# 2021

# U.S. HARD RED SPRING WHEAT

# Regional Quality Report

# U.S. HARD RED SPRING Wheat

**MINNESOTA | MONTANA
NORTH DAKOTA | SOUTH DAKOTA
IDAHO | OREGON | WASHINGTON**

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## THE ARISTOCRAT OF WHEAT

Hard Red Spring, a specialty wheat grown primarily in the Northern Plains of the United States—stands out as the aristocrat of wheat when it comes to baking bread. The high protein content and superior gluten quality of hard red spring wheat make it ideal for use in some of the world's finest baked goods. Yeast breads, hard rolls and specialty products such as hearth breads, whole grain breads, bagels and pizza crusts look and taste their best when baked with top quality spring wheat flour. Even frozen dough products are better with spring wheat because they can be stored longer than those made with lower protein wheats.

Flour mills in the United States and around the world also use hard red spring wheat extensively as a blending wheat to increase the gluten strength in a batch of flour. Adding hard red spring to lower protein wheat improves dough handling and mixing characteristics as well as water absorption. The resulting flour can be used to make an assortment of bread products, as well as Chinese-type noodles.
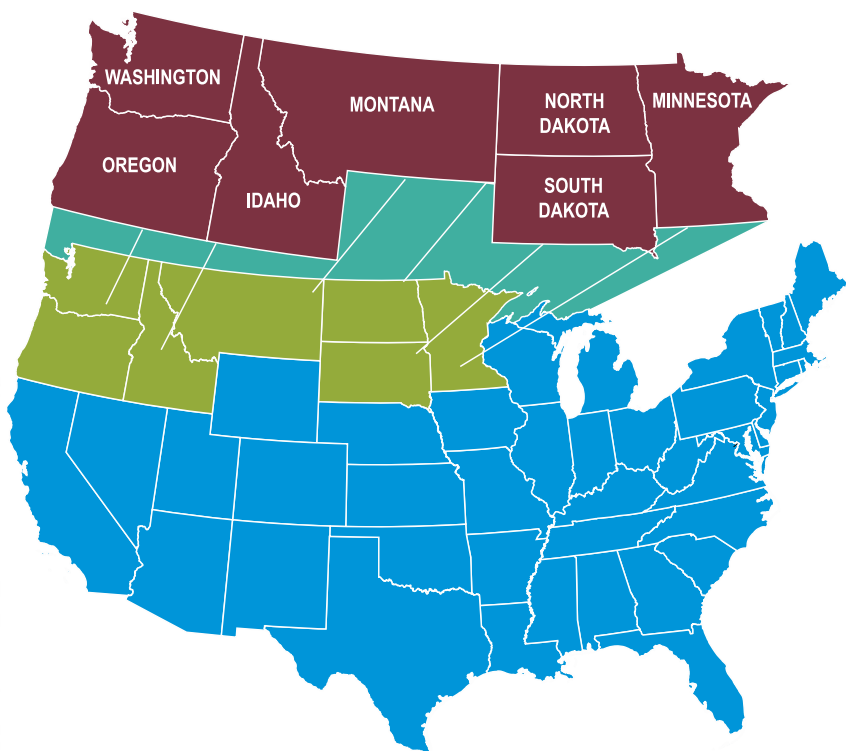
## OVERVIEW

**THE 2021** U.S. hard red spring wheat (HRS) crop endured significant drought conditions over much of the growing region, leading to well below average yields, and a higher than normal share of the planted acres abandoned for grain harvest. Total production is estimated at 297 million bushels (8.1 MMT), 44% below last year. Despite the moisture stressed growing season, quality parameters of the crop are very good, with high kernel protein, vitreous levels, soundness, and notable improvements in dough strength.

The **CROP AVERAGES** a No. 1 Dark Northern Spring, supported by improved vitreous kernel levels (DHV), compared to 2020 and the 5-year average. Grade distributions on survey samples, place 87% in the No. 1 grade, and five percent at No. 2 grade, slightly lower than 2020 grade distributions. The crop average test weight is 61.5 lbs/bu (80.8 kg/hl), slightly lower than 2020, but similar to the 5-yr average. Seventy-four percent of the crop is above 60 lbs/bu (78.9 kg/hl), but 10% falls below 58 lbs/bu (76.4 kg/hl), compared to just two percent in 2020, indicative of intense drought conditions in parts of the region. Average damaged kernel levels are very low at 0.1%, as disease pressures were minimal to non-existent, and harvest weather was favorable. Shrunken and broken kernels at 0.9% are slightly higher than the 5-yr average. Overall vitreous kernel levels, averaging 81%, are notably higher than the 72% level from a year ago, with the most notable year-to-year improvements across eastern areas. Nearly 80 percent of the samples exceed the 75% minimum level for Dark Northern Spring.

| PRODUCTION DATA | | | |
|---|---|---|---|
| | **2021** | **2020** | **2016-20 AVERAGE** |
| **MILLION BUSHELS** | | | |
| Minnesota | 56 | 72 | 64 |
| Montana | 37 | 125 | 74 |
| North Dakota | 175 | 276 | 218 |
| South Dakota | 17 | 36 | 24 |
| ID/OR/WA | 12 | 20 | 29 |
| **U.S. Total** | **297** | **530** | **409** |
| **MILLION METRIC TON** | | | |
| Minnesota | 1.52 | 1.96 | 1.75 |
| Montana | 1.01 | 3.40 | 2.02 |
| North Dakota | 4.76 | 7.51 | 5.95 |
| South Dakota | 0.46 | 0.98 | 0.66 |
| ID/OR/WA | 0.33 | 0.54 | 0.72 |
| **U.S. Total** | **8.08** | **14.4** | **11.1** |

Source: USDA 2021 Small Grains Summary

Crop average **PROTEIN** is 15.4% (12% moisture basis), a full percentage point higher than the 5-yr average, and the second highest on survey record. Protein levels are high region-wide, but are highest across western parts of the region. Distribution of protein on survey samples shows 86 percent above 14% protein. Kernel moisture is very low for a second straight year, averaging just 11.8%.

**THOUSAND KERNEL WEIGHTS** (TKW) are lower than 2020 and the 5-yr average, with the lowest across western areas. The crop average is 30.6 grams, ranging from a low of 23.8, in drought stressed areas, to a high of 34 grams in areas with less moisture stress during kernel fill. Disease pressures from Fusarium headlight were non-existent, and no detectable DON was found in any of the area composites. A dry, rapid harvest supported kernel soundness, with the crop average falling number of 398 seconds, and 96% of the samples exceeding 350 seconds.

**MILLING** analysis, based on a Buhler Lab Mill, averages 67.4% extraction, just slightly lower than 2020, but a point below the 5-year averages. The lab mill settings are not adjusted to account for kernel parameter shifts, so the lighter TKW's, and smaller kernel size likely impacted mill yields. Average flour ash is 0.50%, lower than 2020 and 5-year averages. Similarly, starch damage averages 5.6%, compared to 7.2 in 2020. Wet gluten values for the crop average 37.1, much higher than typical, reflective of the sharply higher kernel protein levels. The flour is showing an improvement in viscosity with an average Amylograph value of 705, compared to just 632 in 2020.

**PHYSICAL DOUGH** tests, based on the Farinograph, indicate the strongest crop in 15 years, with an average Farinograph stability time of 16.2 minutes, up from 11.8 in 2020, and 11.4 for 5-year averages. The surveyed crop is showing improved dough strength region-wide. Farinograph absorption, averaging 62.8%, is also higher than 2020's 61.6%, and similar to 5-year averages. Extensigraph analysis of the crop confirms the stronger dough properties, with less extensibilty. On the 135 minute pull on the Extensograph, the overall extensibility and resistance to extension is 12.4 cm and 1201 B.U., compared to 13.9 and 750 in 2020. Alveograph tests produced a crop average W-value of 415, up from 2020 and 5-year averages. The average P/L ratio on the Alveograph is 0.61 in 2021, similar to last year.
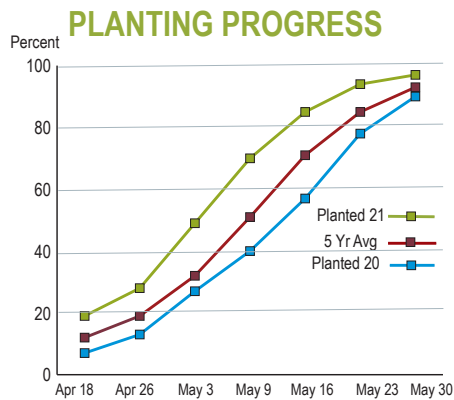
# U.S. HARD RED SPRING WHEAT
## MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON

**BAKING** evaluations produced an average loaf volume of 918 cubic centimeters, down from both 2020 and 5-year averages. Dough handling properties scored slightly lower, rated at 8.7 compared to 8.9 in 2020. Overall bread scores were rated similar to higher than a year ago for crumb grain and color, and crust color.

**PRODUCTION** was the factor most impacted by the 2021 drought, leading to a much smaller than typical crop for the U.S. HRS region. In areas where the drought was most intense, kernel size and weight were also impacted. Still, crop average test weights remain high. The smaller crop is commanding higher market values, but buyers will appreciate the significant improvement in dough strength in the 2021 crop, along with high protein content, kernel soundness, low kernel moisture, and little to no damage. Diligent contract specifications are always the best way to optimize value in the crop.
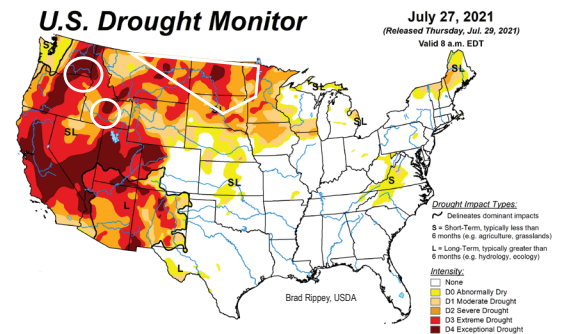
## SEASONAL CONDITIONS - 2021

**PLANTING** of the 2021 crop began in the early part of April, slightly ahead of normal, and progress continued to out-pace the 5-year average through completion, due to generally dry soil conditions region-wide. Limited snowfall during the winter period, and below normal spring precipitation, allowed for the fast planting pace, with the bulk of producers finished by late May. In some areas, delays were seen due to cool soil temperatures, or overly dry topsoil conditions.

**PLANTING PROGRESS**

Percent

- Planted 21
- 5 Yr Avg
- Planted 20

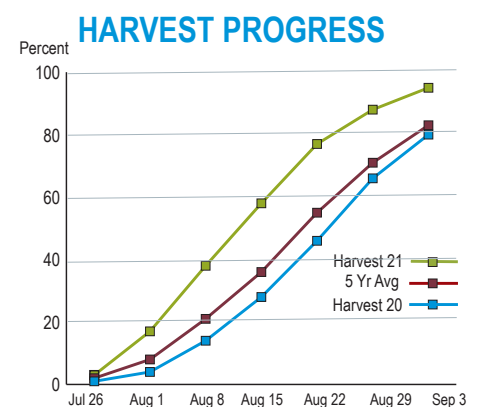(Apr 18, Apr 26, May 3, May 9, May 16, May 23, May 30)

**EMERGENCE** of the crop was hampered in central parts of the region due to acute shortages of topsoil moisture and little to no in-season precipitation, impacting yield potential early in those areas. The balance of the region had more favorable early season topsoil moisture, but above-normal temperatures, and frequent winds, stressed a significant share of the crop by mid-season. Areas that received timely rains, or had subsoil moisture reserves had more favorable plant establishment and early growth, promoting more promising crop potential. Moderate to severe drought conditions were present during much of the growing season for the 2021

HRS crop, as depicted on the map below. In central and western parts of the region, this led to a larger than normal share of the planted acres harvested as hay, and reducing yield potential region-wide. The dry growing season resulted in no disease pressures which was beneficial to both yields and quality.

**U.S. Drought Monitor**

**July 27, 2021**
*(Released Thursday, Jul. 29, 2021)*
*Valid 8 a.m. EDT*

*Drought Impact Types:*
- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

*Intensity:*
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Brad Rippey, USDA

**HARVEST** began in late July and moved rapidly, due to the wide-spread drought conditions and advanced maturity of the crop. Rains did slow progress in some northern areas, later in the harvest, but for much of the region, warm, dry conditions prevailed, allowing harvest to be completed by early September, ahead of normal. These conditions also secured a very sound, high quality crop.

**HARVEST PROGRESS**

Percent

- Harvest 21
- 5 Yr Avg
- Harvest 20

(Jul 26, Aug 1, Aug 8, Aug 15, Aug 22, Aug 29, Sep 3)

## WHEAT CHARACTERISTICS

**WHEAT GRADES** as defined by the Federal Grain Inspection Service (FGIS) of the USDA Grain Inspection, Packers and Stockyards Administration (GIPSA), reflect the general quality and condition of a representative sample. U.S. grades are based on test weight and include limits on damaged kernels, foreign material, shrunken and broken kernels, and wheat of contrasting classes. Each determination is made on the basis of the grain when free from dockage and shrunken and broken kernels.

**SUBCLASS** is as separate marketing factor based on the number of kernels that are dark, hard and vitreous. For hard red spring wheat, the subclasses are:

• Dark Northern Spring (DNS) – at least 75 percent or more dark, hard, vitreous kernels;

• Northern Spring (NS) – between 25 and 74 percent dark, hard, vitreous kernels;

• Red Spring (RS) – less than 25 percent dark, hard, vitreous kernels.

**OTHER BASIC CRITERIA** not included as grading factors but important in the U.S. wheat marketing system.

**PROTEIN** is probably the most important factor in determining the value of hard red spring wheat since it relates to many processing properties. In the U.S. market HRS prices are usually quoted for 14.0 percent protein (on a 12.0 percent moisture basis). Price premiums or discounts may be specified for halves, fifths and tenths of a percentage point above and below 14.0 percent.

**MOISTURE** content is an indicator of grain storability. Wheat with lower moisture content is generally more stable during storage and more profitable to a miller. U.S. HRS ranges from 12 to 13 percent.

**DOCKAGE** is any material easily removed from a wheat sample during cleaning using standard mechanical means. All U.S. grade and non-grade factors are determined only after dockage is removed.

**Official U.S. Grades and Grade Requirements (Revised June 1993)**

| GRADING FACTORS | U.S. GRADES | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **HARD RED SPRING – MINIMUM TEST WEIGHTS** | | | | | |
| Pounds per bushel | 58.0 | 57.0 | 55.0 | 53.0 | 50.0 |
| Kilograms per hectoliter | 76.4 | 75.1 | 72.5 | 69.9 | 66.0 |
| **MAXIMUM PERCENT LIMITS OF:** | | | | | |
| Damaged kernels | | | | | |
|     Heat (part of total) | 0.2 | 0.2 | 0.5 | 1.0 | 3.0 |
|     Total | 2.0 | 4.0 | 7.0 | 10.0 | 15.0 |
| Foreign material | 0.4 | 0.7 | 1.3 | 3.0 | 5.0 |
| Shrunken/broken kernels | 3.0 | 5.0 | 8.0 | 12.0 | 20.0 |
| Total[1] | 3.0 | 5.0 | 8.0 | 12.0 | 20.0 |
| Wheat of other class[2] | | | | | |
|     Contrasting classes | 1.0 | 2.0 | 3.0 | 10.0 | 20.0 |
|     Total[3] | 3.0 | 5.0 | 10.0 | 10.0 | 10.0 |
| Stones | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **MAXIMUM COUNT LIMITS OF:** | | | | | |
| Other material | | | | | |
|     Animal filth | 1 | 1 | 1 | 1 | 1 |
|     Castor beans | 1 | 1 | 1 | 1 | 1 |
|     Crotalaria seeds | 2 | 2 | 2 | 2 | 2 |
|     Glass | 0 | 0 | 0 | 0 | 0 |
|     Stones | 3 | 3 | 3 | 3 | 3 |
|     Unknown foreign material | 3 | 3 | 3 | 3 | 3 |
|     Total[4] | 4 | 4 | 4 | 4 | 4 |
|     Insect-damaged kernels | 31 | 31 | 31 | 31 | 31 |

U.S. sample grade is wheat that:
a. Does not meet the requirements for U.S. Nos. 1, 2, 3, 4 or 5; or
b. Has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or
c. Is heating or of distinctly low quality.
    1. Includes damaged kernels (total), foreign material and shrunken and broken kernels.
    2. Unclassed wheat of any grade may contain not more than 10.0 percent of wheat of other classes.
    3. Includes contrasting classes.
    4. Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones or unknown foreign substance.

