



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

## University of Idaho

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

An application requesting a certificate of protection for an alleged novel variety of sexually reproduced, or tuber propagated plant, the name and description of which are contained in the application and exhibits, a copy of which is hereunto annexed and made a part hereof, and the various requirements of law in such cases made and provided have been complied with, and the title thereto is, from the records of the PLANT VARIETY PROTECTION OFFICE, in the applicant(s) indicated in the said copy, and whereas, upon due examination made, the said applicant(s) is (are) adjudged to be entitled to a certificate of plant variety protection under the law.

Now, therefore, this certificate of plant variety protection is to grant unto the said applicant(s) and the successors, heirs or assigns of the said applicant(s) for the term of TWENTY years from the date of this grant, subject to the payment of the required fees and periodic replenishment of viable basic seed of the variety in a public repository as provided by law, the right to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or conditioning it for propagation, or stocking it for any of the above purposes or using it in producing a hybrid or different variety there from, to the extent provided by the PLANT VARIETY PROTECTION ACT. In the United States seed of this variety (1) shall be sold by variety name only as a class of certified seed and (2) shall conform to the number of generations specified by the owner of the rights. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'UI Sparrow'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the *City of Washington, D.C.* this twenty-ninth day of January, in the year *two thousand and twenty.*



Attest:

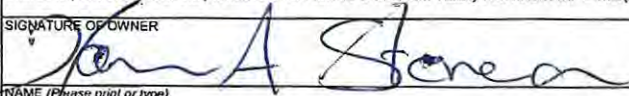
Acting Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

Secretary of Agriculture

MAR 30 2017

REPRODUCE LOCALLY. include form number and date on all reproductions

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE  <b>APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE</b> <i>(Instructions and information collection burden statement on reverse)</i>		The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.  Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).	
1. NAME OF OWNER <b>University of Idaho</b>		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME <b>IDO1108DH</b>	3. VARIETY NAME <b>UI Sparrow</b>
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) University of Idaho Office of Technology Transfer, 875 Perimeter Dr., MS 3003, Moscow, ID 83844-3003		5. TELEPHONE (include area code) <b>208-885-4550</b>	FOR OFFICIAL USE ONLY PVPO NUMBER <b>201700189</b>
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) <b>Land-Grant University</b>		8. IF INCORPORATED, GIVE STATE OF INCORPORATION	9. DATE OF INCORPORATION <b>3/30/2017</b>
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Karen Stevenson, Licensing Associate, University of Idaho, Office of Technology Transfer, 875 Perimeter Dr., MS 3003, Moscow, ID 83844-3003  Jianli Chen, Breeder, University of Idaho R & E Center, 1691 S 2700 W, Aberdeen, ID 83210		11. TELEPHONE (Include area code) <b>208-885-4550</b>	FILING AND EXAMINATION FEES: \$ <b>4,382</b> DATE <b>3/30/2017</b> CERTIFICATION FEE: \$ DATE
13. E-MAIL <b>karens@uidaho.edu</b>		12. FAX (Include area code) <b>208-885-4551</b>	
14. CROP KIND (Common Name) <b>Soft White Winter Wheat</b>	15. GENUS AND SPECIES NAME OF CROP <b>Triticum aestivum L.</b>	16. FAMILY NAME (Botanical) <b>Triticeae</b>	
17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	18. DOES THE VARIETY CONTAIN ANY BIOTECHNOLOGY EVENTS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO  A biotechnology event is defined as a single insertion of a nucleic acid construct into a specific site in a plant's chromosome that is regulated under the U.S. Coordinated Framework for the Regulation of Biotechnology.	20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act) <input checked="" type="checkbox"/> YES (If "yes", answer items 21 and 22 below) <input type="checkbox"/> NO (If "no", go to item 23) <input type="checkbox"/> UNDECIDED	
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Filing and Examination Fee (\$4,382), <input checked="" type="checkbox"/> Make checks and money orders payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office) <input checked="" type="checkbox"/> Credit Card Payments (See instructions on Page 2 of 11)		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. ___ FOUNDATION ___ REGISTERED ___ CERTIFIED (If additional explanation is necessary, please use the space indicated on next page.)	
23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO  IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on next page.)		24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO  IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on next page.)	
25. The owners declare that a viable sample of basic seed will be furnished directly to an acceptable depository in support of the variety within three months of filing. Seed will be replenished upon request in accordance with such regulations as may be applicable. For a tuber propagated variety or vegetative propagated parent of the variety, a tissue culture or vegetative sample will be deposited in a public repository within three months of the date of the certificate fee request letter. These will be maintained for the duration of the certificate.			
The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF OWNER  NAME (Please print or type) <b>Karen Stevenson</b>		SIGNATURE OF OWNER  NAME (Please print or type) <b>Jianli Chen</b>	
CAPACITY OR TITLE <b>Licensing Associate</b>	DATE <b>3/27/2017</b>	CAPACITY OR TITLE <b>Associate Professor</b>	DATE <b>March 24, 2017</b>

