

# MSU/MAES Hollow-Stemmed Winter Wheat Varieties

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## Description of selected varieties developed by MSU/MAES Winter Wheat Breeding Program:

**Decade** – hard red winter wheat developed by the Montana Agricultural Experiment Station and released jointly with North Dakota (pending at publication) in 2010. Decade is an early to medium maturing reduced height wheat with white chaff. Decade is a high yielding wheat with good winter hardiness and medium to high test weight and protein. Decade is resistant to prevalent races of stem and stripe rust. Decade has excellent milling and baking quality. PVP, Title V has been issued (Certificate #201100096).

**FourOsix** - hard red winter wheat developed by the Montana Agricultural Experiment Station and available to seed growers in fall 2018. FourOsix is a medium maturing, short to medium statured wheat, with average winter-hardiness. FourOsix is a high yielding variety with above average test weight and average protein. FourOsix (50% Yellowstone, in pedigree) is similar in grain yield of Yellowstone, but with significantly earlier heading, shorter plant height, and significantly higher test weight and protein. FourOsix is resistant to stripe rust and this resistance is either similar or significantly higher than that of Yellowstone. FourOsix is moderately susceptible to stem rust. FourOsix has excellent milling and baking qualities, comparable to Decade and parental cultivar, Yellowstone. PVP, Title V will be applied for.

**Northern** is a hard red winter wheat developed by the Montana Agricultural Experiment Station and released to growers in 2015. Northern was named to commemorate the 100<sup>th</sup> anniversary of the Northern Agricultural Research Center (NARC) in Havre, Montana. Northern is a medium-late maturing, medium-short statured wheat, with white chaff. Northern has average yield (similar to Yellowstone and Colter), average test weight, and average protein. Northern is resistant to both stem and stripe rust. Northern has above average milling and average baking properties (Table 3.) Northern is a low PPO cultivar with favorable Asian noodle color stability and noodle score. PVP, Title V has been issued (Certificate# 201600092).

**SY Clearstone 2CL** – a 2-gene CLEARFIELD hard red winter wheat developed by Montana Agricultural Experiment Station in 2012 and licensed exclusively to Syngenta Seeds. SY Clearstone wheat 2CL is very similar to Yellowstone. It is a medium maturing, medium tall, white chaffed wheat with average winter hardiness. It is a high yielding wheat with average test weight and protein. SY Clearstone 2CL is resistant to stripe rust and has moderate resistance to stem rust, the latter an improvement over Yellowstone. SY Clearstone 2CL is a medium PPO variety with average mill and above average bake properties. PVP, Title V has been issued (Certificate# 201300357). Additionally, the CLEARFIELD genes are patented.

**Yellowstone** – hard red winter wheat developed by the Montana Agricultural Experiment Station and released to seed growers in 2005. Yellowstone is a very high yielding winter hardy variety with medium test weight, maturity, height, and grain protein. Yellowstone has excellent baking and good Asian noodle quality. It is moderately resistant to TCK smut and resistant to stripe rust, but susceptible to stem rust. Yellowstone has been the leading winter wheat variety planted in Montana since 2012. PVP, Title V has been issued (Certificate #200600284).

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**Table 1. Yield of Hollow-Stemmed Winter Wheat varieties, 2016-2018<sup>1/</sup>**

Shaded entries are MSU/MAES developed varieties

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman	3 Huntley <sup>2/</sup>	4 Moccasin <sup>3/</sup>	5 Conrad <sup>4/</sup>	5 Have <sup>5/</sup>	6- Sidney & Williston	
location-years	2	2	12	10	10	8	4	48
<b>Keldin</b>	101.2	115.1	92.2	64.0	<b>73.8</b>	58.1	67.8	<b>76.1</b>
<b>SY Monument</b>	105.6	114.8	87.3	64.2	<b>71.2</b>	58.4	62.1	<b>74.1</b>
<b>Northern</b>	106.0	116.0	86.4	59.4	69.6	58.4	59.5	72.4
<b>SY Clearstone 2CL</b>	103.4	116.3	83.0	64.6	<b>70.0</b>	57.4	56.5	72.1
<b>Yellowstone</b>	89.3	116.2	84.2	60.3	<b>70.4</b>	58.2	60.5	71.6
<b>FourOsix</b>	113.7	111.4	84.5	61.9	68.7	54.8	56.0	71.5
<b>SY Wolf</b>	85.1	99.0	86.7	62.2	68.7	54.5	62.4	70.9
<b>Decade</b>	33.5	90.2	81.5	60.7	64.2	54.1	56.2	65.2
<b>LSD (0.05)</b>	<b>ns</b>	<b>ns</b>	<b>ns</b>	<b>ns</b>	<b>4.2</b>	<b>ns</b>	<b>ns</b>	<b>3.3</b>