**FALLING NUMBER** indicates the soundness of wheat or its alpha-amylase activity. Falling numbers above 300 seconds are most desired for baking products.

# U.S. HARD RED SPRING WHEAT
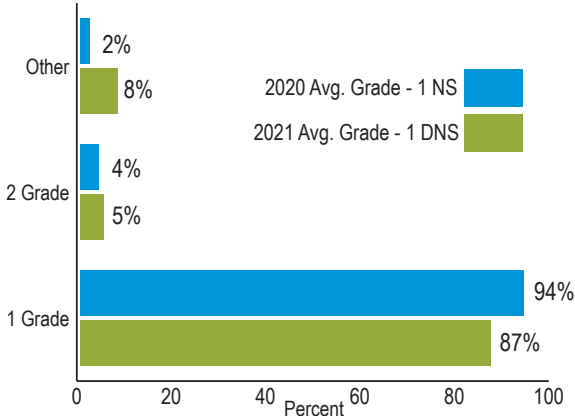**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## WHEAT GRADING DATA

| STATE AND CROP REPORTING AREA | TEST WEIGHT LBS/BU | KG/HL | DAMAGE % | SHRUNKEN/ BROKEN KERNELS % | TOTAL DEFECTS % | U.S GRADE SUBCLASS | VITREOUS KERNELS % |
|---|---|---|---|---|---|---|---|
| **MINNESOTA** | | | | | | | |
| Area A | 62.8 | 82.6 | 0.0 | 0.4 | 0.4 | 1 DNS | 87 |
| Area B | 62.6 | 82.3 | 0.0 | 0.5 | 0.5 | 1 NS | 64 |
| State Avg 2021 | 62.8 | 82.5 | 0.0 | 0.4 | 0.4 | 1 DNS | 83 |
| State Avg 2020 | 60.9 | 80.1 | 0.5 | 0.5 | 1.0 | 1 NS | 43 |
| **MONTANA** | | | | | | | |
| Area A | 59.0 | 77.7 | 0.2 | 1.5 | 1.7 | 1 DNS | 75 |
| Area B | 58.7 | 77.3 | 0.2 | 2.7 | 2.9 | 1 DNS | 89 |
| Area C | 59.8 | 78.7 | 0.3 | 1.4 | 1.7 | 1 DNS | 87 |
| Area D | 61.0 | 80.2 | 0.2 | 2.2 | 2.4 | 1 DNS | 92 |
| Area E | 59.6 | 78.4 | 0.0 | 0.7 | 0.7 | 1 DNS | 83 |
| State Avg 2021 | 59.0 | 77.6 | 0.2 | 2.1 | 2.3 | 1 DNS | 83 |
| State Avg 2020 | 62.4 | 82.1 | 0.1 | 1.1 | 1.2 | 1 DNS | 90 |
| **NORTH DAKOTA** | | | | | | | |
| Area A | 61.5 | 80.9 | 0.2 | 0.8 | 1.0 | 1 DNS | 82 |
| Area B | 61.7 | 81.2 | 0.2 | 0.5 | 0.7 | 1 NS | 72 |
| Area C | 62.6 | 82.3 | 0.0 | 0.7 | 0.7 | 1 DNS | 88 |
| Area D | 60.7 | 79.8 | 0.0 | 1.2 | 1.2 | 1 DNS | 87 |
| Area E | 62.0 | 81.6 | 0.0 | 0.8 | 0.8 | 1 DNS | 90 |
| Area F | 62.0 | 81.5 | 0.0 | 0.5 | 0.5 | 1 NS | 70 |
| State Avg 2021 | 61.6 | 81.1 | 0.1 | 0.8 | 0.9 | 1 DNS | 81 |
| State Avg 2020 | 61.8 | 81.3 | 0.1 | 0.6 | 0.7 | 1 NS | 71 |
| **SOUTH DAKOTA** | | | | | | | |
| Area A | 60.5 | 79.6 | 0.0 | 1.8 | 1.8 | 1 DNS | 82 |
| Area B | 61.4 | 80.7 | 0.0 | 0.9 | 0.9 | 1 NS | 72 |
| Area C | 61.7 | 81.2 | 0.0 | 0.6 | 0.6 | 1 NS | 54 |
| State Avg 2021 | 61.2 | 80.5 | 0.0 | 1.1 | 1.1 | 1 NS | 71 |
| State Avg 2020 | 60.9 | 80.1 | 0.0 | 0.8 | 0.8 | 1 NS | 64 |
| **IDAHO - OREGON - WASHINGTON** | | | | | | | |
| Area A | 60.5 | 79.6 | 0.2 | 2.4 | 2.6 | 1 DNS | 94 |
| Area B | 61.4 | 80.7 | 0.2 | 0.7 | 0.9 | 1 NS | 70 |
| State Avg 2021 | 61.0 | 80.3 | 0.2 | 1.4 | 1.6 | 1 DNS | 80 |
| State Avg 2020 | 63.4 | 83.3 | 0.0 | 0.4 | 0.4 | 1 DNS | 95 |
| **REGION AVERAGE** | | | | | | | |
| Avg 2021 | 61.5 | 80.8 | 0.1 | 0.9 | 1.0 | 1 DNS | 81 |
| Avg 2020 | 61.8 | 81.3 | 0.1 | 0.7 | 0.8 | 1 NS | 72 |
| Five-Year Avg | 61.6 | 81.0 | 0.3 | 0.8 | 1.1 | 1 NS | 72 |

## GRADE – Regional Distribution

2020 Avg. Grade - 1 NS
2021 Avg. Grade - 1 DNS

| Category | 2020 | 2021 |
|---|---|---|
| Other | 2% | 8% |
| 2 Grade | 4% | 5% |
| 1 Grade | 94% | 87% |

Percent (0–100)

## VITREOUS KERNEL

Percent

Regional Distribution
2020 Avg. - 72 percent
2021 Avg. - 81 percent

| Range | 2020 | 2021 |
|---|---|---|
| -25 | 6% | 1% |
| 25-50 | 21% | 4% |
| 51-74 | 32% | 15% |
| 75+ | 41% | 80% |

Percent (0–80)

## AVERAGE VITREOUS KERNEL BY AREA
### (Percent)

Washington — A 94
Oregon / Idaho — B 70, E 83

Montana — A 75, C 87, B 89, D 92

North Dakota — A 82, D 87, A 82, B 72, E 90, B 72, C 88, F 70, A 87

South Dakota — B 64, C 54

Minnesota

## TEST WEIGHT – Regional Distribution

2020 Avg. – 61.8 lbs/bu (81.3 kg/hl)
2021 Avg. - 61.5 lbs/bu (80.8 kg/hl)

| lb/bu / kg/hl | 2020 | 2021 |
|---|---|---|
| <56 / <74.9 | 0% | 5% |
| 57-57.9 / 75-76.2 | 2% | 5% |
| 58-59.9 / 76.3-78.8 | 12% | 16% |
| 60-61.9 / 78.9-81.4 | 42% | 34% |
| 62+ / 81.5+ | 44% | 40% |

Percent (0–50)

## AVERAGE TEST WEIGHT BY AREA
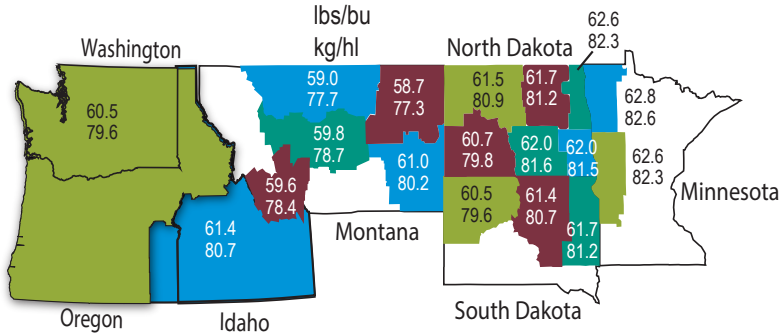
lbs/bu
kg/hl

Washington — 60.5 / 79.6
Oregon / Idaho — 61.4 / 80.7, 59.6 / 78.4

Montana — 59.0 / 77.7, 59.8 / 78.7, 58.7 / 77.3, 61.0 / 80.2

North Dakota — 61.5 / 80.9, 61.7 / 81.2, 62.6 / 82.3, 60.7 / 79.8, 62.0 / 81.6, 62.0 / 81.5, 62.8 / 82.6, 62.6 / 82.3

South Dakota — 60.5 / 79.6, 61.4 / 80.7, 61.7 / 81.2

Minnesota
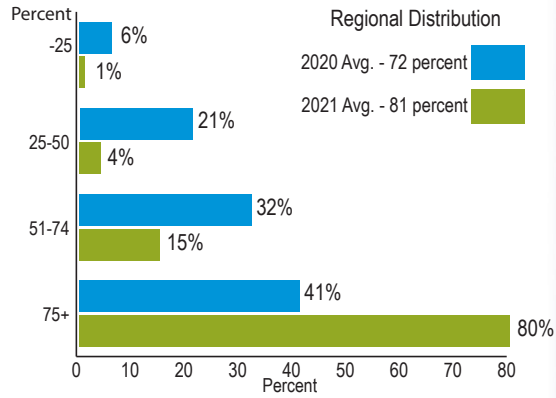
# U.S. HARD RED SPRING WHEAT
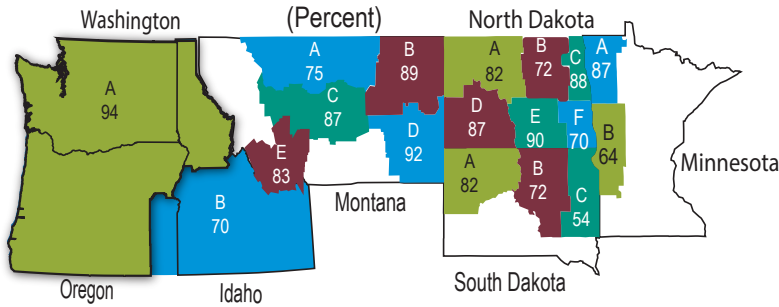**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## OTHER KERNEL QUALITY DATA

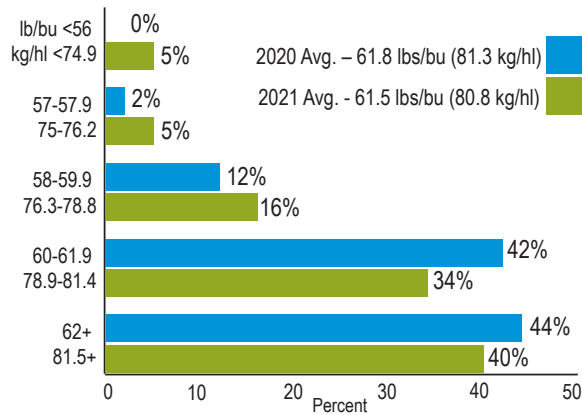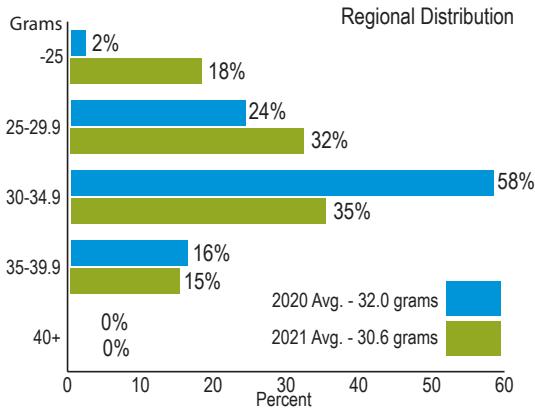| STATE AND CROP REPORTING AREA | DOCKAGE % | MOISTURE % | 1000 KERNEL WEIGHT G | KERNEL DIST. MED/LGE % | PROTEIN 12%/0% MOISTURE BASIS % | DON (PPM) | WHEAT ASH % | FALLING NUMBER (SEC) | ZELENY SED (CC) |
|---|---|---|---|---|---|---|---|---|---|
| **MINNESOTA** | | | | | | | | | |
| Area A | 0.3 | 12.2 | 34.0 | 49/49 | 14.9/17.0 | 0.0 | 1.42 | 408 | 68 |
| Area B | 0.6 | 13.0 | 33.1 | 46/52 | 14.0/16.0 | 0.0 | 1.51 | 393 | 62 |
| State Avg 2021 | 0.3 | 12.4 | 33.9 | 49/49 | 14.8/16.8 | 0.0 | 1.43 | 406 | 67 |
| State Avg 2020 | 0.5 | 13.0 | 32.7 | 45/53 | 13.6/15.4 | 0.2 | 1.56 | 396 | 64 |
| **MONTANA** | | | | | | | | | |
| Area A | 0.9 | 11.0 | 28.2 | 75/18 | 15.1/17.2 | 0.0 | 1.50 | 378 | 66 |
| Area B | 0.8 | 10.3 | 23.8 | 80/8 | 15.9/18.1 | 0.0 | 1.67 | 382 | 67 |
| Area C | 0.4 | 11.0 | 26.6 | 78/17 | 15.2/17.3 | 0.0 | 1.39 | 401 | 70 |
| Area D | 0.5 | 9.3 | 24.3 | 88/4 | 15.5/17.6 | 0.0 | 1.53 | 409 | 64 |
| Area E | 0.7 | 12.3 | 29.4 | 62/35 | 15.9/18.1 | 0.0 | 1.62 | 434 | 71 |
| State Avg 2021 | 0.8 | 10.6 | 25.9 | 77/13 | 15.6/17.7 | 0.0 | 1.58 | 383 | 67 |
| State Avg 2020 | 0.7 | 10.5 | 31.6 | 56/42 | 13.4/15.2 | 0.0 | 1.52 | 394 | 65 |
| **NORTH DAKOTA** | | | | | | | | | |
| Area A | 0.8 | 11.6 | 30.1 | 66/31 | 15.6/17.7 | 0.0 | 1.53 | 386 | 69 |
| Area B | 0.4 | 12.8 | 33.1 | 50/48 | 15.2/17.3 | 0.0 | 1.53 | 388 | 67 |
| Area C | 0.5 | 12.4 | 33.0 | 51/47 | 15.2/17.3 | 0.0 | 1.52 | 406 | 67 |
| Area D | 0.6 | 11.1 | 27.9 | 79/16 | 16.0/18.2 | 0.0 | 1.55 | 417 | 68 |
| Area E | 0.6 | 11.7 | 29.2 | 66/30 | 16.0/18.2 | 0.1 | 1.55 | 417 | 68 |
| Area F | 0.6 | 12.3 | 31.4 | 60/38 | 14.4/16.4 | 0.0 | 1.42 | 419 | 65 |
| State Avg 2021 | 0.6 | 12.0 | 30.9 | 62/35 | 15.5/17.6 | 0.0 | 1.53 | 400 | 68 |
| State Avg 2020 | 0.6 | 12.3 | 32.1 | 45/53 | 14.8/16.8 | 0.3 | 1.59 | 387 | 66 |
| **SOUTH DAKOTA** | | | | | | | | | |
| Area A | 1.0 | 10.4 | 25.8 | 80/12 | 15.3/17.4 | 0.0 | 1.64 | 404 | 61 |
| Area B | 0.5 | 11.8 | 28.2 | 70/26 | 15.5/17.6 | 0.0 | 1.52 | 387 | 64 |
| Area C | 0.5 | 12.7 | 31.3 | 65/33 | 14.5/16.5 | 0.0 | 1.53 | 381 | 63 |
| State Avg 2021 | 0.6 | 11.6 | 28.2 | 72/24 | 15.3/17.3 | 0.0 | 1.55 | 390 | 63 |
| State Avg 2020 | 0.6 | 12.3 | 29.1 | 62/36 | 15.0/17.0 | 0.1 | 1.65 | 383 | 62 |
| **IDAHO - OREGON - WASHINGTON** | | | | | | | | | |
| Area A | 0.4 | 8.8 | 29.2 | 68/26 | 15.5/17.6 | 0.1 | 1.63 | 399 | 64 |
| Area B | 0.3 | 10.5 | 29.8 | 66/32 | 15.8/18.0 | 0.0 | 1.62 | 398 | 68 |
| State Avg 2021 | 0.4 | 9.8 | 29.6 | 67/30 | 15.7/17.8 | 0.0 | 1.62 | 398 | 67 |
| State Avg 2020 | 0.3 | 9.6 | 34.9 | 37/62 | 14.0/16.0 | 0.1 | 1.54 | 378 | 67 |
| **REGION AVERAGE** | | | | | | | | | |
| Avg 2021 | 0.5 | 11.8 | 30.6 | 62/34 | 15.4/17.4 | 0.0 | 1.52 | 398 | 67 |
| Avg 2020 | 0.6 | 11.8 | 32.0 | 48/50 | 14.3/16.2 | 0.2 | 1.57 | 389 | 66 |
| Five-Year Avg | 0.6 | 12.1 | 31.5 | 50/47 | 14.3/16.2 | 0.2 | 1.54 | 384 | 65 |