MAH 4/10/2019

Continuation Page from ST – 470 (Application for Plant Variety Protection Certificate)

**22. CONTINUED FROM FRONT** *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

**23. CONTINUED FROM FRONT** *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

**24. CONTINUED FROM FRONT** *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE  <b>EXHIBIT A – ORIGIN AND BREEDING HISTORY</b> ** Use additional pages as needed.		FOR OFFICIAL USE ONLY  PVPO NUMBER
1. Name of Owner	2. Temporary Designation or Experimental Name	3. Variety Name
University of Idaho	IDO1108DH	UI Sparrow
4. Describe the genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s). ** UI Sparrow is a F1-derived dihaploid (DH) line from the cross 'UI Silver' (PI 658467) x 'Simon' (PI 636132) using wheat by Maize dihaploid method. UI Silver is a hard white winter wheat cultivar derived from the backcross IDO498*2/UT944157, which was released by the Idaho Agricultural Experiment Station. Simon is a soft white winter wheat cultivar derived from 'Haven'/'Lambert'/'Madsen'. Haven is a soft red biscuit wheat from Nickerson Seed Inc. (formerly PBI), UK. Lambert is a soft white common winter wheat released jointly by the Idaho Agricultural Experiment Station, the Oregon Agricultural Experiment Station and Washington Agricultural Experiment Station (Zemetra et al. 1995). Madsen is a soft white common winter wheat developed by the USDA-ARS, Pullman, WA (Allan et al. 1989) and carries the Pchl gene for resistance to strawbreaker footrot (caused by Pseudocercospora herpotrichoides (Fron) Deighton).  The F1 was made in the field in 2007 and assigned as A0711W. The dihaploid production was conducted in greenhouse in spring 2008. A total of 51 dihaploid (A0711W08DH-1 to -51) plants were obtained and replanted for a seed increase in spring of 2009. The 51 DH lines were planted in single headrow plots in fall of 2009 and all were harvested in summer 2010. All DH lines were planted in a non-replicated trials in Aberdeen and Moscow in fall 2010 and evaluated for yield and baking quality in summer 2011. One line A0711W08DH-30 showed good agronomic performance, milling and baking quality was selected and assigned as IDO1108 in 2011. IDO1108DH is same as IDO1108. DH indicated a dihaploid.		
5. Give the details of subsequent stages of selection and multiplication. **		
Year	Detail of Stage	Selection Criteria
2012 2013 2014-16	replicated yield trials in Aberdeen and Rockland, ID; Western Regional Trials; State Variety Trials in ID, WA, and OR	Yield, uniformity, disease resistance, and end-use quality; Yield and uniformity, disease resistance; Yield, uniformity, disease resistance, and end-use quality.
6. Is the variety uniform? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No  How did you test for uniformity? visual look		
7. Is the variety stable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No  How did you test for stability? Over how many generations? visual look since 2012		
8. Are genetic variants observed or expected during reproduction and multiplication? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No  If yes, state how these variants may be identified, their type and frequency. UI Sparrow is normally brown-chaffed spike and white color seed. The allowable white-chaffed spikes is up to 0.1% in the foundation seed production field. The allowable red color seed of this cultivar is up to 10 kernels per pound in the class of foundations seed, up to 25 kernels per pound in the class of registered seed, and up to 50 kernels per pound in the class of certified seed.		





REPRODUCE LOCALLY. Include form number and date on all reproductions.

Form Approved OMB NO 0581-0055

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U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705

Exhibit C

OBJECTIVE DESCRIPTION OF VARIETY  
Wheat (*Triticum* spp.)

