Northwestern Agricultural Research Center Field Day

July 18, 2019

11:00 am **Registration and Introductions**

11:30 Scott Buxbaum – NWARC Farmer Advisory Chair
11:35 Dr. Jessica Torrion – MSU NWARC Superintendent
11:40 Dr. Darrin Boss – MSU Research Center Department Head
11:50 Dr. Sreekala Bajwa – MSU Vice President and Dean, College of Agriculture

12:00 pm **Lunch**

Andy Lybeck – CHS and Market update
Bob Konen – Columbia River Basin Update

1:00 pm **Field Tours**

Stop #1: **Corn Planting Date**.....5
Jordan Penney — MSU Northwestern Ag Research Center
Ken McAlpin – Producer

Stop #2: **Alfalfa dormancy and Moisture Availability**.....6
Dr. Jessica Torrion – Northwestern Ag Research Center
Scott Buxbaum – Producer

Stop #3: **Alfalfa Dormancy and Levels of P & K & Moisture**.....7
Amanda Shine & Thomas Fritz – Northwestern Ag Research Center
Ed Braaten – Producer

Stop #4: **Spring Wheat Breeding Program**
Dr. Luther Talbert & Mrs. Brittney Brewer-Jones – MSU Plant Science and Plant Pathology
Tryg Koch – Producer

Stop #5: **Annual Cereal Forages**.....8
Dr. Pat Carr – MSU Central Agricultural Research Center
Bridgett Lake-Cheff – Producer

Stop #6: **Winter Wheat Breeding Program Update**.....9
Dr. Phil Bruckner – MSU Plant Science and Plant Pathology
Andy Lybeck – Cenex Mountain West Co-op

Stop #7: **Barley Breeding Program Update**
Dr. Jamie Sherman – MSU Plant Science and Plant Pathology
Markus Braaten – Yara International

3:30 pm **Refreshments**

Northwestern Agricultural Research Center

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Northwestern Agricultural Research Center Staff

Left to right: Elliot Sanford, Mark Byers, Jessica Torrion, Maria Bay, Dove Carlin, Jordan Penney, Amanda Shine, Thomas Fritz, Sage Rasmussen

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Lake County

Dan Barz, Scott Buxbaum, Bridgett Lake-Cheff, Ken McAlpin, Jack Stivers

Sanders County

Juli Thurston

Corn Planting Date

Jordan Penney and Jessica A. Torrion

When planting corn, the rule of thumb is to plant when there is a 48-hour (2-days) window with soil temperature that does not drop much below 50°F (Elmore et al., 2018). After this window, if the temperature drops, the chilling injury to a germinating seed is close to zero. This lowered temperature however delays emergence, which exposes untreated seeds to soil-borne pathogens on cold and wet soil.