## 1000 KERNEL WEIGHT

Regional Distribution

Grams

| Range | Blue | Green |
|---|---|---|
| -25 | 2% | 18% |
| 25-29.9 | 24% | 32% |
| 30-34.9 | 58% | 35% |
| 35-39.9 | 16% | 15% |
| 40+ | 0% | 0% |

2020 Avg. - 32.0 grams
2021 Avg. - 30.6 grams

Percent (x-axis: 0 to 60)

## AVERAGE 1000 KERNEL BY AREA
### (Grams)



Washington — A 29.2
Oregon / Idaho — B 29.8
North Dakota — A 28.2, B 23.8, C 26.6, D 24.3, E 29.4, A 30.1, B 33.1, D 27.9, E 29.2, F 31.4, C 33.0
Minnesota — A 34.0, B 33.1
South Dakota — A 25.8, B 28.2, C 31.3
Montana

## PROTEIN - 12% MOISTURE

Regional Distribution

Percent

| Range | Blue | Green |
|---|---|---|
| -12 | 4% | 0% |
| 12-12.9 | 8% | 3% |
| 13-13.9 | 23% | 11% |
| 14-14.9 | 28% | 23% |
| 15+ | 37% | 63% |

2020 Avg. - 14.3 percent
2021 Avg. - 15.4 percent

Percent (x-axis: 0 to 80)
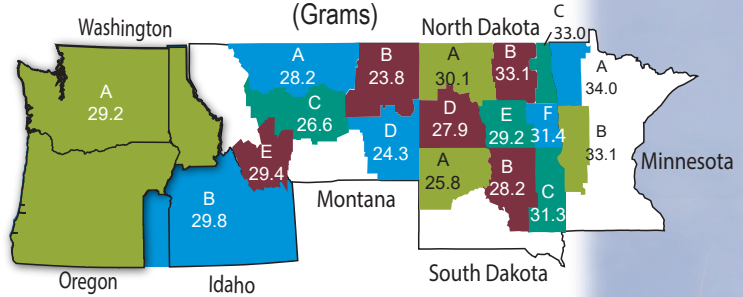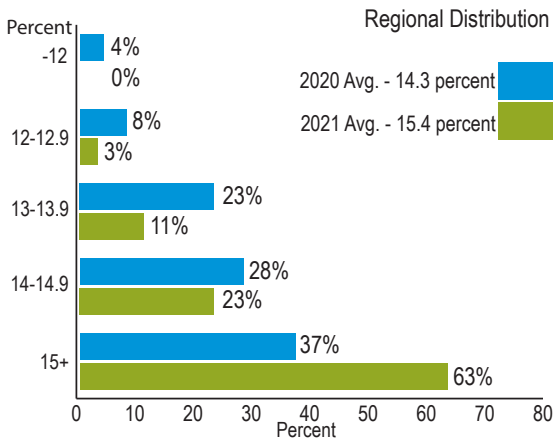
## AVERAGE WHEAT PROTEIN BY AREA
### 12% Moisture Basis - (Percent)



Washington — A 15.5
Oregon / Idaho — B 15.8
North Dakota — A 15.1, B 15.9, C 15.2, D 15.5, E 15.9, A 15.6, B 15.2, D 16.0, E 16.0, F 14.4, C 15.2
Minnesota — A 14.9, B 14.0
South Dakota — A 15.3, B 15.5, C 14.5
Montana

## FALLING NUMBER

Regional Distribution

Seconds

| Range | Blue | Green |
|---|---|---|
| -250 | 1% | 0% |
| 250-300 | 1% | 1% |
| 301-350 | 12% | 3% |
| 351-400 | 47% | 21% |
| 401+ | 39% | 75% |

2020 Avg. - 389 seconds
2021 Avg. - 398 seconds

Percent (x-axis: 0 to 80)
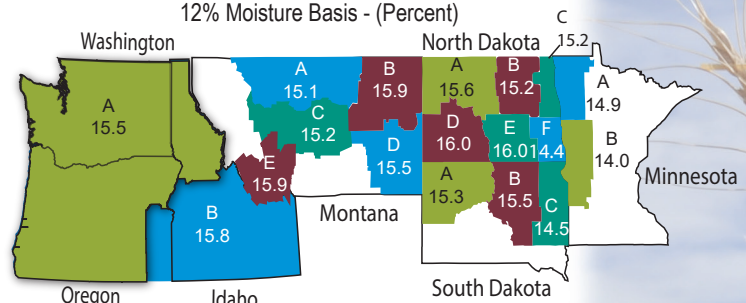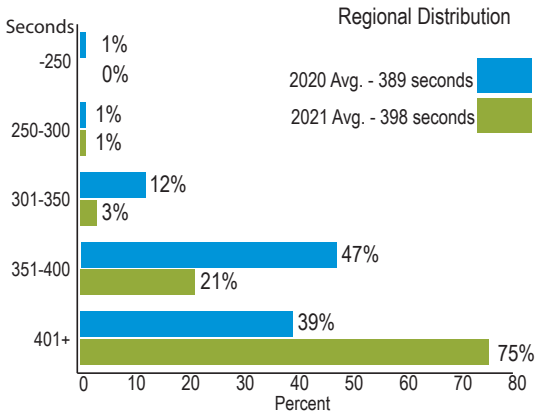
## AVERAGE FALLING NUMBER BY AREA
### (Seconds)
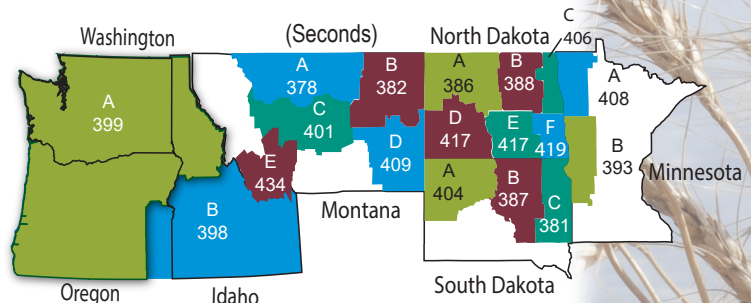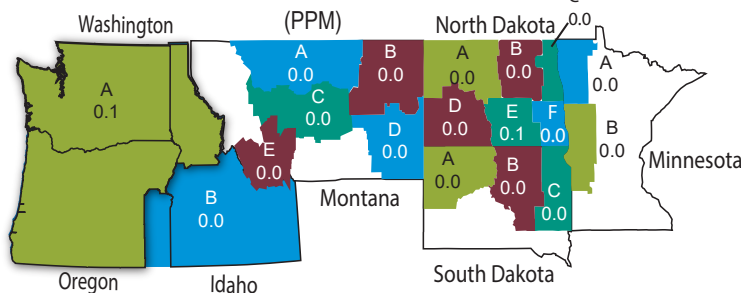


Washington — A 399
Oregon / Idaho — B 398
North Dakota — A 378, B 382, C 401, D 409, E 434, A 386, B 388, D 417, E 417, F 419, C 406
Minnesota — A 408, B 393
South Dakota — A 404, B 387, C 381
Montana

## AVERAGE DON BY AREA
### (PPM)



Washington — A 0.1
Oregon / Idaho — B 0.0
North Dakota — A 0.0, B 0.0, C 0.0, D 0.0, E 0.0, A 0.0, B 0.0, D 0.0, E 0.1, F 0.0, C 0.0
Minnesota — A 0.0, B 0.0
South Dakota — A 0.0, B 0.0, C 0.0
Montana

## FLOUR QUALITY DATA

| STATE AND CROP REPORTING AREA | FLOUR EXTRACTION % | FLOUR ASH % | FLOUR PROTEIN (14% MOISTURE) % | STARCH DAMAGE % | SRC: GPI | WATER 50% SUCROSE | 5% LACTIC ACID/5% NA$_2$CO$_3$ | WET GLUTEN % | GLUTEN INDEX | FALLING NUMBER | AMYLOGRAPH VISCOSITY 65 G FL B.U. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MINNESOTA** | | | | | | | | | | | |
| Area A | 66.8 | 0.49 | 13.8 | 5.6 | 0.73 | 73/117 | 156/98 | 36.1 | 96 | 406 | 758 |
| Area B | 69.0 | 0.50 | 13.2 | 5.9 | 0.67 | 69/114 | 139/94 | 32.6 | 97 | 420 | 742 |
| State Avg 2021 | 67.1 | 0.49 | 13.7 | 5.6 | 0.72 | 72/116 | 153/97 | 35.6 | 96 | 408 | 755 |
| State Avg 2020 | 67.2 | 0.52 | 12.5 | 7.0 | 0.66 | 71/118 | 145/101 | 29.7 | 97 | 424 | 578 |
| **MONTANA** | | | | | | | | | | | |
| Area A | 67.1 | 0.51 | 14.2 | 5.5 | 0.63 | 74/129 | 150/107 | 37.1 | 91 | 399 | 701 |
| Area B | 65.2 | 0.52 | 14.7 | 5.2 | 0.65 | 74/127 | 146/98 | 38.0 | 94 | 402 | 791 |
| Area C | 65.4 | 0.48 | 14.0 | 5.7 | 0.68 | 77/129 | 159/106 | 36.8 | 91 | 420 | 812 |
| Area D | 63.7 | 0.50 | 14.4 | 5.4 | 0.62 | 73/122 | 136/99 | 40.5 | 72 | 415 | 798 |
| Area E | 65.6 | 0.50 | 14.7 | 5.8 | 0.64 | 78/134 | 156/111 | 36.4 | 96 | 496 | 770 |
| State Avg 2021 | 66.0 | 0.51 | 14.5 | 5.3 | 0.64 | 74/128 | 148/102 | 37.6 | 92 | 405 | 754 |
| State Avg 2020 | 67.5 | 0.51 | 12.6 | 7.5 | 0.63 | 73/123 | 148/111 | 29.9 | 94 | 414 | 708 |
| **NORTH DAKOTA** | | | | | | | | | | | |
| Area A | 68.1 | 0.49 | 14.5 | 5.5 | 0.68 | 73/125 | 152/99 | 37.3 | 97 | 390 | 636 |
| Area B | 67.5 | 0.50 | 14.2 | 5.5 | 0.69 | 71/117 | 147/97 | 37.0 | 89 | 393 | 617 |
| Area C | 68.3 | 0.51 | 14.3 | 5.7 | 0.68 | 74/121 | 151/100 | 37.1 | 94 | 423 | 737 |
| Area D | 67.6 | 0.51 | 14.9 | 5.6 | 0.64 | 74/123 | 146/104 | 39.5 | 88 | 422 | 714 |
| Area E | 68.4 | 0.51 | 15.0 | 5.6 | 0.64 | 70/121 | 146/106 | 39.0 | 91 | 436 | 745 |
| Area F | 68.6 | 0.51 | 13.6 | 5.8 | 0.64 | 71/121 | 145/107 | 33.3 | 95 | 417 | 787 |
| State Avg 2021 | 67.9 | 0.50 | 14.5 | 5.6 | 0.67 | 73/121 | 148/100 | 37.5 | 92 | 407 | 678 |
| State Avg 2020 | 67.9 | 0.52 | 13.8 | 7.1 | 0.68 | 71/118 | 149/101 | 35.1 | 88 | 397 | 612 |
| **SOUTH DAKOTA** | | | | | | | | | | | |
| Area A | 66.8 | 0.52 | 14.4 | 5.7 | 0.62 | 71/119 | 133/96 | 37.8 | 86 | 472 | 778 |
| Area B | 67.5 | 0.52 | 14.3 | 5.7 | 0.67 | 71/118 | 142/94 | 37.1 | 96 | 399 | 619 |
| Area C | 68.6 | 0.52 | 13.3 | 5.7 | 0.64 | 67/115 | 135/96 | 34.0 | 92 | 405 | 562 |
| State Avg 2021 | 67.5 | 0.52 | 14.1 | 5.7 | 0.65 | 71/117 | 139/95 | 36.8 | 93 | 418 | 647 |
| State Avg 2020 | 67.6 | 0.53 | 13.6 | 6.9 | 0.67 | 68/112 | 138/93 | 35.3 | 84 | 406 | 624 |
| **IDAHO - OREGON - WASHINGTON** | | | | | | | | | | | |
| Area A | 64.5 | 0.52 | 14.6 | 5.6 | 0.60 | 71/123 | 135/101 | 38.8 | 81 | 429 | 668 |
| Area B | 64.3 | 0.48 | 14.7 | 5.4 | 0.64 | 73/128 | 145/100 | 38.3 | 95 | 458 | 864 |
| State Avg 2021 | 64.4 | 0.50 | 14.7 | 5.4 | 0.62 | 72/126 | 141/100 | 38.5 | 89 | 446 | 786 |
| State Avg 2020 | 66.4 | 0.51 | 13.3 | 7.7 | 0.59 | 77/131 | 145/116 | 33.9 | 89 | 428 | 652 |
| **REGION AVERAGE** | | | | | | | | | | | |
| Avg. 2021 | 67.4 | 0.50 | 14.3 | 5.6 | 0.67 | 72/121 | 148/100 | 37.1 | 93 | 409 | 705 |
| Avg. 2020 | 67.7 | 0.52 | 13.3 | 7.2 | 0.66 | 72/119 | 147/103 | 33.1 | 90 | 407 | 632 |
| Five-Year Avg. | 68.5 | 0.53 | 13.4 | 7.3 | 0.66 | 72/120 | 147/102 | 34.8 | 91 | 400 | 590 |

**FLOUR** is evaluated for several factors to determine overall milling efficiency, grade, soundness and functional properties.

**EXTRACTION**, or the proportion of the wheat kernel that can be milled into flour, is important to mill profitability. For purposes of this survey, test milling was conducted with a Buhler laboratory mill. Results are suitable for comparison between crop years, however yields are lower than those obtained in commercial mills.
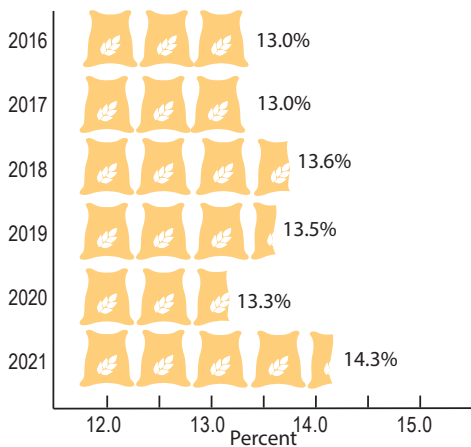
Another measure of milling efficiency and of flour grade is the ash content, or mineral residue, remaining after incineration of a sample.

**STARCH** damage measures physical damage to a proportion of the starch granules of flour. The level directly affects water absorption and dough mixing properties.
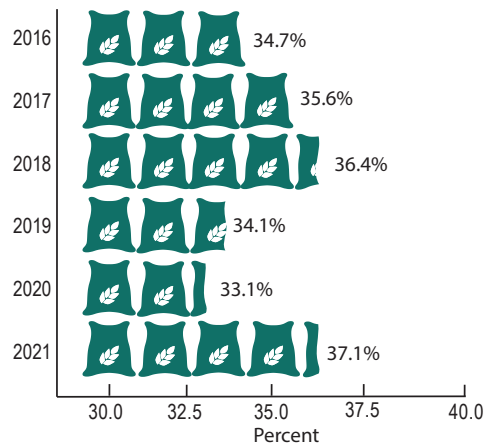
**WET GLUTEN** provides a quantitative measure of the gluten forming proteins in flour that are primarily responsible for its dough mixing and baking properties.