NAME OF APPLICANT (S) University of Idaho	TEMPORARY OR EXPERIMENTAL DESIGNATION IDO1108DH	VARIETY NAME UI Sparrow
ADDRESS (Street and No. or RD No., City, State, Zip Code and Country) Karen Stevenson, Licensing Associate, University of Idaho, Office of Technology Transfer, 875 Perimeter Dr., MS 3003, Moscow, ID 83844-3003  Jianli Chen, Breeder, University of Idaho R & E Center, 1691 S 2700 W, Aberdeen, ID 83210  Enter your e-mail address: jchen@uidaho.edu		FOR OFFICIAL USE ONLY  PVPO NUMBER

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g., 0 9 9 or 0 9 ) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: \_\_\_\_\_ . Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND: <u>1</u> 1 = Common 2 = Durum 3 = Club 4 = Other (Specify) _____	2. VERNALIZATION: <u>2</u> 1 = Spring 2 = Winter 3 = Other (Specify) _____
3. COLEOPTILE ANTHOCYANIN: <u>1</u> 1 = Absent      2 = Present	4. JUVENILE PLANT GROWTH: <u>1</u> 1 = Prostrate      2 = Semi-Erect      3 = Erect
5. PLANT COLOR: (Boot Stage) <u>3</u> 1 = Yellow-Green 2 = Green 3 = Blue-Green	6. FLAG LEAF: (Boot Stage) <u>2</u> 1 = Erect      2 = Recurved <u>2</u> 1 = Not Twisted      2 = Twisted <u>1</u> 1 = Wax Absent      2 = Wax Present
7. EAR EMERGENCE: <u>167</u> Number of Days (Average) <u>1</u> Number of Days Earlier Than * <u>Otto(S ID)</u> Same As * <u>Eltan (S ID)</u> <u>2</u> Number of Days Later Than * <u>Bobtail (S ID)</u> *Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial	
8. ANTHHER COLOR: <u>1</u> 1 = Yellow      2 = Purple	

## 9. PLANT HEIGHT: (From Soil to Top of Head, Excluding Awns)

96 cm (Average)  
8 cm Taller Than Bobtail (N ID) \*  
 Same As Bruneau (N ID) \*  
 \_\_\_\_\_ cm Shorter Than \_\_\_\_\_ \*

## 10. STEM:

2 A. ANTHOCYANIN 1 = Absent 2 = Present  
1 B. WAXY BLOOM 1 = Absent 2 = Present  
1 C. HAIRINESS (last internode of rachis) 1 = Absent 2 = Present

1 D. INTERNODE 1 = Hollow 2 = Semi-Solid 3 = Solid  
4 Number of Nodes  
1 E. PEDUNCLE 1 = Erect 2 = Recurved 3 = Semi-Erect  
 \_\_\_\_\_ cm Length  
 \_\_\_\_\_ F. AURICLE  
2 Anthocyanin: 1 = Absent 2 = Present  
1 Hair: 1 = Absent 2 = Present

## 11. HEAD: (At Maturity)

2 A. DENSITY  
 1 = Lax  
 2 = Middense (Laxidense)  
 3 = Dense

4 B. SHAPE  
 1 = Tapering  
 2 = Strap  
 3 = Clavate  
 4 = Other (Specify) Oblong

2 C. CURVATURE  
 1 = Erect  
 2 = Inclined  
 3 = Recurved

4 D. AWNEDNESS  
 1 = Awnless  
 2 = Apically Awnletted  
 3 = Awnletted  
 4 = Awned

## 12. GLUMES: (At Maturity)

3 A. COLOR  
 1 = White  
 2 = Tan  
 3 = Other (Specify) brown

2 B. SHOULDER  
 1 = Wanting 2 = Oblique  
 3 = Rounded 4 = Square  
 5 = Elevated 6 = Apiculate  
 7 = Other (Specify) \_\_\_\_\_

