12	22	14	16	42	16	23	33	18.61
6	Modf	18	24	30	28	36	12	19	24	13	12	14	20	24	20	25	12	15	19	42	42	42	42	42	25.00
7	Modf	30	42	30	24	28	16	18	18	30	11	11	20	20	25	24	14	34	22	35	42	42	42	42	26.96
8	Modf	20	22	26	38	24	12	26	11	12	12	14	22	34	23	24	10	24	27	38	42	20	42	42	24.57
9	Modf	16	16	22	36	22	12	12	12	19	12	15	26	18	25	24	10	27	15	42	42	42	42	42	23.87
10	Modf	24	22	24	32	25	15	12	28	8	9	20	26	34	28	38	24	26	14	20	42	42	42	42	25.96
11	Modc	20	26	16	30	24	16	15	15	12	10	12	14	26	24	17	5	17	16	16	42	24	42	42	20.91
12	Modc	30	22	30	32	18	14	23	14	20	18	12	22	16	24	20	3	20	16	28	42	17	42	40	22.74
13	Modc	20	20	18	34	23	14	22	12	12	7	14	22	20	30	25	3	24	15	15	42	20	42	42	21.57
14	Modc	21	28	16	32	27	10	25	16	24	10	20	22	18	30	30	6	24	17	37	42	24	42	42	24.48
15	Modf	42	30	14	34	23	14	18	5	12	7	12	12	18	20	14	4	24	11	20	42	20	38	27	20.04
16	Med	42	24	30	32	30	32	26	22	12	6	20	36	42	36	38	24	42	19	42	42	42	42	42	31.43
17	Modf	22	22	22	30	30	12	14	6	11	6	17	22	23	28	24	6	21	13	18	42	18	38	24	20.39
18	Modf	18	20	22	42	24	10	18	18	16	7	20	42	19	38	24	4	40	13	22	42	42	42	42	25.43
19	Modf	22	26	12	36	24	6	20	15	18	11	14	26	24	20	12	3	34	13	15	42	24	42	25	21.04
20	Modf	22	30	18	32	22	29	20	18	14	8	12	18	26	18	25	8	20	16	18	42	10	39	42	22.04

Table 1. Plant available water capacities for soil textural classes in Montana.<sup>1</sup>

		Soil Textural Class	Estimated Average Plant AWC (in/ft) <sup>2</sup>
Sandy soils	Coarse texture	Sands	0.5
		Loamy sands	1.0
	Medium texture	Loamy fine sands	} 1.25
		Loamy v. fine sands	
		Fine sands	
V. fine sands			
Loamy soils	Moderately coarse texture	Sandy loam	} 1.5
		Fine sandy loam	
	Medium texture	V. fine sandy loam	} 2.0
		Loam	
		Silt loam	
		Silt	
	Moderately fine texture	Clay loam	} 2.2
		Sandy clay loam	
		Silty clay loam	
Clayey soils	Fine texture	Sandy clay	} 2.0
		Silty clay	
		Clay	

<sup>1</sup> Approved by Soils Committee, MSU, Plant and Soil Science Planning Conference. January 31, 1984.

<sup>2</sup> Soil depth measured to depth of crop rooting or depth of root limiting layers.

NOTES

Soluble salts and gravel will decrease plant available water capacity; whereas, organic matter, and good soil structure will increase it. The capacity increases about 0.1 inch for each 1% organic matter. Soils with water restricting layers like compact subsoils, shallow bedrock, or stratification can increase PAWC of the overlying layers. Soils that are deep, medium textured, and uniform can have decreased PAW but allow for deeper rooting.

Example: 3 feet of moist silt loam: 3' x 2.0"/ft. = 6" available water.