**FALLING NUMBER** measures enzyme activity in flour. A fast time indicates high activity, revealing too much sugar and too little starch. Since starch provides bread's supporting structure, too much activity results in sticky dough and poor texture in finished products.
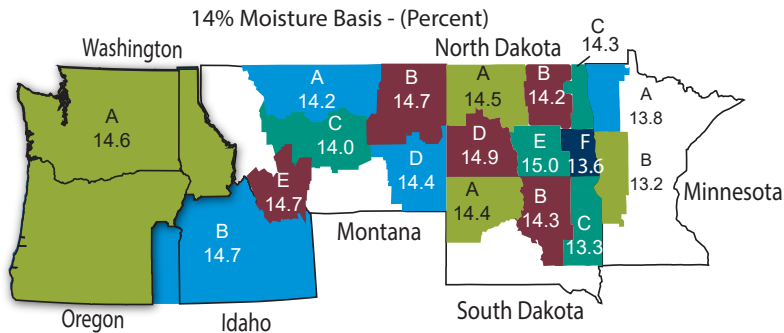
## FLOUR PROTEIN – Regional Average

| Year | Percent |
|------|---------|
| 2016 | 13.0% |
| 2017 | 13.0% |
| 2018 | 13.6% |
| 2019 | 13.5% |
| 2020 | 13.3% |
| 2021 | 14.3% |

## WET GLUTEN – Regional Average

| Year | Percent |
|------|---------|
| 2016 | 34.7% |
| 2017 | 35.6% |
| 2018 | 36.4% |
| 2019 | 34.1% |
| 2020 | 33.1% |
| 2021 | 37.1% |

## AVERAGE FLOUR PROTEIN BY AREA
14% Moisture Basis - (Percent)

Washington A 14.6

Oregon B 14.7

Idaho

Montana A 14.2, C 14.0, B 14.7, E 14.7, D 14.4

North Dakota A 14.5, B 14.2, D 14.9, E 15.0, F 13.6

C 14.3

South Dakota A 14.4, B 14.3, C 13.3

Minnesota A 13.8, B 13.2

# U.S. HARD RED SPRING WHEAT
**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## PHYSICAL DOUGH QUALITY

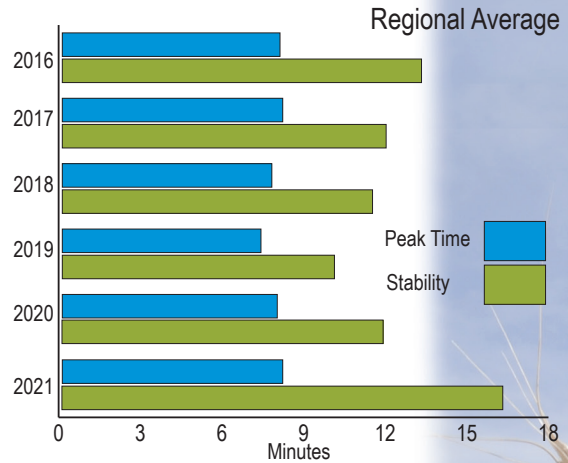| FARINOGRAPH | | | | | |
|---|---|---|---|---|---|
| STATE AND CROP REPORTING AREA | ABSORPTION % | PEAK TIME MIN | STABILITY MIN | MTI B.U. | QUALITY NUMBER MM |
| **MINNESOTA** | | | | | |
| Area A | 62.1 | 7.4 | 22.3 | 15 | 274 |
| Area B | 60.6 | 7.7 | 15.2 | 17 | 187 |
| State Avg 2021 | 61.9 | 7.4 | 21.2 | 15 | 260 |
| State Avg 2020 | 59.0 | 7.4 | 16.4 | 24 | 147 |
| **MONTANA** | | | | | |
| Area A | 63.0 | 7.8 | 11.8 | 22 | 161 |
| Area B | 63.7 | 8.0 | 15.2 | 13 | 229 |
| Area C | 63.0 | 11.4 | 20.7 | 13 | 280 |
| Area D | 64.4 | 7.1 | 8.7 | 23 | 146 |
| Area E | 65.3 | 9.9 | 17.8 | 14 | 255 |
| State Avg 2021 | 63.4 | 8.1 | 13.9 | 17 | 202 |
| State Avg 2020 | 62.0 | 7.7 | 10.5 | 26 | 133 |
| **NORTH DAKOTA** | | | | | |
| Area A | 62.5 | 8.1 | 17.5 | 16 | 210 |
| Area B | 62.5 | 7.1 | 13.0 | 19 | 252 |
| Area C | 62.3 | 7.9 | 14.3 | 23 | 189 |
| Area D | 64.2 | 9.9 | 18.0 | 16 | 243 |
| Area E | 64.3 | 8.6 | 13.0 | 19 | 188 |
| Area F | 62.2 | 8.1 | 16.1 | 23 | 198 |
| State Avg 2021 | 62.9 | 8.2 | 15.5 | 18 | 222 |
| State Avg 2020 | 62.0 | 8.3 | 11.6 | 23 | 150 |
| **SOUTH DAKOTA** | | | | | |
| Area A | 63.1 | 7.8 | 14.5 | 17 | 185 |
| Area B | 63.0 | 9.4 | 15.5 | 16 | 228 |
| Area C | 60.8 | 7.0 | 12.9 | 21 | 161 |
| State Avg 2021 | 62.7 | 8.6 | 14.8 | 17 | 206 |
| State Avg 2020 | 61.2 | 7.4 | 10.0 | 25 | 133 |
| **IDAHO - OREGON - WASHINGTON** | | | | | |
| Area A | 64.3 | 8.8 | 10.5 | 24 | 160 |
| Area B | 63.7 | 11.0 | 15.0 | 17 | 217 |
| State Avg 2021 | 63.9 | 10.1 | 13.2 | 20 | 194 |
| State Avg 2020 | 64.8 | 7.1 | 10.6 | 20 | 150 |
| **REGION AVERAGE** | | | | | |
| Avg. 2021 | 62.8 | 8.1 | 16.2 | 18 | 225 |
| Avg. 2020 | 61.6 | 7.9 | 11.8 | 24 | 145 |
| Five-Year Avg. | 62.8 | 7.6 | 11.4 | 23 | 145 |

Physical characteristics of dough are evaluated to reveal useful information about variations in flour types, processing requirements and expected end-product quality.

A farinograph traces a curve during the dough mixing process to record variations in gluten development and the breakdown of gluten proteins over time. Water absorption indicates the amount of water that can be added to the flour until the dough reaches a definite consistency. Peak time indicates the number of minutes required to achieve this level of dough consistency and mixing tolerance indicates the stability of the dough. Both peak time and stability are related to dough strength.
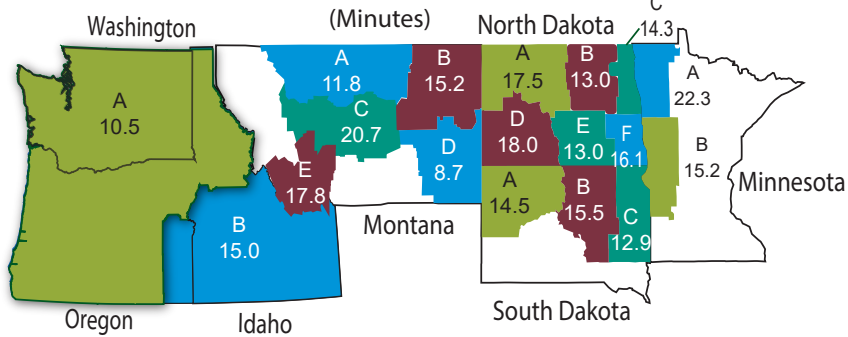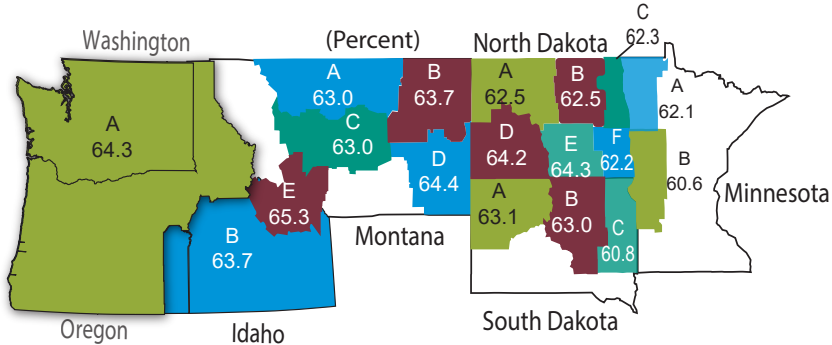
## 2021 AVERAGE FARINOGRAPH

## FARINOGRAPH RESULTS

Regional Average



Peak Time
Stability
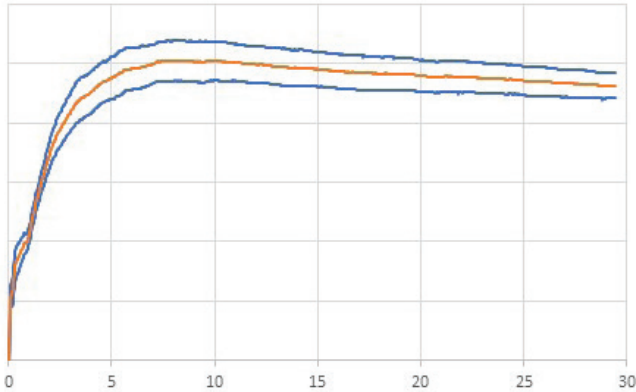
Minutes

## AVERAGE STABILITY BY AREA
(Minutes)



Washington — North Dakota

| Area | Stability |
|------|-----------|
| Washington A | 10.5 |
| Oregon/Idaho B | 15.0 |
| E | 17.8 |
| Montana A | 11.8 |
| Montana B | 15.2 |
| Montana C | 20.7 |
| Montana D | 8.7 |
| North Dakota A | 17.5 |
| North Dakota B | 13.0 |
| North Dakota D | 18.0 |
| North Dakota E | 13.0 |
| North Dakota F | 16.1 |
| North Dakota A | 14.5 |
| North Dakota B | 15.5 |
| North Dakota C | 12.9 |
| Minnesota C | 14.3 |
| Minnesota A | 22.3 |
| Minnesota B | 15.2 |

South Dakota

## AVERAGE FARINOGRAPH ABSORPTION BY AREA
(Percent)



Washington — North Dakota

| Area | Absorption |
|------|-----------|
| Washington A | 64.3 |
| Oregon/Idaho B | 63.7 |
| E | 65.3 |
| Montana A | 63.0 |
| Montana B | 63.7 |
| Montana C | 63.0 |
| Montana D | 64.4 |
| North Dakota A | 62.5 |
| North Dakota B | 62.5 |
| North Dakota D | 64.2 |
| North Dakota E | 64.3 |
| North Dakota F | 62.2 |
| North Dakota A | 63.1 |
| North Dakota B | 63.0 |
| North Dakota C | 60.8 |
| Minnesota C | 62.3 |
| Minnesota A | 62.1 |
| Minnesota B | 60.6 |

South Dakota

## PHYSICAL DOUGH QUALITY

| STATE AND CROP REPORTING AREA | EXTENSOGRAPH | | | | | | ALVEOGRAPH | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | EXTENSIBILITY 45 MIN CM | RESISTANCE 45 MIN B.U. | AREA SQ CM | EXTENSIBILITY 135 MIN CM | RESISTANCE 135 MIN B.U. | AREA SQ CM | P MM | L MM | W P/L RATIO | JOULES X 10⁴ |
| **MINNESOTA** | | | | | | | | | | |
| Area A | 18.0 | 601 | 132 | 13.9 | 1106 | 202 | 88 | 122 | 0.72 | 403 |
| Area B | 16.3 | 640 | 134 | 12.5 | 1173 | 189 | 75 | 138 | 0.54 | 350 |
| State Avg 2021 | 17.7 | 607 | 132 | 13.7 | 1117 | 200 | 86 | 125 | 0.69 | 395 |
| State Avg 2020 | 16.8 | 559 | 121 | 14.0 | 764 | 138 | 81 | 137 | 0.59 | 394 |
| **MONTANA** | | | | | | | | | | |
| Area A | 17.6 | 553 | 122 | 13.5 | 977 | 171 | 84 | 144 | 0.58 | 389 |
| Area B | 18.0 | 567 | 133 | 12.9 | 988 | 165 | 84 | 142 | 0.59 | 401 |
| Area C | 15.6 | 649 | 129 | 11.9 | 1257 | 188 | 97 | 112 | 0.87 | 403 |
| Area D | 14.6 | 448 | 89 | 11.3 | 1072 | 158 | 87 | 118 | 0.74 | 325 |
| Area E | 17.0 | 509 | 99 | 13.1 | 1081 | 182 | 98 | 142 | 0.69 | 469 |
| State Avg 2021 | 17.6 | 560 | 126 | 13.1 | 999 | 169 | 85 | 141 | 0.60 | 397 |
| State Avg 2020 | 15.4 | 511 | 103 | 13.1 | 760 | 131 | 89 | 114 | 0.79 | 347 |
| **NORTH DAKOTA** | | | | | | | | | | |
| Area A | 17.0 | 648 | 142 | 11.2 | 1373 | 198 | 88 | 144 | 0.61 | 455 |
| Area B | 16.1 | 618 | 122 | 13.9 | 1265 | 146 | 82 | 149 | 0.55 | 417 |
| Area C | 15.3 | 650 | 129 | 12.3 | 1220 | 195 | 87 | 141 | 0.62 | 429 |
| Area D | 16.0 | 602 | 122 | 10.3 | 1260 | 169 | 86 | 145 | 0.59 | 428 |
| Area E | 17.7 | 680 | 157 | 12.1 | 1297 | 201 | 86 | 143 | 0.60 | 421 |
| Area F | 15.6 | 669 | 136 | 11.9 | 1088 | 172 | 90 | 130 | 0.69 | 412 |
| State Avg 2021 | 16.3 | 635 | 132 | 12.0 | 1277 | 177 | 86 | 144 | 0.60 | 431 |
| State Avg 2020 | 16.3 | 497 | 106 | 14.0 | 779 | 142 | 77 | 144 | 0.54 | 362 |
| **SOUTH DAKOTA** | | | | | | | | | | |
| Area A | 16.1 | 688 | 141 | 11.9 | 1008 | 160 | 92 | 125 | 0.74 | 404 |
| Area B | 16.3 | 547 | 115 | 10.7 | 1275 | 170 | 81 | 136 | 0.60 | 375 |
| Area C | 17.9 | 579 | 133 | 13.5 | 1042 | 184 | 70 | 146 | 0.48 | 337 |
| State Avg 2021 | 16.5 | 586 | 124 | 11.5 | 1171 | 170 | 82 | 135 | 0.61 | 376 |
| State Avg 2020 | 17.1 | 435 | 100 | 15.7 | 540 | 110 | 75 | 129 | 0.58 | 306 |
| **IDAHO - OREGON - WASHINGTON** | | | | | | | | | | |
| Area A | 16.6 | 486 | 105 | 11.9 | 1032 | 164 | 77 | 137 | 0.56 | 333 |
| Area B | 17.3 | 630 | 137 | 12.6 | 1247 | 200 | 85 | 148 | 0.57 | 423 |
| State Avg 2021 | 17.0 | 572 | 124 | 12.3 | 1161 | 186 | 82 | 144 | 0.57 | 387 |
| State Avg 2020 | 16.7 | 352 | 76 | 13.8 | 636 | 112 | 94 | 126 | 0.75 | 362 |
| **REGION AVERAGE** | | | | | | | | | | |
| Avg. 2021 | 16.8 | 615 | 130 | 12.4 | 1201 | 180 | 85 | 140 | 0.61 | 415 |
| Avg. 2020 | 16.2 | 498 | 105 | 13.9 | 750 | 135 | 81 | 134 | 0.61 | 359 |
| Five-Year Avg. | 16.7 | 523 | 114 | 14.1 | 818 | 150 | 83 | 132 | 0.63 | 362 |

## 2021 AVERAGE EXTENSOGRAPH
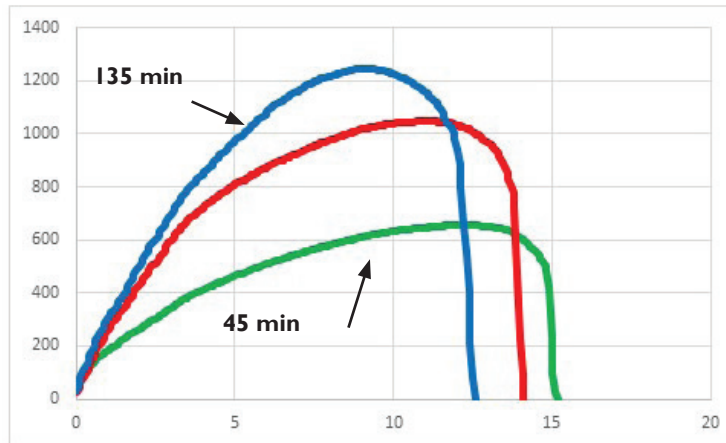


The extensigraph measures dough strength by stretching a piece of dough on a hook until it breaks. The apparatus traces a curve that measures extensibility, resistance to extension and the area beneath the curve, or energy value.