2 C. SHOULDER WIDTH  
 1 = Narrow  
 2 = Medium  
 3 = Wide

3 D. BEAK  
 1 = Obtuse  
 2 = Acute  
 3 = Acuminate

2 E. BEAK WIDTH  
 1 = Narrow  
 2 = Medium  
 3 = Wide

3 F. GLUME LENGTH  
 1 = Short (ca. 7 mm)  
 2 = Medium (ca. 8 mm)  
 3 = Long (ca. 9 mm)

2 G. WIDTH  
 1 = Narrow (ca. 3 mm)  
 2 = Medium (ca. 3.5 mm)  
 3 = Wide (ca. 4 mm)

1 H. PUBESCENCE  
 1 = Not Present  
 2 = Present

13. SEED:

3 A. SHAPE

- 1 = Ovate
- 2 = Oval
- 3 = Elliptical

1 E. COLOR

- 1 = White
- 2 = Amber
- 3 = Red
- 4 = Other (Specify) \_\_\_\_\_

2 B. CHEEK

- 1 = Rounded
- 2 = Angular

2 F. TEXTURE

- 1 = Hard
- 2 = Soft
- 3 = Other (Specify) \_\_\_\_\_

2 C. BRUSH

- 1 = Short
- 2 = Medium
- 3 = Long

- 1 1 = Not Collared  
2 = Collared

\_\_\_\_ G. PHENOL REACTION

- 1 = Ivory
- 2 = Fawn
- 3 = Light Brown
- 4 = Dark Brown
- 5 = Black

1 D. CREASE

- 1 = Width 60% or less of Kernel
- 2 = Width 80% or less of Kernel
- 3 = Width Nearly as Wide as Kernel

43 H. SEED WEIGHT

g/1000 Seed (Whole Number Only)

- 1 1 = Depth 20% or less of Kernel  
2 = Depth 35% or less of Kernel  
3 = Depth 50% or less of Kernel

1 I. GERM SIZE

- 1 = Small
- 2 = Midsize
- 3 = Large

14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

<u>2</u> Stem Rust ( <i>Puccinia graminis</i> f. sp. <i>tritici</i> )	Race: SrTmp _____
<u>0</u> Leaf Rust ( <i>Puccinia recondita</i> f. sp. <i>tritici</i> )	Race: _____
<u>2</u> Stripe Rust ( <i>Puccinia striiformis</i> )	Race: mixed races, HTAP _____
<u>0</u> Loose Smut ( <i>Ustilago tritici</i> )	Race: _____
<u>0</u> Tan Spot ( <i>Pyrenophora tritici-repentis</i> )	Race: _____
<u>0</u> Flag Smut ( <i>Urocystis agropyri</i> )	Race: _____
<u>0</u> Halo Spot ( <i>Selenophoma donacis</i> )	Race: _____
<u>2</u> Common Bunt ( <i>Tilletia tritici</i> or <i>T. laevis</i> )	Race: mixed races _____
<u>0</u> <i>Septoria nodorum</i> (Glume Blotch)	Race: _____
<u>2</u> Dwarf Bunt ( <i>Tilletia controversa</i> )	Race: mixed races _____
<u>0</u> <i>Septoria avenae</i> (Speckled Leaf Disease)	Race: _____
<u>0</u> Karnal Bunt ( <i>Tilletia indica</i> )	Race: _____
<u>0</u> <i>Septoria tritici</i> (Speckled Leaf Blotch)	Race: _____
<u>0</u> Powdery Mildew ( <i>Erysiphe graminis</i> f. sp. <i>tritici</i> )	Race: _____
<u>0</u> Scab ( <i>Fusarium</i> spp.)	Race: _____
<u>2</u> "Snow Molds"	Race: similar to Eltan _____
<u>0</u> "Black Point" (Kernel Smudge)	Race: _____
<u>2</u> Common Root Rot ( <i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.)	Race: similar to Madsen _____
<u>0</u> Barley Yellow Dwarf Virus (BYDV)	Race: _____
<u>0</u> Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )	Race: _____
<u>0</u> Soilborne Mosaic Virus (SBMV)	Race: _____
<u>0</u> Black Chaff ( <i>Xanthomonas campestris</i> pv. <i>translucens</i> ).	Race: _____
<u>0</u> Wheat Yellow (Spindle Streak) Mosaic Virus	Race: _____
<u>0</u> Bacterial Leaf Blight ( <i>Pseudomonas syringae</i> pv. <i>syringae</i> )	Race: _____
<u>0</u> Wheat Streak Mosaic Virus (WSMV)	Race: _____
____ Other (Specify) _____	Race: _____
____ Other (Specify) _____	Race: _____
____ Other (Specify) _____	Race: _____
____ Other (Specify) _____	Race: _____