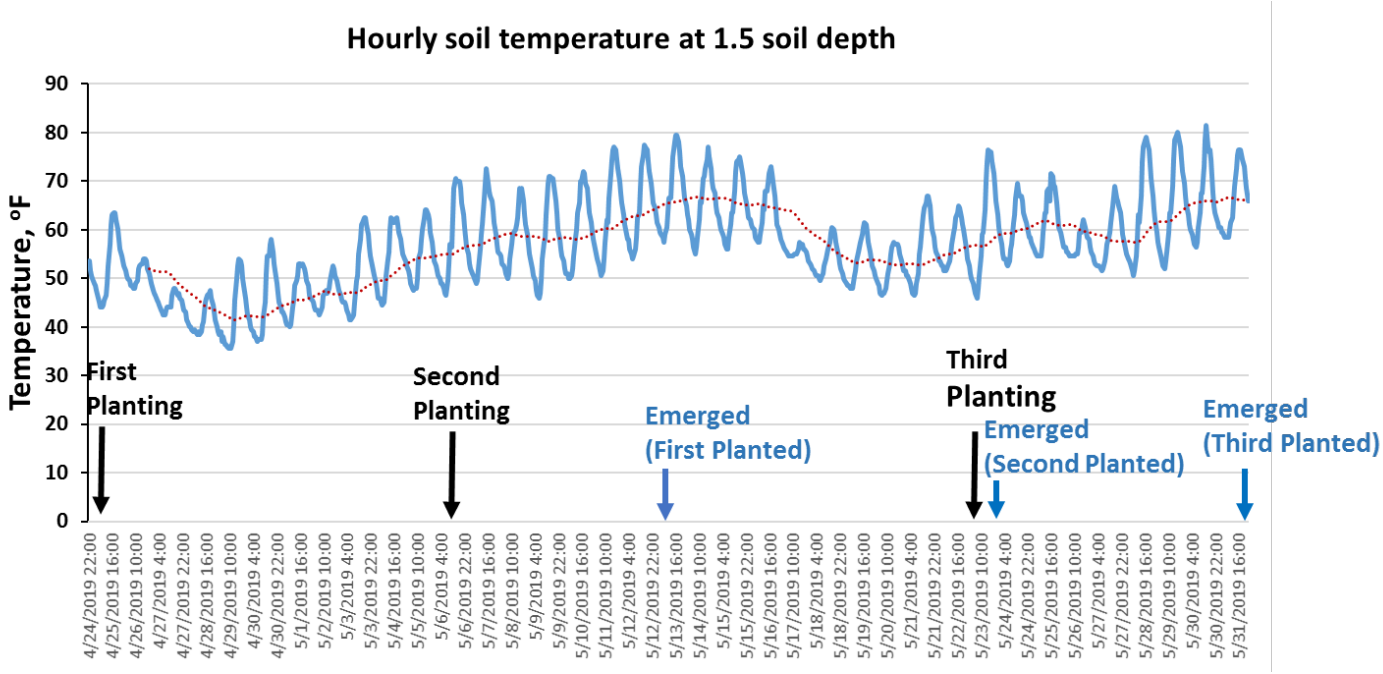

Figure 1. Hourly soil temperature at 1.5 soil depth and respective corn planting & emergence dates, NWARC, Kalispell, MT.

Table 1. Detailed Agronomic Management Information.

Soil: Creston silt loam	Soil analysis: 144-10-250 (lbs NO_3-N, P, K) Fertilizer applied: 130-50-20 (lbs N, P205, K20)
Relative Maturity: 75 and 80 days	
Planted: 1st PD- April 25, 2019 2nd PD- May 6, 2019 3rd PD- May 23, 2019 Emerged: 1st PD- May 13, 2019 2nd PD- May 23, 2019 3rd PD- June 1, 2019	Herbicide: Stinger- June 5, 2019 Roundup- June 10, 2019 Seed Treatment: both varieties were pre-treated

Useful reading material:

Elmore, R., H. Yang, and P. Grassini. Cold soil temperature and corn planting windows. Univ. of Nebraska CropWatch. https://cropwatch.unl.edu/2018/cold-soil-temperature-and-corn-planting-windows

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National Institute of Food and Agriculture

Alfalfa Dormancy and Moisture Availability

Jessica A. Torrion, Mike Ottman, Isaya Kisseka, Gerrit Hoogenboom, and Kenneth J. Boote

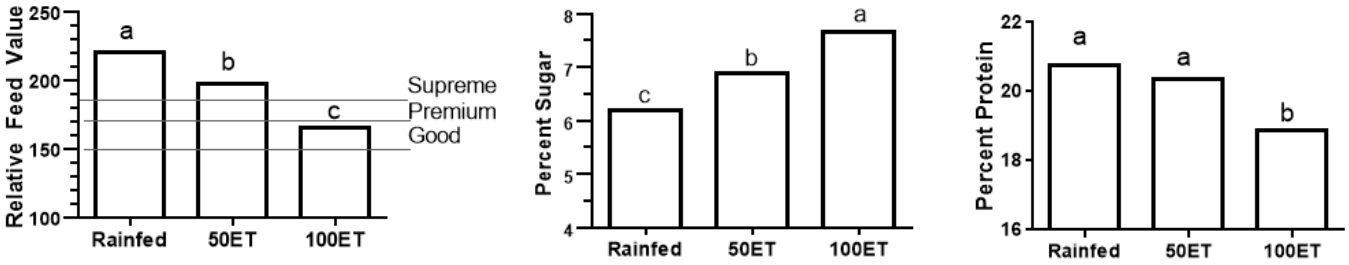
Table 1. Yields and water productivity. Different letter assignment denotes data are statistically different.

Year and Treatment	Yield per Cut (10% FLWR)		Total Yield	Water Productivity	
	1st (7/25)	2nd (9/26)		Irrigation	Total
2018 (1st year)	----------Tons/Acre----------			------Tons/inch -------	
Rainfed	**1.0** b	**0.5** c	**1.5** c	-	**0.25**
50ET	**1.2** ab (+1.3")	**1.4** b (+3.7")	**2.6** b (+5.0")	**0.22**	**0.23**
100ET	**1.4** a (+2.6")	**1.8** a (+7.3")	**3.2** a (+10.0")	**0.17**	**0.20**
Mean	*1.8*	*1.2*	*2.4*	*0.19*	*0.22*
2019 (2nd year)	1st (6/17)				
Rainfed	**2.6** b			-	**0.48**
50ET	**3.7** a (+ 1.2")			**0.92**	**0.56**
100ET	**3.9** a (+ 2.4")			**0.54**	**0.50**

2018 Notes: Available water in the soil (top 3-ft): 3 inches ; 2018: Total Rainfall from Emergence to Final Cut: 3.2 inches (3.0 inches were received from May 30-Jul 3, 2018)

Table 2. 2018 variety yield performance with moisture.