## 2021 AVERAGE ALVEOGRAPH
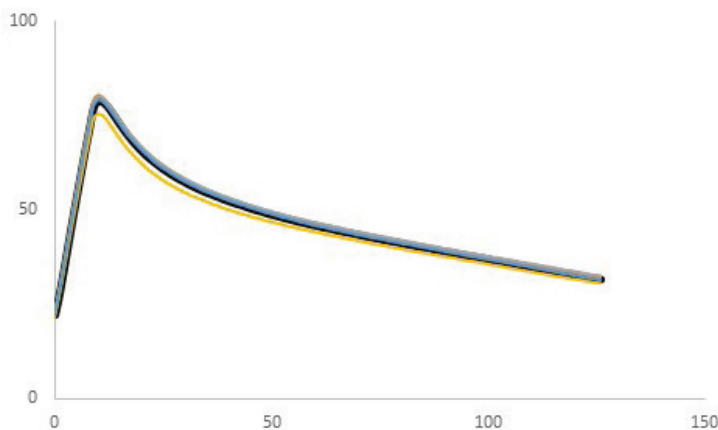


An alveograph traces a curve that measures the air pressure necessary to inflate a piece of dough to the point of rupture. The overpressure (P) value reflects the maximum pressure needed to deform the piece of dough during the inflation process and is an indication of resistance, or dough stability. The length (L) measurement reflects dough extensibility. The deformation energy (W) measurement is the amount of energy needed to inflate the dough to the point of rupture and is indicative of dough strength.

# U.S. HARD RED SPRING WHEAT
**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## BAKING DATA

| STATE AND CROP REPORTING AREA | BAKING ABSORPTION % | DOUGH HANDLING PROPERTIES | LOAF VOLUME CC | GRAIN AND TEXTURE | CRUMB COLOR | CRUST COLOR | SYMMETRY |
|---|---|---|---|---|---|---|---|
| **MINNESOTA** | | | | | | | |
| Area A | 65.3 | 9.0 | 860 | 7.5 | 8.0 | 9.0 | 8.0 |
| Area B | 65.4 | 9.0 | 860 | 7.0 | 8.0 | 9.0 | 7.0 |
| State Avg 2021 | 65.3 | 9.0 | 860 | 7.4 | 8.0 | 9.0 | 7.8 |
| State Avg 2020 | 64.3 | 9.0 | 952 | 7.7 | 7.6 | 9.5 | 8.9 |
| **MONTANA** | | | | | | | |
| Area A | 68.6 | 9.0 | 885 | 7.5 | 7.5 | 10.0 | 7.0 |
| Area B | 67.9 | 9.0 | 955 | 7.0 | 8.0 | 10.0 | 8.0 |
| Area C | 66.6 | 8.0 | 900 | 7.5 | 8.0 | 9.0 | 8.0 |
| Area D | 69.6 | 8.0 | 950 | 7.5 | 7.5 | 10.0 | 9.0 |
| Area E | 70.8 | 9.0 | 1015 | 8.0 | 8.0 | 10.0 | 9.0 |
| State Avg 2021 | 68.3 | 8.9 | 925 | 7.3 | 7.8 | 10.0 | 7.6 |
| State Avg 2020 | 67.2 | 9.0 | 896 | 7.6 | 7.8 | 10.0 | 8.0 |
| **NORTH DAKOTA** | | | | | | | |
| Area A | 66.3 | 8.0 | 970 | 8.5 | 8.0 | 10.0 | 8.0 |
| Area B | 67.4 | 9.0 | 875 | 8.0 | 8.5 | 10.0 | 7.0 |
| Area C | 67.5 | 9.0 | 915 | 7.0 | 7.5 | 10.0 | 9.0 |
| Area D | 69.5 | 8.0 | 945 | 7.5 | 7.5 | 10.0 | 8.0 |
| Area E | 69.8 | 9.0 | 970 | 8.0 | 8.0 | 10.0 | 10.0 |
| Area F | 66.4 | 9.0 | 895 | 8.5 | 8.5 | 10.0 | 8.0 |
| State Avg 2021 | 67.6 | 8.6 | 927 | 7.9 | 8.0 | 10.0 | 8.0 |
| State Avg 2020 | 67.5 | 8.8 | 1014 | 7.9 | 7.7 | 10.0 | 8.9 |
| **SOUTH DAKOTA** | | | | | | | |
| Area A | 63.2 | 9.0 | 845 | 7.5 | 7.5 | 10.0 | 7.0 |
| Area B | 66.9 | 9.0 | 965 | 8.0 | 8.5 | 10.0 | 9.0 |
| Area C | 64.6 | 9.0 | 890 | 8.0 | 8.0 | 10.0 | 8.0 |
| State Avg 2021 | 65.6 | 9.0 | 923 | 7.9 | 8.2 | 10.0 | 8.4 |
| State Avg 2020 | 65.5 | 9.0 | 988 | 7.6 | 7.9 | 9.9 | 8.8 |
| **IDAHO - OREGON - WASHINGTON** | | | | | | | |
| Area A | 69.6 | 9.0 | 970 | 8.5 | 8.5 | 10.0 | 8.0 |
| Area B | 68.6 | 9.0 | 1065 | 8.0 | 8.5 | 10.0 | 9.0 |
| State Avg 2021 | 69.0 | 9.0 | 1027 | 8.2 | 8.5 | 10.0 | 8.6 |
| State Avg 2020 | 70.6 | 8.3 | 1040 | 7.8 | 8.0 | 10.0 | 9.6 |
| **REGION AVERAGE** | | | | | | | |
| Avg 2021 | 67.2 | 8.7 | 918 | 7.8 | 8.0 | 9.8 | 8.0 |
| Avg 2020 | 67.0 | 8.9 | 977 | 7.8 | 7.7 | 9.9 | 8.7 |
| Five-Year Avg. | 67.5 | 8.9 | 982 | 7.7 | 7.7 | 9.9 | 9.1 |

## RECENT QUALITY TRENDS

| SUMMARY INFORMATION | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CROP YEAR** | **2021** | **2020** | **2019** | **2018** | **2017** | **2016** | **FIVE-YEAR AVERAGE** |
| **WHEAT GRADING** | | | | | | | |
| Test Weight (lbs/bu) | 61.5 | 61.8 | 60.7 | 62.2 | 61.7 | 61.6 | 61.6 |
| Test Weight (kg/hl) | 80.8 | 81.3 | 79.8 | 81.8 | 81.1 | 81.0 | 81.3 |
| Vitreous Kernels (%) | 81 | 72 | 55 | 86 | 71 | 77 | 72 |
| 1000 Kernel Weight (gm) | 30.6 | 32.0 | 31.9 | 31.2 | 31.5 | 30.9 | 31.5 |
| Protein: 12%/0% moisture | 15.4/17.4 | 14.3/16.2 | 14.5/16.4 | 14.5/16.5 | 14.5/16.5 | 14.2/16.1 | 14.3/16.2 |
| Ash: 14% moisture (%) | 1.52 | 1.57 | 1.54 | 1.57 | 1.50 | 1.53 | 1.54 |
| Falling Number (sec) | 398 | 389 | 337 | 399 | 389 | 406 | 384 |
| **FLOUR DATA** | | | | | | | |
| Extractions (%) | 67.4 | 67.7 | 68.7 | 68.1 | 71.2 | 66.9 | 68.5 |
| Ash: 14% moisture (%) | 0.50 | 0.52 | 0.53 | 0.52 | 0.57 | 0.53 | 0.53 |
| Protein: 14% moisture (%) | 14.3 | 13.3 | 13.5 | 13.6 | 13.8 | 13.0 | 13.4 |
| Wet Gluten (%) | 37.1 | 33.1 | 34.1 | 36.4 | 35.6 | 34.7 | 34.8 |
| Falling Number (sec) | 409 | 407 | 352 | 421 | 407 | 415 | 400 |
| **Amylograph Peak Viscosity** | | | | | | | |
| 65g FL (B.U.) | 705 | 632 | 441 | 649 | 570 | 659 | 590 |
| **PHYSICAL DOUGH PROPERTIES** | | | | | | | |
| **\*FARINOGRAPH:** | | | | | | | |
| Absorption (%) | 62.8 | 61.6 | 62.6 | 64.2 | 62.6 | 62.7 | 62.8 |
| Peak Time (min) | 8.1 | 7.9 | 7.3 | 7.7 | 8.1 | 8.0 | 7.6 |
| Stability (min) | 16.2 | 11.8 | 10.0 | 11.4 | 11.9 | 13.2 | 11.4 |
| **EXTENSOGRAPH:** | | | | | | | |
| Extensibility-45 min (cm) | 16.8 | 16.2 | 17.9 | 16.1 | 16.8 | 16.6 | 16.7 |
| Resistance-45 min (B.U.) | 615 | 498 | 497 | 570 | 513 | 536 | 523 |
| Area-45 min (sq cm) | 130 | 105 | 117 | 120 | 113 | 115 | 150 |
| **ALEOGRAPH:** | | | | | | | |
| P (mm) | 85 | 81 | 83 | 88 | 80 | 84 | 83 |
| L (mm) | 140 | 134 | 135 | 119 | 141 | 130 | 132 |
| W (joules x10$^4$) | 415 | 359 | 360 | 345 | 372 | 376 | 362 |
| **BAKING DATA** | | | | | | | |
| Absorption (%) | 67.2 | 67.0 | 67.2 | 69.5 | 66.2 | 67.6 | 67.5 |
| Dough Handling Properties | 8.7 | 8.9 | 8.4 | 9.0 | 9.0 | 9.3 | 8.9 |
| Loaf Volume (CC) | 918 | 977 | 1019 | 988 | 951 | 976 | 982 |
| Grain and Texture | 7.8 | 7.8 | 7.7 | 7.6 | 7.8 | 7.6 | 7.7 |
| Crumb Color | 8.0 | 7.7 | 7.6 | 7.7 | 7.8 | 7.7 | 7.7 |
| Crust Color | 9.8 | 9.9 | 9.8 | 10.0 | 9.8 | 9.8 | 9.9 |
| Symmetry | 8.0 | 8.7 | 9.1 | 9.3 | 9.1 | 9.1 | 9.1 |

## 2021 QUALITY FACTORS BY PROTEIN RANGE/AREA
## WEST

Samples in this region were collected from Montana, North Dakota areas A and D, South Dakota area A, and Idaho, Oregon and Washington. Please reference page 3.

To illustrate the correlation between higher protein and other quality parameters, samples of the regional crop were segregated by protein levels:

**LOW**
<13.5%

**MEDIUM**
13.5 to 14.5 %

**HIGH**
> 14.5%
* (12% moisture basis)

Data contained on pages 18-21 represent the composites of samples by West and East production regions and a low, medium and high protein range.

| PROTEIN RANGES | | | |
|---|---|---|---|
| WHEAT GRADING DATA | LOW | MEDIUM | HIGH |
| **WHEAT GRADING DATA** | | | |
| Test Weight (lbs/bu/kg/hl) | 61.4/80.7 | 61.3/80.6 | 60.0/78.9 |
| Damage (%) | 0.5 | 0.2 | 0.1 |
| Shrunken/Broken (%) | 1.7 | 1.5 | 1.8 |
| Total Defects (%) | 2.2 | 1.7 | 1.9 |
| Vitreous Kernels (%) | 73 | 84 | 85 |
| Grade | 1 NS | 1 DNS | 1 DNS |
| **WHEAT DATA** | | | |
| Dockage (%) | 0.7 | 0.9 | 0.8 |
| Moisture (%) | 11.1 | 11.1 | 10.8 |
| Protein:12%/0% moisture (%) | 13.0/14.7 | 14.2/16.1 | 16.4/18.6 |
| Ash: 14%/0% moisture (%) | 1.54/1.79 | 1.53/1.78 | 1.55/1.80 |
| 1000 Kernel Weight | 28.0 | 26.6 | 27.0 |
| Falling Number (sec) | 358 | 388 | 374 |
| Sedimentation (cc) | 65 | 69 | 70 |
| **FLOUR DATA** | | | |
| Extraction (%) | 66.2 | 66.7 | 64.0 |
| Color: L | 90.3 | 91.0 | 90.6 |
| a/b | -1.2/9.8 | -1.3/9.6 | -1.3/9.9 |
| Protein: 14%/0% moisture (%) | 12.0/13.9 | 13.2/15.4 | 14.8/17.2 |
| Ash: 14%/0% moisture (%) | 0.48/0.56 | 0.47/0.55 | 0.50/0.58 |
| Wet Gluten (%) | 29.6 | 33.4 | 40.0 |
| Gluten Index (%) | 98 | 95 | 86 |
| Falling Number (sec) | 396 | 413 | 404 |
| Amylograph Viscosity: 65g FL (BU) | 716 | 794 | 747 |
| **DOUGH DATA** | | | |
| Farinograph: Absorption (%) | 60.2 | 61.0 | 62.8 |
| Peak Time (min) | 6.4 | 8.1 | 10.6 |
| Stability (min) | 12.1 | 15.9 | 20.5 |
| Alveograph: P (mm) | 90 | 90 | 87 |
| L (mm) | 122 | 126 | 146 |
| P/L Ratio | 0.74 | 0.71 | 0.60 |
| W ($10^{-4}$ joules) | 390 | 405 | 447 |
| Extensograph (45/135 min): Resistance | 632/1048 | 639/1247 | 676/1483 |
| Extensibility (sm) | 15.9/11.6 | 14.8/12.4 | 14.7/11.4 |
| Area (sq cm) | 127/161 | 123/198 | 130/216 |
| **BAKING DATA** | | | |
| Absorption (%) | 64.1 | 64.2 | 66.6 |
| Crumb Grain and Texture | 7.5 | 7.5 | 8.0 |
| Loaf Volume (cc) | 905 | 960 | 935 |
| **SAMPLE %** | **8** | **12** | **80** |

## EAST

| PROTEIN RANGES | | | |
|---|---|---|---|
| **WHEAT GRADING DATA** | **LOW** | **MEDIUM** | **HIGH** |
| **WHEAT GRADING DATA** | | | |
| Test Weight (lbs/bu/kg/hl) | 62.8/82.6 | 62.8/82.6 | 62.1/81.6 |
| Damage (%) | 0.2 | 0.2 | 0.3 |
| Shrunken/Broken (%) | 0.6 | 0.5 | 0.5 |
| Total Defects (%) | 0.8 | 0.7 | 0.8 |
| Vitreous Kernels (%) | 60 | 74 | 79 |
| Grade | 1 NS | 1 NS | 1 DNS |
| **WHEAT DATA** | | | |
| Dockage (%) | 0.4 | 0.4 | 0.4 |
| Moisture (%) | 12.7 | 12.6 | 12.3 |
| Protein:12%/0% moisture (%) | 13.1/14.9 | 13.9/15.8 | 15.5/17.6 |
| Ash: 14%/0% moisture (%) | 1.46/1.70 | 1.43/1.66 | 1.49/1.73 |
| 1000 Kernel Weight | 31.7 | 31.5 | 31.8 |
| Falling Number (sec) | 382 | 377 | 380 |
| Sedimentation (cc) | 62 | 67 | 69 |
| **FLOUR DATA** | | | |
| Extraction (%) | 68.1 | 68.3 | 67.1 |
| Color: L | 90.3 | 90.6 | 90.1 |
| a/b | -1.1/9.5 | -1.1/9.1 | -1.1/9.5 |
| Protein: 14%/0% moisture (%) | 12.2/14.1 | 13.1/15.2 | 14.5/16.8 |
| Ash: 14%/0% moisture (%) | 0.47/0.55 | 0.48/0.56 | 0.50/0.58 |
| Wet Gluten (%) | 29.7 | 32.9 | 38.7 |
| Gluten Index (%) | 97 | 96 | 94 |
| Falling Number (sec) | 377 | 388 | 400 |
| Amylograph Viscosity: 65g FL (BU) | 702 | 784 | 691 |
| **DOUGH DATA** | | | |
| Farinograph: Absorption (%) | 60.1 | 61.6 | 63.0 |
| Peak Time (min) | 7.2 | 7.6 | 8.9 |
| Stability (min) | 14.2 | 15.6 | 19.8 |
| Alveograph: P (mm) | 84 | 85 | 91 |
| L (mm) | 122 | 133 | 133 |
| P/L Ratio | 0.69 | 0.64 | 0.68 |
| W ($10^{-4}$ joules) | 351 | 395 | 441 |
| Extensograph (45/135 min): Resistance | 553/948 | 593/1002 | 640/1406 |
| Extensibility (sm) | 15.8/13.6 | 16.8/13.9 | 14.8/11.9 |
| Area (sq cm) | 112/171 | 126/180 | 120/219 |
| **BAKING DATA** | | | |
| Absorption (%) | 64.3 | 65.9 | 67.3 |
| Crumb Grain and Texture | 7.5 | 7.5 | 8.5 |
| Loaf Volume (cc) | 860 | 955 | 990 |
| **SAMPLE %** | **8** | **25** | **67** |

Samples in this region were collected from North Dakota areas B, C, E and F, South Dakota areas B and C, and Minnesota. Please reference pg 3.