**15. HOMOZYGOUS FOR SPECIFIC DISEASE RESISTANCE GENE**

Stem rust SrTmp  
 Leaf rust \_\_\_\_\_  
 Other \_\_\_\_\_

**16. INSECT: PLEASE SPECIFY BIOTYPE (Where Needed) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)**

- 0 Hessian Fly (*Mayetiola destructor*) General \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype A \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype B \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype C \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype D \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype E \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype F \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype G \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype H \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype I \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype J \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype L \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype M \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype N \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) Biotype O \_\_\_\_\_
- 0 Hessian Fly (*Mayetiola destructor*) (Specify) \_\_\_\_\_
- 0 Stem Sawfly (*Cephus* spp.) (Specify) \_\_\_\_\_
- 0 Cereal Leaf Beetle (*Oulema melanopa*) (Specify) \_\_\_\_\_
- 0 Russian Aphid 1 (*Diuraphis noxia*) \_\_\_\_\_
- 0 Russian Aphid 2 (*Diuraphis noxia*) \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) (General) \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) Biotype A \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) Biotype B \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) Biotype C \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) Biotype E \_\_\_\_\_
- 0 Greenbug (*Schizaphis graminum*) Other (Specify) \_\_\_\_\_
- 0 Aphids (Specify) \_\_\_\_\_
- 0 Other (Specify) \_\_\_\_\_

**17. HIGH MOLECULAR WEIGHT GLUTENIN SUBUNIT PROFILE (Check those that apply):**

<table border="0"> <tr><td><input type="checkbox"/></td><td><u>Glu-A1</u></td></tr> <tr><td><input type="checkbox"/></td><td>1</td></tr> <tr><td><input type="checkbox"/></td><td>2*</td></tr> <tr><td><input type="checkbox"/></td><td>null</td></tr> <tr><td><input type="checkbox"/></td><td>1*</td></tr> </table>	<input type="checkbox"/>	<u>Glu-A1</u>	<input type="checkbox"/>	1	<input type="checkbox"/>	2*	<input type="checkbox"/>	null	<input type="checkbox"/>	1*	<table border="0"> <tr><td><input type="checkbox"/></td><td><u>Glu-B1</u></td></tr> <tr><td><input type="checkbox"/></td><td>6+8</td></tr> <tr><td><input type="checkbox"/></td><td>7+8</td></tr> <tr><td><input type="checkbox"/></td><td>7+9</td></tr> <tr><td><input type="checkbox"/></td><td>13+16</td></tr> <tr><td><input type="checkbox"/></td><td>13+19</td></tr> <tr><td><input type="checkbox"/></td><td>17+18</td></tr> </table>	<input type="checkbox"/>	<u>Glu-B1</u>	<input type="checkbox"/>	6+8	<input type="checkbox"/>	7+8	<input type="checkbox"/>	7+9	<input type="checkbox"/>	13+16	<input type="checkbox"/>	13+19	<input type="checkbox"/>	17+18	<table border="0"> <tr><td><input type="checkbox"/></td><td><u>Glu-D1</u></td></tr> <tr><td><input type="checkbox"/></td><td>2+11</td></tr> <tr><td><input type="checkbox"/></td><td>2+12</td></tr> <tr><td><input type="checkbox"/></td><td>3+12</td></tr> <tr><td><input type="checkbox"/></td><td>5+10</td></tr> <tr><td><input type="checkbox"/></td><td>null</td></tr> </table>	<input type="checkbox"/>	<u>Glu-D1</u>	<input type="checkbox"/>	2+11	<input type="checkbox"/>	2+12	<input type="checkbox"/>	3+12	<input type="checkbox"/>	5+10	<input type="checkbox"/>	null
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**18. TRANSLOCATIONS (1=Present 2=Absent 3=Heterogeneous 4= Not Tested):**

- 4 1BL/1RS
- 4 1A/1R
- 4 2NS/2AS
- 4 4DL/4AgS
- \_\_\_\_\_ OTHER (explain) \_\_\_\_\_
- \_\_\_\_\_ OTHER (explain) \_\_\_\_\_

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19. IMIDAZOLINONE HERBICIDE TOLERANCE (1=Present 2=Absent 3=Not Tested):

3 Als-1

3 Als-2





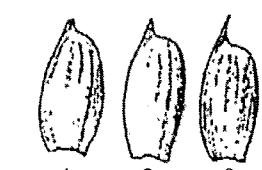
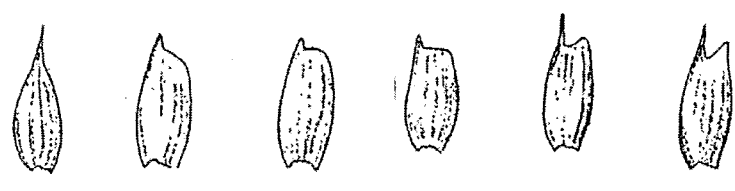
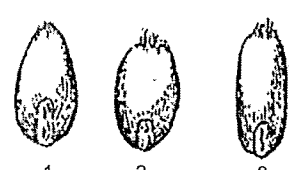