Cultivar	Fall dormancy	Rainfed	50ET	100ET
		---Total Yield Tons/Acre---		
Maxi Graze	2 (very dormant)	1.5	2.7	3.3
FSG229CR	2 (very dormant)	1.6	2.5	3.4
Rugged	3 (dormant)	1.5	2.6	3.2
Big Sky	3 (dormant)	1.6	2.4	3.1
Cisco II	6 (semi-dormant)	1.5	2.7	3.4
Hi-Gest 660	6 (semi-dormant)	1.4	2.4	3.0
Mean		*1.5*	*2.6*	*3.2*
CV		*0.05*	*0.05*	*0.05*
LSD		*ns*	*ns*	*ns*
Pr > F		*0.9501*	*0.1207*	*0.0541*



2018 Second Cutting's Relative Feed Value, Percent Sugar, and Protein. Different letter assignment means data are statistically different from each other.

Funded by Montana Fertilizer Advisory Committee

Phosphorus and Potassium Fertilization of Dormant to Semi-Dormant Alfalfa

Amanda Shine, Thomas Fritz, Jessica Torrion, Maryse Bourgault, and Emily Meccage

There are 2.8 million acres planted with hay in Montana. Alfalfa makes up 72% of total hay production and is valued at $478 million dollars. Alfalfa uses a large amount (luxurious consumption) of potassium (K). Alfalfa uses 50-60 lbs K_2O per ton of hay. This nutrient, along with phosphorus (P), is needed for root development, which is essential to alfalfa persistence.

Our goal with this project is to document yield, quality, and persistence of dormant to less-dormant alfalfa when P and K fertilizers are applied at or below optimum levels. This experiment is conducted across three environments: NWARC rainfed, NWARC irrigated, and NARC (Havre, MT) rainfed.

Table 1. Agronomic Management Information

Soil: Flathead fine sandy loam Spring Soil analysis: 22-15-99 (NO_3-N, P, and K respectively)	Seed Treatment: Apron XL & pre-treated Inoculant: PreVail (Verdesian)
Fertilizer applied: Pre-plant, incorporated, and packed Planted: May 22, 2019 at 30 live plants/ft^2 Emerged: May 29, 2019	Herbicide: Raptor- June 18, 2019

Table 2. Fertilizer Rates and Treatment Description

Fertilizer Rates	Description
0P/0K	Control
0P/1K	0 P_2O_5 / 170 lbs K_20
0P/.5K	0 lbs P_2O_5 / 85 lbs K_20
1P/1K	40 lbs P_2O_5 / 170 lbs K_20
1P/.5K	40 lbs P_2O_5 / 85 lbs K_20

Table 3. Alfalfa Varieties and Fall Dormancy (FD) Ratings

FD	Varieties
FD 2 (very dormant)	Maxi-Graze
FD 3 (dormant)	Rugged
FD 4 (dormant)	Alphatron
FD 5 (moderately dormant)	Saltiva
FD 6 (semi-dormant)	Cisco II
FD 7 (semi-dormant)	Magna

Annual Cereal Forage Testing
Montana State University

Patrick M. Carr, Phil Bruckner, Peggy Lamb, John Miller, and Zach Miller

The MSU Central Agricultural Research Center coordinates fall- and spring-seeded forage trials each year at research centers across the state. In 2018, those centers included the Northern Agric. Res. Ctr. near Havre, the Western Agric. Res. Ctr. near Corvallis, the Northern Triangle Agric. Res. Ctr. near Conrad, the Arthur H. Post research farm outside of Bozeman, and the Central Agric. Res. Ctr. near Moccasin. MSU plant breeders Phil Bruckner (winter wheat) and Jamie Sherman (barley) uses data from thee trials to help select for varieties suited for forage production within their respective programs. A summary of plant height and forage yield (tons of dry matter per acre) for a few of the entries in both trials is provided in the tables below.