To illustrate the correlation between higher protein and other quality parameters, samples of the regional crop were segregated by protein levels:

**LOW**
<13.5%

**MEDIUM**
13.5 to 14.5 %

**HIGH**
> 14.5%
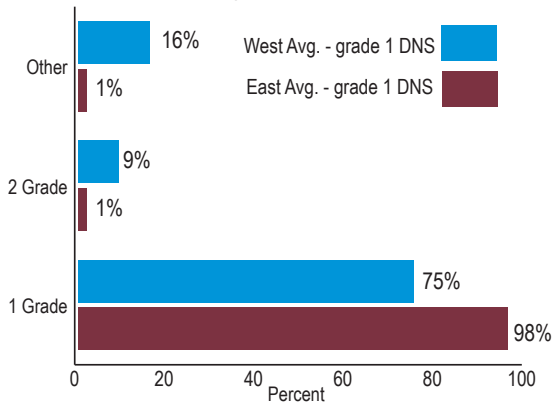* (12% moisture basis)

# U.S. HARD RED SPRING WHEAT
**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## OVERALL REGION

To illustrate the correlation between higher protein and other quality parameters, samples of the regional crop were segregated by protein levels:

**LOW**
<13.5%

**MEDIUM**
13.5 to 14.5 %

**HIGH**
> 14.5%
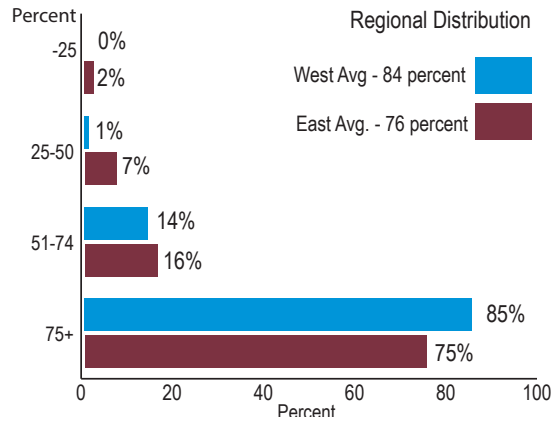* (12% moisture basis)

**PRODUCTION DISTRIBUTION BY PROTEIN**
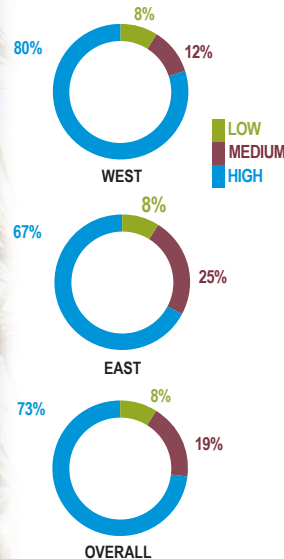
WEST
80% / 8% / 12%

LOW
MEDIUM
HIGH

EAST
67% / 8% / 25%

OVERALL
73% / 8% / 19%

| PROTEIN RANGES | | | |
|---|---|---|---|
| **WHEAT GRADING DATA** | **LOW** | **MEDIUM** | **HIGH** |
| **WHEAT GRADING DATA** | | | |
| Test Weight (lbs/bu/kg/hl) | 62.1/81.7 | 62.3/81.9 | 60.9/80.1 |
| Damage (%) | 0.4 | 0.2 | 0.2 |
| Shrunken/Broken (%) | 1.2 | 0.8 | 1.2 |
| Total Defects (%) | 1.5 | 1.0 | 1.4 |
| Vitreous Kernels (%) | 67 | 77 | 82 |
| Grade | 1 NS | 1 DNS | 1 DNS |
| **WHEAT DATA** | | | |
| Dockage (%) | 0.5 | 0.6 | 0.6 |
| Moisture (%) | 11.9 | 12.1 | 11.5 |
| Protein:12%/0% moisture (%) | 13.0/14.8 | 14.0/15.9 | 16.0/18.2 |
| Ash: 14%/0% moisture (%) | 1.50/1.74 | 1.46/1.70 | 1.52/1.77 |
| 1000 Kernel Weight | 29.9 | 29.9 | 29.2 |
| Falling Number (sec) | 370 | 381 | 377 |
| Sedimentation (cc) | 63 | 67 | 69 |
| **FLOUR DATA** | | | |
| Extraction (%) | 67.1 | 67.7 | 65.4 |
| Color: L | 90.3 | 90.7 | 90.4 |
| a/b | -1.1/9.6 | -1.2/9.3 | -1.2/9.7 |
| Protein: 14%/0% moisture (%) | 12.1/14.0 | 13.1/15.3 | 14.7/17.1 |
| Ash: 14%/0% moisture (%) | 0.47/0.55 | 0.48/0.56 | 0.50/0.58 |
| Wet Gluten (%) | 29.6 | 33.1 | 39.4 |
| Gluten Index (%) | 98 | 95 | 90 |
| Falling Number (sec) | 387 | 396 | 402 |
| Amylograph Viscosity: 65g FL (BU) | 709 | 787 | 722 |
| **DOUGH DATA** | | | |
| Farinograph: Absorption (%) | 60.2 | 61.4 | 62.9 |
| Peak Time (min) | 6.8 | 7.8 | 9.8 |
| Stability (min) | 13.2 | 15.7 | 20.2 |
| Alveograph: P (mm) | 87 | 87 | 89 |
| L (mm) | 122 | 131 | 140 |
| P/L Ratio | 0.71 | 0.66 | 0.63 |
| W ($10^{-4}$ joules) | 371 | 398 | 444 |
| Extensograph (45/135 min): Resistance | 593/998 | 608/1084 | 660/1449 |
| Extensibility (sm) | 15.9/12.6 | 16.1/13.4 | 14.7/11.6 |
| Area (sq cm) | 120/166 | 125/186 | 126/217 |
| **BAKING DATA** | | | |
| Absorption (%) | 64.2 | 65.3 | 66.9 |
| Crumb Grain and Texture | 7.5 | 7.5 | 8.2 |
| Loaf Volume (cc) | 883 | 957 | 960 |
| **SAMPLE %** | **8** | **19** | **73** |

# DISTRIBUTIONS BY EAST/WEST PRODUCTION REGIONS

## GRADE – Regional Distribution

West Avg. - grade 1 DNS
East Avg. - grade 1 DNS

| Category | West | East |
|---|---|---|
| Other | 16% | 1% |
| 2 Grade | 9% | 1% |
| 1 Grade | 75% | 98% |

Percent

## VITREOUS KERNEL

Percent

Regional Distribution

West Avg - 84 percent
East Avg. - 76 percent

| Category | West | East |
|---|---|---|
| -25 | 0% | 2% |
| 25-50 | 1% | 7% |
| 51-74 | 14% | 16% |
| 75+ | 85% | 75% |

Percent

## TEST WEIGHT – Regional Distribution

West Avg. - 60.2 lbs/hl (79.2 kg/hl)
East Avg. - 62.3 lbs/hl (81.9 kg/hl)

| lb/bu / kg/hl | West | East |
|---|---|---|
| -56 / -73 | 4% | 0% |
| 56-57.9 / 75-76.2 | 14% | 1% |
| 58-59.9 / 76.3-78.8 | 25% | 7% |
| 60-61.9 / 78.9-81.4 | 35% | 33% |
| 62+ / 81.5+ | 22% | 59% |

Percent

## 1000 KERNEL WEIGHT

Grams

Regional Distribution

West Avg. - 27.0 grams
East Avg. - 31.7 grams

| Category | West | East |
|---|---|---|
| -25 | 31% | 3% |
| 25-29.9 | 39% | 26% |
| 30-34.9 | 26% | 45% |
| 35-39.9 | 4% | 26% |
| 40+ | 0% | 0% |

Percent

## FALLING NUMBER

Seconds

Regional Distribution

West Avg. - 374 seconds
East Avg. - 379 seconds

| Category | West | East |
|---|---|---|
| -250 | 0% | 1% |
| 251-300 | 1% | 1% |
| 301-350 | 4% | 1% |
| 351-400 | 22% | 19% |
| 401+ | 73% | 78% |

Percent

## PROTEIN - 12% MOISTURE

Percent

Regional Distribution

West Avg - 15.8 percent
East Avg. - 14.9 percent

| Category | West | East |
|---|---|---|
| -12 | 0% | 0% |
| 12-12.9 | 4% | 3% |
| 13-13.9 | 9% | 14% |
| 14-14.9 | 18% | 27% |
| 15+ | 69% | 56% |

Percent

The same base collection samples as shown in the area specific data displayed on pages 6-17 were used for the West/East and protein splits.

## HANDLING AND TRANSPORTATION

The hard red spring wheat growing region utilizes truck, rail and water to get wheat from farms to export facilities. The Northern Plains has a vast network of country elevators to facilitate efficient and precise movement to domestic and export markets. On average, nearly 80 percent of the region's wheat moves to markets by rail. The dominant railroads are the Burlington Northern Santa Fe, the Union Pacific and the Canadian Pacific. In the Pacific Northwest, a large river system is used along with rail to move wheat to export points.

An increasing number of the elevators in the region are investing in facilities and rail capacity to ship 100-110 car units in "shuttle" trains. Each rail car holds approximately 3,500 bushels (95 metric tons)

of wheat. Shuttle-equipped facilities receive the lowest rates, sharing volume and transaction efficiencies with the railroad.

The diverse rail and water shipping capacities and a widespread network of elevators are strengths that buyers can capitalize on, especially as their demand heightens for more precise quality specifications and consistency between shipments. Buyers are encouraged to explore origin-specific shipments to optimize the quality and value of wheat they purchase.

The elevator network in the U.S. hard red spring wheat region is well suited for meeting the increasing quality demands of both domestic and international customers.
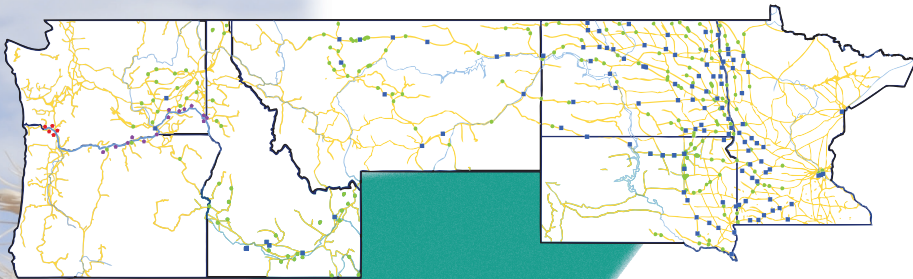
### Grain Handling and Transportation Facilities in the U.S. HRS Region

- ■ 100+ rail car track
- ● 50 - 99 rail car track
- ⬠ Export terminals
- ⬠ River terminals
- ━ River system
- ━ Rail network
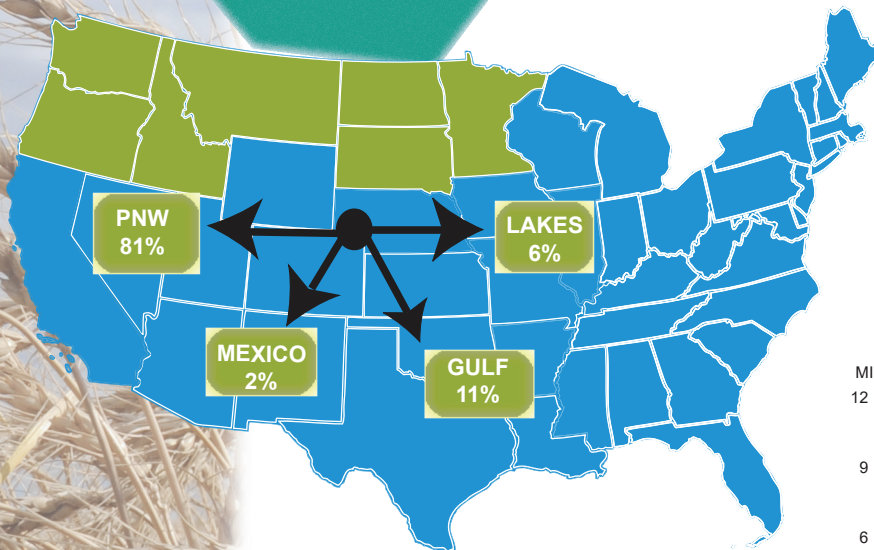
### AVERAGE SHARE OF U.S. HRS EXPORTS BY PORT (2017-2020)

PNW 81%
LAKES 6%
MEXICO 2%
GULF 11%

### 2017-2020 U.S. HRS DOMESTIC USE AND EXPORTS



Bar chart: Domestic Use (blue) and Exports (green) by year 17-18, 18-19, 19-20, 20-21. Left axis MILLION TONS (0-12), right axis MILLION BUSHELS (0-441).
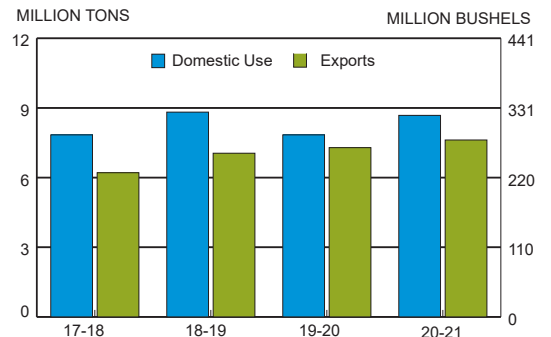
## 2021 SURVEY BACKGROUND

All quality data contained in this report are the result of testing and analysis conducted under the supervision of Dr. Senay Simsek, Wheat Quality Specialist, and by her team members, DeLane Olsen, Kelly McMonagle, Amber Walter, Gwen Thomas, and Kathy Christianson with the Hard Red Spring Wheat Quality Laboratory at North Dakota State University, Fargo, North Dakota, USA.

**COLLECTION** - The North Dakota, South Dakota, Montana and Minnesota state offices of the National Agricultural Statistics Service obtained samples during harvest directly from growers either in the fields or farm bins and local elevators. PNW samples were obtained from the Wheat Marketing Center. These samples reflect the condition of the grain at the point of origin. Sample collection is based on county production histories. A total of 784 samples were collected. Minnesota (120), Montana (156), North Dakota (385), South Dakota (86) and PNW (37).