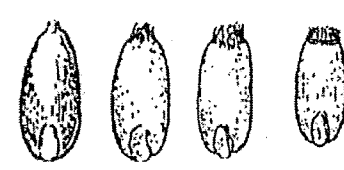
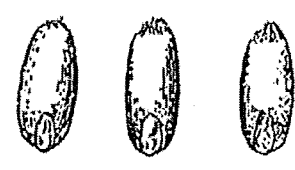



3 Als-3

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20. ADDITIONAL INFORMATION ON ANY ITEM ABOVE OR GENERAL COMMENTS:

**WHEAT DESCRIPTOR ILLUSTRATIONS**

Section Numbers Correspond to the Numbers of the Sections on the Form

<p><b>4. EARLY PLANT GROWTH HABIT:</b></p>  <p>1 Prostrate      2 Intermediate      3 Erect</p>	<p><b>10. (D.) STEM INTERNODE X-SECTION:</b></p>  <p>1 Hollow      2 Semi-solid      3 Solid</p>	<p><b>11. (B.) SPIKE SHAPE:</b></p>  <p>1 Tapering      2 Oblong      3 Clavate      4 Elliptical</p>	
<p><b>11. (D.) AWNEDNESS:</b></p>  <p>1 Awnless      2 Apically Awnleted      3 Awnleted      4 Awned</p>	<p><b>12. (D.) BEAK SHAPE:</b></p>  <p>1 Obtuse      2 Acute      3 Acuminate</p>	<p><b>12. (C.) SHOULDER SHAPE:</b></p>  <p>1 Wanting      2 Oblique      3 Rounded      4 Square      5 Elevated      6 Apiculate</p>	
<p><b>13. (A.) SEED SHAPE:</b></p>  <p>1 Ovate      2 Oval      3 Elliptical</p>	<p><b>13. (B.) CHEEK SHAPE:</b></p>  <p>1 Rounded      2 Angular</p>	<p><b>13. (C.) BRUSH SIZE:</b></p>  <p>1 Small      2 Midsized      3 Large      4 Collared</p>	<p><b>13. (C.) BRUSH HAIR LENGTH:</b></p>  <p>1 Short      2 Medium      3 Long</p>
<p><b>13. (I.) GERM (EMBRYO) SIZE:</b></p>  <p>1 Small      2 Midsized      3 Large</p>	<p><b>13. (D.) SEED CREASE WIDTH:</b></p>  <p>1 Narrow      2 Mid-wide      3 Wide</p>	<p><b>13. (D.) SEED CREASE DEPTH:</b></p>  <p>1 Shallow      2 Mid-Deep      3 Deep</p>	

## Registration of 'UI Sparrow' Wheat

J. Chen,\* J. Wheeler, W. Zhao, N. Klassen, K. O'Brien, J. M. Marshall, C. Jackson, K. Schroeder, R. Higginbotham, and X. Chen

### Abstract

'UI Sparrow' (Reg. No. CV-1134, PI 680612) soft white winter wheat (*Triticum aestivum* L.) was developed and released by the Idaho Agricultural Experiment Station in August 2016. Soft white winter wheat is an important wheat class grown in Idaho and the rest of Pacific Northwest. Resistance to stripe rust is critical for winter and spring wheat cultivars grown in the Pacific Northwest. Resistances to dwarf bunt and snow mold are also important traits for winter wheat cultivars produced in the dryland areas of the Pacific Northwest. UI Sparrow, tested under the experimental designations IDO1108DH, is a semidwarf cultivar with strong straw, brown chaff, and long awns. It has excellent resistance to dwarf bunt, all-stage resistance to all tested predominant races of *Puccinia striiformis* f. sp. *tritici* except for PSTv-40, moderate to high levels of high-temperature adult-plant resistance to stripe rust, and high level resistance to snow mold. UI Sparrow was released as an alternative to 'Eltan', 'Otto', and 'Xerpha' in the low-rainfall regions (<300 mm) and to 'Bobtail', 'SY Ovation', and 'UI-WSU Huffman' in the intermediate- (300–500 mm) and high-rainfall regions (>500 mm) of Idaho and Washington.