MSU 2018 winter cereal forage trial - forage data

CULTIVAR	CROP	– – – – PLANT HEIGHT – – – –					– – – – FORAGE YIELD – – – –				
		BOZ	CON	COR	HAV	MOC	BOZ	CON/2	COR	HAV	MOC
		in					(tons DM/ac)				
Willow Creek	Wheat	58	48	42	35	45	6.8	9.0	2.6	3.2	2.2
Ray (MTF1432)	Wheat	45	33	32	27	34	5.1	8.7	2.3	2.8	2.8
Flex 719	Triticale	61	45	48	40	41	7.9	8.2	2.8	3.0	2.6
Trical 102	Triticale	63	47	49	39	44	7.7	7.2	3.9	3.3	2.6
WCF 1060	Triticale	68	47	49	41	51	8.0	8.9	2.4	3.5	3.0
EXPERIMENTAL MEANS		60	45	44	38	44	7.1	8.7	2.8	3.0	2.7
LSD (0.05)		5.7	3.5	5.3	2.6	3.2	1.8	NS	NS	0.4	NS
C.V.: (S / MEAN)*100		6.8	5.7	8	4.8	5.2	17.4	18.9	25.5	8.5	16.3
P-VALUE (Entries)		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.4	0.17	<0.0001	0.338

/1 BOZ = Bozeman, CON = Conrad, COR = Corvallis, HAV = Havre, MOC = Moccasin

/2 Conrad yields reported on a wet weight basis

2018 spring cereal forage trial

CULTIVAR	CROP	CON	HAV	MOC	CON	HAV	MOC
Haxby	Barley	18	40		4.1	1.1	2.9
Haybet	Barley	20	51		3.5	1.5	2.9
Hays	Barley	19	42		3.3	1.3	2.9
Lavina	Barley	20	45		2.9	1.3	2.6
Lucille	Emmer	27	59		2.9	1.3	2.8
Vida	HRSW	22	46		2.6	1.1	2.3
Otana	Oat	28	53		--	1.8	3.0
Gazelle	S. rye	40	72		2.5	1.4	2.8
Pronghorn	S. triticale	33	62		2.7	2.0	2.6
Tritical 141-2	S. triticale	36	68		3.3	1.5	2.8
EXPERIMENTAL MEANS		26	54		3.1	1.4	2.8
LSD (0.05)		2.2	2		0.5	0.2	0.3
C.V.: (S / MEAN)*100		5.8	3.1		11.6	8.0	7.8
P-VALUE (Entries)		<.0001	0.001		<0.0001	<.0001	0.001

MAES Winter Wheat

Northwestern Agricultural Research Center (NWARC) at Kalispell is an important winter wheat evaluation site for the MAES Winter Wheat Cultivar Development program. Historically, the Montana Intrastate winter wheat trial, which contains currently grown proprietary and public cultivars as well as candidate **experimental** lines, has been grown at NWARC. The trial contains 49 entries in three replications. Since 1990, the winter wheat Intrastate trial has been grown here in Kalispell 27 times, averaging 94 bushels/acre [range 47-144 bu/acre]. Kalispell is generally the highest yielding site in our trial and generally has higher levels of stripe rust, which makes it a useful site in developing stripe rust-resistant winter wheat cultivars.

Last year the Winter Wheat Intrastate yield trial at NWARC averaged 85 bushels/acre, varying from 125 bu/acre for a LimaGrain experimental line to 26 bu/acre for stripe rust susceptible cultivar Bearpaw. Over the last three years the trial was successfully grown [2017 trial lost due to flooding /waterlogged conditions] the highest yielding varieties were **Loma (120 bu/a), Warhorse (117 bu/a), WB4623CLP (116 bu/a), Northern (114 bu/a), Judee (113 bu/a) and SY Clearstone 2CL (113 bu/a). All these cultivars have excellent resistant to stripe rust.**

Foundation seed of two new MAES-developed winter wheat cultivars is currently being increased for release this fall to Montana Seed Growers. New winter wheat cultivars include:

Bobcat – solid stem, semi-dwarf hard red winter wheat with resistance to wheat stem sawfly. Bobcat has improved yield potential compared to other solid stem lines at Conrad, Havre, and other wheat stem sawfly infested locations.

Flathead – hollow stem, semi-dwarf hard red winter wheat with resistance to stripe rust and early heading date. This cultivar was developed in cooperation with NWARC following multiple cycles of phenotypic selection for stripe rust resistance at Creston.

Research projects in the near future:

-incorporation of a new effective gene [Wsm2] for wheat streak mosaic virus resistance

-development of additional winter wheat annual forage cultivars besides Ray and Willow Creek