**ANALYSIS** - Approximately 60 percent of the total wheat samples collected were analyzed for grade and other physical kernel characteristics, to generate distribution data. Distribution averages may differ from data averages in the various tables, because the latter are derived from all samples.

All samples collected are represented in the composite for each crop reporting area. All state and regional averages have been adjusted to reflect current year production.

### APPROXIMATE SHARE OF REGIONAL PRODUCTION
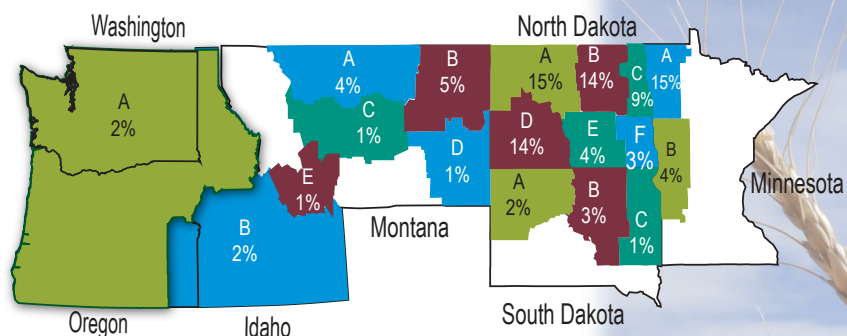


## METHODS, TERMS, SYMBOLS

### WHEAT

**SAMPLE COLLECTION** – Each sample contained approximately 2 to 3 pounds of wheat, stored in sealed, moisture-proof plastic bags.

**MOISTURE** – Official USDA procedure using Dickey-John Moisture Meter.

**GRADE** – Official United States Standards for Grain, as determined by a licensed grain inspector. North Dakota Grain Inspection Service, Fargo, ND, provided grades for composite wheat samples representing each crop reporting area.

**VITREOUS KERNELS** – Approximate percentage of kernels having vitreous endosperm.

**DOCKAGE** – Official USDA procedure. All matter other than wheat which can be removed readily from a test portion of the original sample by use of an approved device (Carter Dockage Tester). Dockage may also include underdeveloped, shriveled and small pieces 0f wheat kernels removed in properly separating the material other than wheat and which cannot be recovered by properly rescreening or recleaning.

**TEST WEIGHT** – American Association of Cereal Chemists International (AACCI) Method 55-10. Measured as pounds per bushel (lb/bu), kilograms per hectoliter (kg/hl) = (lbs/bu X 1.292) + 1.419. *Approved Methods of the AACCI Approved Methods (11th Edition), St. Paul, MN.

**THOUSAND KERNEL WEIGHT** – Based on 10 gram sample of cleaned wheat (free of foreign material and broken kernels) counted by electronic seed counter.

# U.S. HARD RED SPRING WHEAT
### MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON

**KERNEL SIZE DISTRIBUTION** – Percentages of the size of kernels (large, medium, small) were determined using a wheat sizer equipped with the following sieve openings:
• top sieve—Tyler #7 with 2.92 mm opening;
• middle sieve—Tyler #9 with 2.24 mm opening; and
• bottom sieve—Tyler #12 with 1.65 mm opening.

**PROTEIN** – AACCI (NIR) Method: 39.10.01 expressed on dry basis and 12 percent moisture basis.

**ASH** – AACCI Method 08.01, expressed on a 14 percent moisture basis.

**DON** – Analysis was done on ground wheat using a gas chromatograph with an electron capture detector as described in J. Assoc. Official Anal. Chem 79,472 (1996)

**FALLING NUMBER** – AACCI Method 56.81.04; units of seconds (14 percent moisture basis).

**SEDIMENTATION** – AACCI Method 56.61.01, expressed in centimeters.

## FLOUR

**EXTRACTION** – Samples are cleaned and tempered according to AACCI 26-01.02. The milling laboratory is controlled at 68 percent relative humidity and 72°F to 74°F. Milling is performed on a Buhler laboratory mill (Type MLU-202). Straight grade flour (of all six flour streams) is blended and reported as "flour extraction." The blended flour is rebolted through an 84 SS sieve. All mill settings are optimized to achieve maximum laboratory mill flour extraction with standardized ash content.

**ASH** – AACCI Method 08.01, expressed on a 14 percent moisture basis.

**PROTEIN** – AACCI Method 39.10.01 (NIR Method), expressed on a 14 percent moisture basis.

**WET GLUTEN** – AACCI Method 38.12.02, expressed on a 14 percent moisture basis determined with the glutomatic instrument.

**GLUTEN INDEX** – AACCI Method 38.12.02, determined with the glutomatic instrument as an indication of gluten strength.

**FLOUR FALLING NUMBER** – AACCI Method 56.81.03, units of seconds. Determination is performed on 7.0 g of Buhler milled flour (14 percent moisture basis).

**AMYLOGRAM** – (65 g) AACCI Method 22.10.01, modified as follows: 65 g of flour (14 percent moisture basis) are slurried in 450 ml distilled water, paddle stirrers are used with the Brabender Amylograph. Peak viscosity reported in Brabender units (B.U.), on a 14 percent moisture basis.

**STARCH DAMAGE** – AACCI Method 76.31.01. Amperometric method using SDmatic.

## SOLVENT RETENTION CAPACITY

**(SRC)** – AACCI 56-11.02, expressed on a 14 percent moisture basis. SRC is used to predict commercial baking performance. Flour is shaken with excess of four types of solvent, to determine the amount of solvent held by the flour. The four solvents used relate to the functionality to flour components as follows:
Water – Water absorption

Sucrose – Non-starch polysaccharides

Lactic Acid – Glutenins

Sodium Carbonate – Damaged Starch

Gluten Performance Index (GPI) – is a ratio of the solvents and used as an overall performance of flour glutenins especially in relation to bread wheat flour.

## PHYSICAL DOUGH PROPERTIES

**FARINOGRAM** – AACCI Method 54-21.02; constant flour weight method, small (50 g) mixing bowl. (Flour weight 14 percent moisture basis). Farionograph-E.

**ABSORPTION** – Amount of water required to center curve peak on the 500 Brabender unit line, expressed on 14 percent moisture basis.

**PEAK TIME** – The interval, to the nearest 0.5 min, from the first addition of water to the maximum consistency immediately prior to the first indication of weakening. Also known as dough development time.

**STABILITY** – The time interval, to the nearest 0.5 min, between the point where the top of the curve that first intersects the 500-BU line and the point where the top of the curve departs the 500-BU line.

**MIXING TOLERANCE INDEX** – The difference, in Brabender units, from the top of the curve at the peak to the top of the curve measured five minutes after the peak.

**QUALITY NUMBER** – AACCI Method 115. The length, expressed in mm, along the time axis, between the point of water addition and the point where the height in the center of the curve decreased by 30 BU compared to the height of the center of the curve at development time. Stronger flours have a higher quality number.

**EXTENSOGRAM** – AACCI Method 54-10.01; modified as follows: (a) 100 grams of flour (14 percent moisture basis), 2.0 percent sodium chloride (U.S.P.) and water (equal to farinograph absorption minus 2 percent) are mixed to optimum development in a National pin dough mixer; (b) doughs are scaled to 150 grams, rounded, moulded, placed in extensigram holders, and rested for 45 minutes and 135 minutes, respectively, at 30°C and 78 percent relative humidity. The dough is then stretched as described in the procedure referenced above. For conversion purposes, 500 grams equals 400 B.U.

**EXTENSIBILITY** – Total length of the curve at the base line in centimeters.

**RESISTANCE** – Maximum curve height, reported in Brabender units (B.U.).

**AREA** – The area under the curve is measured and reported in square centimeters.

**ALVEOGRAPH** – AACCI Method 54.30.02. Alveolab is used to measure dough extensibility and resistance to extension.

**"P"** – Maximal overpressure; related to dough's resistance to deformation.

**"L"** – Dough extensibility.

**"W"** – The "work" associated with dough deformation.

## BAKING

**PROCEDURE** – AACCI Method 10-09.01, modified as follows: (a) fungal amylase (SKB 15) replacing malt dry powder, (b) Instant dry yeast (1 percent) in lieu of compressed yeast, (c) 5 to 10 ppm ammonium phosphate, where added oxidants are required, (d) 2 percent shortening added. Doughs are mechanically punched using 6-inch rolls, and mechanically moulded using a National Laboratory Test moulder. Baking is accomplished in "Shogren-type" pans.

**BAKING ABSORPTION** – Water required for optimum dough baking performance, expressed as a percent of flour weight on a 14 percent moisture basis.

**DOUGH CHARACTER** – Handling conversion assessed at panning on a scale of 1 to 10 with higher scores preferred.

**LOAF VOLUME** – Rapeseed displacement measurement made 30 minutes after bread is removed from the oven.

**CRUMB GRAIN AND TEXTURE** – Visual comparison to standard using a constant illumination source. Scale of 1 to 10, the higher scores preferred.

**CRUMB COLOR** – Visual comparison with a standard using a constant illumination source on a scale of 1 to 10, the higher scores preferred.

**CRUST COLOR** – Visual comparison with a standard using a constant illumination source on a scale of 1 to 10, the higher scores preferred.

**SYMMETRY** – Visual comparison with a standard using a constant illumination source on a scale of 1 to 10, the higher scores preferred.

# U.S. HARD RED SPRING WHEAT
### MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON

## VARIETAL INFORMATION

### 2021 MAJOR VARIETIES PRODUCED • AGRONOMIC FACTORS

| | | AGRONOMIC DESCRIPTION | | REACTION TO DISEASE[3] | | | AVERAGE YIELD | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | EASTERN, ND[4] | | WESTERN ND[5] | |
| VARIETY | AGENT OR ORIGIN[1] | YEAR RELEASED | STRAW STRENGTH[2] | DAYS TO HEAD | LEAF RUST | HEAD (SCAB) | BU/ACRE | MT/HECT | BU/ACRE | MT/HECT |
| AP Murdock | Syngenta/AgriPro | 2019 | 4 | 53 | 5 | 6 | n/a | n/a | n/a | n/a |
| Barlow | ND | 2009 | 6 | 52 | 6 | 4 | 63.5 | 4.27 | 49.3 | 3.31 |
| Bolles | MN | 2015 | 4 | 56 | 3 | 5 | 63.3 | 4.26 | 48.8 | 3.28 |
| CP 3530 | Croplan | 2015 | 5 | 56 | 2 | 5 | 73.2 | 4.92 | n/a | n/a |
| Faller | ND | 2007 | 5 | 56 | 7 | 4 | 74.2 | 4.99 | 57.0 | 3.83 |
| Glenn | ND | 2005 | 4 | 52 | 6 | 4 | 61.4 | 4.13 | 50.0 | 3.36 |
| Lanning | MSU | 2017 | 4 | 54 | 7 | 6 | n/a | n/a | 54.0 | 3.63 |
| Linkert | MN | 2013 | 2 | 54 | 3 | 5 | 63.1 | 4.24 | 49.5 | 3.33 |
| MN Torgy | MN | 2020 | 3 | 54 | 4 | 3 | n/a | n/a | n/a | n/a |
| ND VitPro | ND | 2016 | 3 | 53 | 4 | 4 | 61.9 | 4.16 | 49.0 | 3.29 |
| Shelly | MN | 2016 | 4 | 56 | 6 | 5 | 68.7 | 4.62 | 55.4 | 3.72 |
| SY Ingmar | Syngenta/AgriPro | 2014 | 3 | 54 | 3 | 5 | 68.4 | 4.60 | 49.0 | 3.29 |
| SY Valda | Syngenta/AgriPro | 2015 | 4 | 54 | 2 | 5 | 73.5 | 4.94 | 52.9 | 3.56 |
| WB 9479[6] | Westbred | 2017 | 2 | 52 | 1 | 6 | n/a | n/a | n/a | n/a |
| WB 9590[6] | Westbred | 2017 | 2 | 54 | 3 | 6 | n/a | n/a | n/a | n/a |

1. ND – North Dakota State University (Public), MN – University of Minnesota (Public), Croplan – (Private), MSU - Montana State University (Public), Syngenta/AgriPro – (Private),  and Westbred (Private).
2. Straw Strength: 1 to 9 scale, with 1 the strongest and 9 the weakest.
3. Disease reaction scores from 1 - 9, with 1 = resistant and 9 = very  susceptible.
4. 2018-20 ND average yield data from four locations in eastern North Dakota.
5. 2018-20 ND average yield data from five locations in western North Dakota.
6. WB 9479 and 9590 were only evaluated in 2018.

## VARIETAL INFORMATION

| | 2021 MAJOR VARIETIES PRODUCED • QUALITY & END-USE FACTORS | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | QUALITY FACTORS[6] | | | |
| VARIETY | TEST WEIGHT LB/BU | TEST WEIGHT KG/HL | WHEAT PROTEIN % | VITREOUS KERNELS % | FARINOGRAM STABILITY (MIN) | ABSORPTION % | LOAF VOLUME CC | MILL & BAKE QUALITY RATING[7] |
| AP Murdock | 60.6 | 79.7 | 14.7 | 52 | 11.3 | 64.2 | 868 | ★★★ |
| Barlow | 62.5 | 82.1 | 15.4 | 77 | 11.5 | 66.4 | 975 | ★★★ |
| Bolles | 60.9 | 80.1 | 17.1 | 79 | 23.6 | 65.4 | 1042 | ★★★★★ |
| CP 3530 | 61.5 | 80.9 | 14.6 | 56 | 8.3 | 64.9 | 985 | ★★★ |
| Faller | 61.5 | 80.9 | 14.5 | 62 | 9.3 | 64.2 | 978 | ★★★ |
| Glenn | 63.7 | 83.8 | 15.7 | 90 | 12.7 | 65.0 | 1009 | ★★★★★ |
| Lanning | 61.1 | 80.3 | 15.8 | 79 | 8.4 | 64.1 | 1002 | ★★★★ |
| Linkert | 61.5 | 80.9 | 15.9 | 75 | 24.0 | 65.0 | 1027 | ★★★★★ |
| MN Torgy | 61.2 | 80.5 | 15.6 | 47 | 14.3 | 62.1 | 908 | ★★★ |
| ND VitPro | 63.4 | 83.3 | 15.7 | 87 | 8.7 | 65.3 | 980 | ★★★ |
| Shelly | 61.2 | 80.5 | 14.5 | 60 | 15.0 | 61.2 | 910 | ★★ |
| SY Ingmar | 62.3 | 81.9 | 15.5 | 72 | 10.5 | 63.7 | 1004 | ★★★★ |
| SY Valda | 61.8 | 81.3 | 14.5 | 82 | 7.2 | 63.1 | 919 | ★★ |
| WB 9479 | 62.4 | 82.0 | 15.4 | 79 | 24.3 | 63.1 | 968 | ★★★ |
| WB 9590 | 61.9 | 81.4 | 14.9 | 75 | 15.5 | 63.8 | 909 | ★★★ |

6. Source: NDSU Plant Science Department, Hard Red Spring Wheat Quality Laboratory, 2018-2020 drill strip trials across ND locations. WB 9479 and 9590 2017-18 only, and MN Torgy is 2019-20 data.