SOFT WHITE WINTER WHEAT (*Triticum aestivum* L.) is an important wheat class grown in Idaho and the Pacific Northwest for domestic use and for export to Asian countries for making pastry and noodles. Few soft white winter wheat cultivars are adapted to diverse rainfall areas and also have high level resistance to stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici* Erikss.), dwarf bunt (caused by *Tilletia controversa* J. G. Kühn), and snow mold [caused by *Microdochium nivale* (Fr.:Fr.) Samuels & I. C. Hallett and *Typhula ishikariensis* var. *idahoensis* Imai]. The objectives of the present study were to develop a soft white winter wheat cultivar that has high level and durable resistance to major diseases and has improved yield compared with current cultivars grown in the states of Idaho and Washington. 'UI Sparrow' (Reg. No. CV-1134, PI 680612) soft white winter wheat (*Triticum aestivum* L.) was developed and released by the Idaho Agricultural Experiment Station in August 2016.

UI Sparrow was selected for high yield, resistance to fungal diseases, and cold tolerance using the wheat-by-maize dihaploid breeding method. Grain yields of UI Sparrow were comparable to check cultivars ('SY Ovation' and 'UI-WSU Huffman') under irrigation and better than dryland cultivars 'Eltan' (Peterson et al., 1991) and 'Otto' (Carter et al., 2012) in Idaho and Washington environments. Height and heading date of UI Sparrow were similar to Eltan, but lodging resistance was much better than Eltan. End-use quality of UI Sparrow was comparable to Bruneau and Eltan. UI Sparrow is adapted to most areas of Idaho and Washington, both irrigated and dryland. UI Sparrow has excellent resistance to dwarf bunt, which is a critical trait required for organic wheat production. UI Sparrow has all-stage resistance to all tested predominant races of *P. striiformis* f. sp. *tritici* except for PSTv-40 and also has a moderate to high level of high-temperature adult-plant resistance to stripe rust. Its resistance reaction was similar to Otto but better than Eltan. UI Sparrow has very good winterhardiness and moderate resistance to snow mold (5.0 on a 0-to-9 scale, where 9 is the best), comparable to Eltan (4.5) and Otto (4.0). Resistance of UI Sparrow

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Journal of Plant Registrations  
doi:10.3198/jpr2017.04.0021crc

Received 10 Apr. 2017.

Accepted 6 July 2017.

Registration by CSSA.

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**Abbreviations:** IT, infection type.

to eyespot (caused by *Tapesia yallundae* Wallwork & Spooner) (disease index = 41) was similar to Madsen (35) but better than Eltan (67). Resistance of UI Sparrow to cephalosporium stripe (caused by *Cephalosporium gramineum* Y. Nisik. & Ikata) (disease index = 63) was similar to Madsen (66) but worse than Eltan (33). UI Sparrow has the *SrTmp* gene conferring resistance to stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Erikss. & E. Henn.), including the UG99 race group.

## Methods

### Pedigree and Breeding History

UI Sparrow is an  $F_1$ -derived dihaploid line from the cross 'UI Silver' (PI 658467) × 'Simon' (PI 636132) using the wheat-by-maize dihaploid method (Laurie and Bennett, 1986). UI Silver is a hard white winter wheat cultivar derived from the backcross IDO498\*2/UT944157, which was released by the Idaho Agricultural Experiment Station in 2010. IDO498 is a hard red winter wheat breeding line derived from the pedigree Turcikum 57/3\*Manning. Manning (CItr 17846) is a hard red winter wheat derived from the pedigree Delmar/PI 178383//Columbia/4/Delmar/3/UT 175-53//Norin 10/Brevor (Dewey, 1981). UT944157 is a hard white winter wheat breeding line that is a sib-selection to 'Golden Spike' (Hole et al., 2002). Golden Spike is a hard white winter wheat derived from the pedigree Arbon/Hansel/4/Hansel/3/CItr 14106/Columbia//McCall. Simon is a soft white winter wheat cultivar derived from 'Haven'/'Lambert'/'Madsen' (Zemetra et al., n.d.). Haven is a soft red biscuit wheat from Nickerson Seed Inc. (formerly PBI). Lambert is a soft white common winter wheat released jointly by the Idaho Agricultural Experiment Station, the Oregon Agricultural Experiment Station, and Washington Agricultural Experiment Station (Zemetra et al., 1995). Madsen is a soft white common winter wheat developed by the USDA-ARS, Pullman, WA (Allan et al., 1989), and carries the *Pchl* gene for resistance to eyespot.