**bold** = indicates highest value within a column

ns = non-significant

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

1/ = 2016-2018 Intrastate and 2017-2018 Off Station tests

2/ includes data from Fort Smith, Hardin area, Hysham Molt, Rapelje

3/ includes data from Belt, Denton, Geraldine, Highway, Winifred

4/ includes data from Choteau, Cut Bank, The Knees, Shelby

5/ includes data from Ft. Benton, Loma, Turner

**Table 2. Agronomic characteristics of Hollow-Stemmed Varieties, 2016-2018<sup>1/</sup>**

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Saw fly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	48	1	18		47	7	47	10	2	1
<b>Decade</b>	60.4	<b>69</b>	157.5	7-Jun	30.4	26	<b>12.7</b>	38	75	2.9
<b>FourOsix</b>	60.9	48	158.1	7-Jun	29.5	27	12.3	48	22	2.8
<b>Keldin</b>	61.4	<b>57</b>	158.3	7-Jun	30.2	32	12.1	45	50	2.8
<b>Northern</b>	60.6	49	160.6	10-Jun	30.3	31	<b>12.6</b>	42	33	2.6
<b>SY Clearstone 2CL</b>	59.8	48	159.4	8-Jun	33.2	39	12.2	52	47	2.9
<b>SY Monument</b>	60.2	<b>60</b>	156.5	6-Jun	29.3	26	11.7	45	18	3.1
<b>SY Wolf</b>	<b>61.9</b>	51	155.6	5-Jun	29.1	30	12.4	33	33	3.1
<b>Yellowstone</b>	60.1	<b>62</b>	159.7	9-Jun	31.8	29	12.2	48	51	2.7
<b>LSD (0.05)</b>	<b>0.4</b>	<b>12</b>	<b>0.8</b>		<b>0.6</b>	<b>ns</b>	<b>0.2</b>	<b>11</b>	<b>ns</b>	<b>0.2</b>

1/ = 2016-2018 Intrastate and 2017-2018 Off Station tests

ns = non-significant

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

**Table 3. Mill and bake characteristics of Hollow-stemmed Varieties, 2016-2017**

Variety	PPO <sup>1/</sup>	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	Ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	8	8	8	8	8	8	8	8	8	8	8
<b>Decade</b>	0.249	74.1	70.2	10.9	<b>0.41</b>	<b>3.5</b>	7.2	<b>66.4</b>	19.2	<b>76.6</b>	988
<b>FourOsix</b>	0.256	71.1	<b>71.6</b>	<b>11.7</b>	0.43	2.6	5.7	<b>67.2</b>	12.5	<b>77.1</b>	<b>1074</b>
<b>Keldin</b>	0.328	64.6	70.0	10.7	0.44	3.0	5.0	63.6	9.0	73.9	956
<b>Northern</b>	<b>0.104</b>	81.6	70.7	<b>11.5</b>	0.45	2.6	3.9	64.3	5.6	74.0	<b>1033</b>
<b>SY Clearstone 2CL</b>	0.271	71.5	69.3	11.1	0.42	<b>3.6</b>	5.4	64.5	8.9	74.7	1011
<b>SY Monument</b>	0.187	74.2	<b>71.6</b>	10.6	<b>0.41</b>	<b>3.5</b>	8.4	<b>64.9</b>	15.9	<b>75.7</b>	961
<b>SY Wolf</b>	0.250	73.1	70.1	10.7	<b>0.40</b>	1.9	4.2	60.9	6.8	70.9	956
<b>Yellowstone<sup>2/</sup></b>	0.228	67.7	68.9	10.6	0.43	3.3	8.0	66.1	18.0	76.8	989
<b>LSD (0.05)</b>	<b>0.044</b>	<b>3.8</b>	<b>0.7</b>	<b>0.5</b>	<b>0.02</b>	<b>0.6</b>	<b>1.3</b>	<b>2.3</b>	<b>3.3</b>	<b>2.4</b>	<b>44</b>

**bold** = indicates highest value within a column 2/ Yellowstone data is for 2016 only

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

1/ polyphenol oxidase, low is best for noodles