7. Mill and bake quality rating based on protein content, milling performance, flour attributes, dough characteristics and baking performance. Five stars = superior, four stars = excellent, three stars = good, two stars = average, one star = poor.
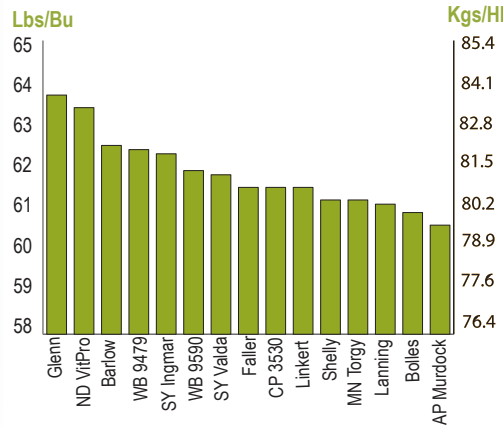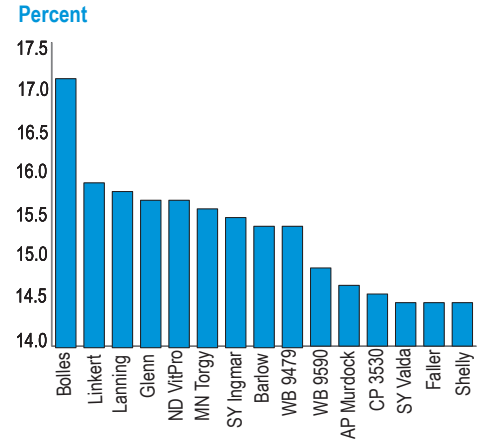
# U.S. HARD RED SPRING WHEAT

**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**
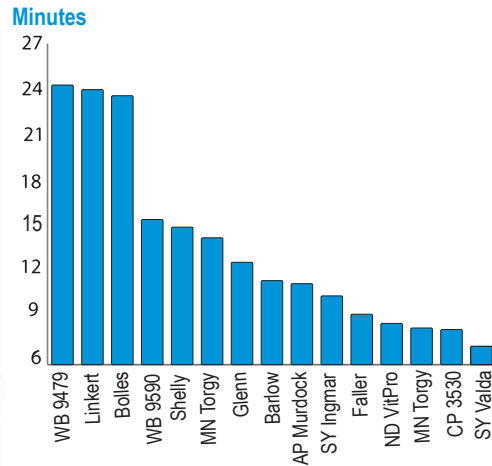
## QUALITY COMPARISON BY POPULAR VARIETIES
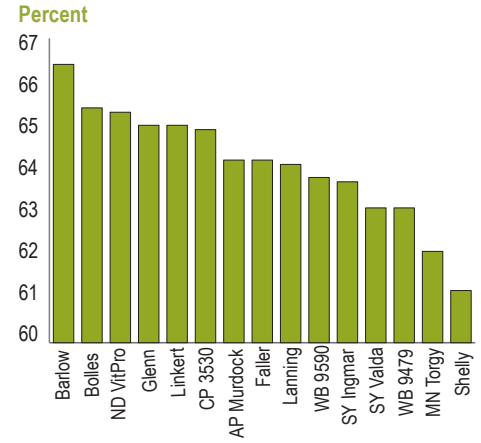
### TEST WEIGHT

Lbs/Bu — Kgs/Hl

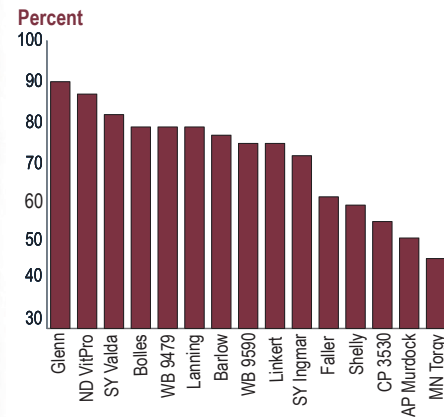Varieties (left to right): Glenn, ND VitPro, Barlow, WB 9479, SY Ingmar, WB 9590, SY Valda, Faller, CP 3530, Linkert, Shelly, MN Torgy, Lanning, Bolles, AP Murdock

### PROTEIN - 12% MOISTURE BASIS

Percent

Varieties (left to right): Bolles, Linkert, Lanning, Glenn, ND VitPro, MN Torgy, SY Ingmar, Barlow, WB 9479, WB 9590, AP Murdock, CP 3530, SY Valda, Faller, Shelly

### FARINOGRAPH STABILITY

Minutes

Varieties (left to right): WB 9479, Linkert, Bolles, WB 9590, Shelly, MN Torgy, Glenn, Barlow, AP Murdock, SY Ingmar, Faller, ND VitPro, MN Torgy, CP 3530, SY Valda

### FARINOGRAPH ABSORPTION

Percent

Varieties (left to right): Barlow, Bolles, ND VitPro, Glenn, Linkert, CP 3530, AP Murdock, Faller, Lanning, WB 9590, SY Ingmar, SY Valda, WB 9479, MN Torgy, Shelly

### VITREOUSNESS

Percent

Varieties (left to right): Glenn, ND VitPro, SY Valda, Bolles, WB 9479, Lanning, Barlow, WB 9590, Linkert, SY Ingmar, Faller, Shelly, CP 3530, AP Murdock, MN Torgy

### LOAF VOLUME

Cubic Centimeters

Varieties (left to right): Bolles, Linkert, Glenn, SY Ingmar, Lanning, CP 3530, ND VitPro, Faller, Barlow, WB 9479, SY Valda, Shelly, WB 9590, MN Torgy, AP Murdock

**THE ACCOMPANYING** tables illustrate the quality evaluation of some of the most popular varieties (cultivars), for key kernel and end-use parameters. A commitment to extensive end-use quality testing of new cultivars during the development stages is a major priority for producers in the region. The goal is to develop and release cultivars that excel in numerous kernel, milling and end-product parameters, across a broad environment.

Source: NDSU Growing season data for MN Torgy is 2019-20; Westbred 9479 and 9550 is 2017-18; and all others are 2018-20

## NORTH DAKOTA

**SY INGMAR** remains the top variety planted in the state in 2021, for the fifth straight year, with 13 percent of the acres, although down from a 20 percent share the previous three years. It is most popular across the western and central regions. In Montana, it ranks fourth, with 6 percent of the acres. SY Ingmar is a 2014 release from Syngenta/AgriPro with broad appeal because of high yield potential, very good straw strength, a high level of disease resistance and moderate to high protein levels. It has very good milling and baking quality.

**SY VALDA** is the second most popular variety in both North Dakota and Minnesota in 2021 with 9.5 and 12.8 percent acreage shares, respectively. A 2015 release from Syngenta/AgriPro, it is popular in eastern parts of the HRS region for its elite yield potential and strong disease tolerance, especially for Fusarium headblight. It is rated as average for milling and baking quality.

**AP MURDOCK** is the fourth most popular variety in North Dakota with nearly 5 percent of the acres, and ranks sixth in Minnesota with slightly more than 8 percent of the acres. It showed notable gains in acreage shares in both states in 2021. Released in 2019 by Syngenta/AgriPro, AP Murdock provides excellent yield potential, good straw strength, moderately high protein levels, and is rated as good for milling and baking quality.

**GLENN** retained the fifth spot in the 2021 survey in North Dakota, capturing 4.4 percent of the acres, up from 3.6 percent in 2020. It is the top variety planted in the southwest district and second in the northwest. Glenn is a 2005 release from NDSU, and is a variety that balances agronomic traits, a high level of resistance to Fusarium headblight and excellent kernel quality. Glenn has superior milling and baking quality characteristics, and is frequently the "check" or reference variety for quality within the Hard Red Spring wheat class.

### NORTH DAKOTA VARIETY SHARE OF PLANTED ACRES[3]

| Variety | 2021%[1] | 2020%[1] |
|---|---|---|
| SY Ingmar | 13.2 | 19.2 |
| SY Valda | 9.5 | 12.5 |
| WB 9590 | 7.5 | 6.1 |
| AP Murdock | 4.7 | 0.4 |
| Glenn | 4.4 | 3.6 |
| Faller | 4.2 | 3.5 |
| Shelly | 3.3 | 2.9 |
| Bolles | 3.0 | 3.3 |
| ND Vitpro | 2.9 | 2.3 |
| CP 3530 | 2.7 | 2.2 |
| Other[2] | 45.0 | 44.6 |

1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage and unknown varieties.
3. ( 1 acre = 0.405 hectares)
   2021 – 5,500,000 planted acres
   2020 – 5,700,000 planted acres

### TOP 3 NORTH DAKOTA VARIETIES BY CROP DISTRICT

| | First | Second | Third |
|---|---|---|---|
| | **PERCENTAGE (%)** | | |
| Northwest | SY Ingmar 27.5 | Glenn 9.3 | SY Rockford 6.3 |
| North Central | SY Ingmar 22.8 | SY Valda 21.6 | WB 9590 5.2 |
| Northeast | Faller 14.8 | WB 9590 14.8 | SY Valda 11.1 |
| West Central | SY Ingmar 18.9 | ND Vitpro 11.4 | Glenn 6.2 |
| Central | SY Valda 12.3 | SY Ingmar 11.4 | WB 9590 8.8 |
| East Central | WB 9590 20.2 | SY Valda 15.8 | AP Murdock 8.7 |
| Southwest | Glenn 10.4 | Barlow 9.5 | Shelly 8.9 |
| South Central | SY Ingmar 25.9 | WB 9719 8.4 | SY Valda 5.1 |
| Southeast | SY Valda 27.1 | SY Ingmar 10.8 | Prosper 7.2 |

# U.S. HARD RED SPRING WHEAT
**MINNESOTA | MONTANA | NORTH DAKOTA | SOUTH DAKOTA | IDAHO | OREGON | WASHINGTON**

## MINNESOTA

### MINNESOTA VARIETY SHARE OF SURVEYED ACRES[3]

| VARIETY | 2021%[1] | 2020%[1] |
|---|---|---|
| WB 9590 | 18.0 | 18.1 |
| SY Valda | 12.8 | 14.2 |
| Linkert | 11.9 | 20.6 |
| WB 9479 | 10.3 | 12.8 |
| MN-Torgy | 9.7 | 0.6 |
| AP Murdock | 8.4 | 0.3 |
| Shelly | 4.2 | 6.0 |
| MN Washburn | 4.0 | 3.9 |
| SY Ingmar | 1.7 | 1.5 |
| Other[2] | 19.0 | 22.0 |

1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage and unknown varieties.
3. (1 acre = 0.405 hectares)
   2021 – 1,210,000 planted acres
   2020 – 1,430,000 planted acres

### TOP 3 MINNESOTA VARIETIES BY CROP DISTRICT

| | First | Second | Third |
|---|---|---|---|
| | PERCENTAGE (%) | | |
| North | WB 9590 20.6 | Linkert 12.4 | SY Valda 12.0 |
| Central | SY Valda 16.9 | MN Torgy 10.4 | Linkert 9.2 |
| South | Linkert 16.2 | MN Torgy 11.8 | SY Ingmar 11.6 |

**WB 9590** moved into the top place in Minnesota in 2021, with 18 percent of the acres, nearly steady with a year ago. It is the third most popular variety in North Dakota with 7.5 percent of the acres, up slightly from 2020. A 2017 release from Westbred, it provides producers with strong straw characteristics, very high resistance to leaf rust disease, high yield potential and moderately high protein content.

**LINKERT** slipped into third position in Minnesota in 2021, with a 12 percent acreage share, down from more than 20 percent a year ago, when it was the leading variety. A 2013 release from the University of Minnesota, it is sought after by producers for its very strong straw, high protein levels and disease resistance traits. It has excellent milling and baking qualities, with especially strong dough properties.

**WB 9479** remained the fourth most popular variety in Minnesota in 2021 with 10 percent of the acres. It is a 2017 release from Westbred with high protein content, strong straw, a high level of leaf rust resistance and high yield potential. WB 9479 has especially strong dough properties, and is rated as good for milling and baking qualities.

**MN TORGY** jumped into fifth place in Minnesota with nearly 10 percent of the acres in 2021, up from just 0.6 in 2020, it's first year of release from the University of Minnesota. It is a variety with excellent disease resistant traits, very strong straw and high yield potential. MN Torgy is rated as good for milling and baking quality.

## MONTANA

**VIDA** remains the leading variety planted in Montana, with 22.6 percent of the acres, although down from nearly one-third of the acres in 2020. It has been the top variety in the state for ten straight years, due to it's high yield and moderate resistance to leaf rust and stripe rust. A 2005 release from the, Vida is most popular across northern and central areas, and is rated as good for milling and baking quality.

**REEDER** is the second most popular variety in Montana, with 12.2 percent of the acres in 2021, up from just 6.1 percent in 2020. A longtime favorite of producers in the northeast part of the state, due to it's high protein content and stay-green trait which allows for longer grain fill. A 1999 release from NDSU, Reeder is rated as average for milling and baking quality.

**LANNING** moved up to third position this year, with 6.5 percent of the acres, up from 3.9 percent in 2020. It is a 2017 release from the Montana Agricultural Experiment Station which was released as a replacement for Vida and Reeder. Lanning combines very good yield potential, strong agronomic traits, high protein potential, and very good milling and baking quality.

## PNW VARIETAL INFORMATION

| | | | | QUALITY FACTORS[2] | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIETY | AGENT OR ORIGIN[1] | YEAR RELEASED | TEST WEIGHT LB/BU | TEST WEIGHT KG/HL | WHEAT PROTEIN % | FARINOGRAM STABILITY (MIN) | ABSORPTION % | LOAF VOLUME CC | MILL & BAKE QUALITY RATING[3] |
| Alum | WSU | 2014 | 62.9 | 82.7 | 13.9 | 24.1 | 66.5 | 1086 | MD |
| Buck Pronto | Buck Semilas S.A. | 2001 | 61.5 | 80.9 | 15.3 | 21.7 | 67.9 | 937 | A |
| Chet | WSU | 2014 | 63.4 | 83.3 | 14.8 | 18.4 | 68.0 | 1108 | MD |
| Expresso | Westbred | 2000 | 62.6 | 82.3 | 14.7 | 5.1 | 68.5 | 1032 | *Not Rated |
| Glee | WSU | 2012 | 62.7 | 82.4 | 13.5 | 16.0 | 65.6 | 1064 | MD |
| SY Gunsight | Syngenta | 2018 | 62.7 | 82.4 | 13.2 | 24.9 | 65.8 | 979 | MD |
| Jefferson | ID | 1997 | 62.3 | 82.0 | 13.6 | 20.9 | 66.0 | 977 | MD |
| Kelse | WSU | 2008 | 62.0 | 81.4 | 14.4 | 19.0 | 67.8 | 1085 | D |
| AP Renegade | Syngenta | 2017 | 61.9 | 81.4 | 13.3 | 28.9 | 65.2 | 922 | D |
| SY605CL | Syngenta | 2010 | 62.9 | 82.7 | 15.4 | 12.0 | 68.4 | 1033 | MD |
| WB 9518 | Westbred | 2013 | 61.9 | 81.4 | 15.0 | 12.7 | 69.4 | 1125 | *Not Rated |
| WB 9662 | Westbred | 2014 | 62.4 | 82.0 | 14.5 | 5.5 | 67.7 | 998 | *Not Rated |
| WB 9668 | Westbred | 2014 | 63.1 | 82.9 | 15.0 | 12.9 | 69.4 | 1111 | D |

**MAJOR VARIETIES PRODUCED IN WASHINGTON, OREGON AND IDAHO • QUALITY & END-USE FACTORS**

1. ID – University of Idaho (Public), WSU – Washington State University (Public), Buck Semillas S.A. (Private), Syngenta (Private) and Westbred (Private).
2. Western Wheat Quality Lab, Pullman, WA.
3. Mill and bake quality rating based on protein content, milling performance, flour attributes, dough characteristics and baking. Western Wheat Quality Lab. Most Desirable (MD), Desirable (D), Acceptable (A).
* Insufficient data exists to produce rating scores

### MONTANA VARIETY SHARE OF SURVEYED ACRES[3]

| VARIETY | 2021%[1] | 2020%[1] |
|---|---|---|
| Vida | 22.6 | 31.5 |
| Reeder | 12.2 | 6.1 |
| Lanning | 6.5 | 3.9 |
| SY Ingmar | 5.9 | 8.6 |
| Corbin | 5.6 | 6.1 |
| SY Longmire | 4.0 | 1.8 |
| SY Soren | 3.8 | 6.1 |
| Duclair | 3.7 | 4.1 |
| Brennan | 3.0 | 3.9 |
| WB 9668 | 2.7 | 1.2 |
| Other[2] | 30.0 | 26.7 |

1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage and unknown varieties.
3. (1 acre = 0.405 hectares)
   2021 – 2,900,000 planted acres
   2020 – 3,350,000 planted acres

### TOP 2 MONTANA VARIETIES BY CROP DISTRICT

| | FIRST | SECOND |
|---|---|---|
| | PERCENTAGE (%) | |
| North Central | Vida 32.7 | Corbin 12.6 |
| North East | Reeder 25.4 | Vida 15.6 |
| Central | Vida 19.8 | SY Ingmar 8.7 |
| South Central | WB 9668 13.0 | Lanning 7.2 |

**SOUTH DAKOTA -** no survey results in 2021.

# 2021 Regional Quality Report
# U.S. HARD RED SPRING WHEAT

## Funding & Support Provided by