Montana and North Dakota

Barley

Table 4. Estimated Barley Yields<sup>a</sup> Based on Stored Soil Water and Seasonal Rainfall

Available Soil Water At Seeding to 4 Feet		Growing Season Precipitation ---- Inches										
		2	3	4	5	6	7	8	9	10	11	12
Inches		Bushels per Acre <sup>b</sup>										
1	With less than	0	0	5	12	19	26	33	40	47	54	61
2	2" of seasonal	0	5	12	19	26	33	40	47	54	61	68
3	rainfall, barley	5	12	19	26	33	40	47	54	61	68	75
4	will fail in	12	19	26	33	40	47	54	61	68	75	82
5	most years	19	26	33	40	47	54	61	68	75	82	
6		26	33	40	47	54	61	68	75	82	Dryland yields	
7		33	40	47	54	61	68	75	82	will seldom exceed		
8		40	47	54	61	68	75	82	82 bu/acre			

a. Unpublished data. Brown, Paul L., A. L. Black and Charles M. Smith.

b. Yields sometimes exceed estimates because of an abnormally favorable combination of soil and seasonal climatic conditions.  
Yields may be below estimates because of weeds, disease, low fertility, lodging and adverse climatic extremes.

Spring Wheat

Table 5. Estimated Spring Wheat Yields (2, 3) Based on Stored Soil Water and Seasonal Rainfall

Available Soil Water At Seeding to 4 Feet		Growing Season Precipitation ---- Inches											
		2	3	4	5	6	7	8	9	10	11	12	
Inches		Bushels per Acre <sup>a</sup>											
1	With less than	0	0	9	13	20	22	26	31	35	40	44	
2	2" of seasonal	0	8	13	17	22	26	30	35	39	44	48	
3	rainfall, spring	8	12	17	21	26	30	34	39	43	48	52	
4	wheat will	12	16	21	25	30	34	38	43	47	52	56	
5	fail in most	16	20	25	29	34	38	42	47	51	56	60	
6	years.	20	24	29	33	38	42	46	51	55	60	64	
7		24	28	33	37	42	46	50	55	59	64	Dryland	
8		28	32	37	41	46	50	54	59	63	yields seldom exceed 64 bu/acre		

a. Yields may exceed estimates because of an abnormally favorable combination of soil and seasonal climatic conditions.  
Yields may be below estimates because of weeds, disease, low fertility, lodging and adverse climatic extremes.

Table 6. Estimated Winter Wheat Yields (based on stored soil water and seasonal rainfall)<sup>1</sup>.

Available soil water <sup>2</sup> to 4 feet at seeding (or early spring)	Growing Season Precipitation - Inches																	
	2		3		4		5		6		7		8		9		10	
	A	F	A	F	A	F	A	F	A	F	A	F	A	F	A	F	A	F
<u>Inches</u>	<u>Bushels per acre</u>																	
1	0	0	0	0	4	7	8	14	12	21	16	28	20	35	24	42	28	49
2	0	0	4	7	8	14	12	21	16	28	20	35	24	42	28	49	32	56
3	4	7	8	14	12	21	16	28	20	35	24	42	28	49	32	56	36	63
4	8	14	12	21	16	28	20	35	24	42	28	49	32	56	36	63	40	70
5	12	21	16	28	20	35	24	42	28	49	32	56	36	63	40	70	44	77
6	16	28	20	35	24	42	28	49	32	56	36	63	40	70	44	77	48	84
7	20	35	24	42	28	49	32	56	36	63	40	70	44	77	48	84	52	91
8	24	42	28	49	32	56	36	63	40	70	44	77	48	84	52	91	56	99
9	28	49	32	56	36	63	40	70	44	77	48	84	52	91	56	98	60	105
10	32	56	36	63	40	70	44	77	48	84	52	91	56	98	60	105	64	112

A - Average condition with some problems such as weed, disease, fertility, high temperature and wind.  
 F - Favorable growing conditions: No weed, disease, or insect problems, good fertility and climate.

<sup>1</sup> Unpublished data - Paul L. Brown.

<sup>2</sup> Determine available soil water by soil moisture probing to determine moist soil depth and convert to inches according to the soil textures; page 15.