The cross was made and  $F_1$  seeds were obtained in the field in 2007 and assigned as A0711W. The dihaploid production was conducted in a greenhouse in spring 2008. A total of 51 dihaploid (A0711W08DH-1 to A0711W08DH-51) plants were obtained and replanted for a seed increase in the spring of 2009. The 51 dihaploid lines were planted in single headrow plots in the fall 2009, and all were harvested in summer 2010. All dihaploid lines were planted in nonreplicated trials in Aberdeen and Moscow, ID, in fall 2010 and evaluated for yield and baking quality in summer 2011. One line, A0711W08DH-30, that showed good agronomic performance and milling and baking quality was selected and named as IDO1108DH in 2011, with the DH indicating a dihaploid.

### Line Selection Evaluation

UI Sparrow, under the experimental designation IDO1108DH, was tested in replicated preliminary yield trials in Aberdeen and Rockland, ID, in 2012; in Western Regional Soft Winter Wheat Trials in 2013; and in replicated elite yield trials in Aberdeen, Rockland, Arbon Valley, and Kimberly, ID, from 2013 to 2016. UI Sparrow was extensively tested in the Extension State Variety Trials in rainfed and irrigated conditions in Idaho, Washington, and Oregon in 2013 to 2016.

Details for plot size and trial location characteristics can be found on the respective web pages for each of the variety trials (Washington State University Extension Cereal Variety Testing Program, 2017; University of Idaho Extension, 2017; Oregon State University, 2017). Grain yield, volume weight, days to heading (50% of heads in the plot completely visible), and plant height (distance from ground to top of spike excluding awns) were measured in most locations, whereas lodging (0-to-9 scale, where 0 = no lodging, 9 = 100% plants lodged) was recorded only when significant lodging was present in the field.

### Evaluation of End-Use Quality

Milling quality and baking quality of UI Sparrow were assessed by the Idaho Wheat Quality Laboratory at Aberdeen using approved methods of the American Association of Cereal Chemist (AACC, 2000). Composite grain samples of 500 g of each genotype from each location were milled using modifications to AACC method 26-50. Near-infrared analysis was performed with a Perten 8611 (Perten Instruments) according to AACC method 39-10 to determine flour protein concentration, with values calibrated by combustion analysis of total nitrogen content with a LECO Model FP-428 instrument (LECO Corp.) and corrected to 120 g kg<sup>-1</sup>. Baking quality of the flour samples was measured using the micro sugar-snap cookie method (AACC method 10-52).

### Evaluation of Resistance to Stripe Rust and Other Diseases

UI Sparrow was evaluated by X.M. Chen's program in a single-row plot (1.0 m long) for resistance to stripe rust under natural infections in both Pullman and Mt. Vernon, WA, in 2014 and 2016 in either or both of two nurseries: the Southern Idaho Wheat Breeding Nursery and the Western Regional Soft Winter Wheat Nursery. Stripe rust races prevalent at these locations during those years in the Pacific Northwest included PSTv-52, PSTv-37, FSTv-4, PSTv-79, and PSTv-48. Stripe rust resistance was evaluated twice at Feekes growth stages 5–6 and 10.1–10.5 in Mt. Vernon and once at stage 10.1–10.5 in Pullman when the susceptible check 'PS279' had about 30% severity at the early stage and greater than 80% severity at both locations at the late growth stage. Infection type (IT) was recorded using the 0-to-9 scale as described by Line and Qayoum (1992), and severity (SEV) was recorded as percentage of foliage infected. In addition, UI Sparrow was evaluated in the greenhouse together with the other entries in the 2010 Western Regional Soft Winter Wheat Nursery at two temperature profiles. One was the low-temperature profile (diurnal temperature cycle gradually changing from 4°C at 2:00 AM to 20°C at 2:00 PM) with 16 h light using selected races PSTv-4, PSTv-14, PSTv-37, PSTv-40, and PSTv-51 in the seedling stage; the other was the high-temperature profile (diurnal temperature cycle gradually changing from 10°C at 2:00 AM to 30°C at 2:00 PM) with races PSTv-14, PSTv-37, and PSTv-40 in adult-plant stages (boot to flowering stage) (Chen and Line, 1995; Chen, 2005; Chen et al., 2010).

The reaction of UI Sparrow to dwarf bunt compared with the reaction of the susceptible cultivar 'Cheyenne' (CItr 8885; Clark, 1931) was tested in Logan, UT, in two replicate 1.5-m rows in the field in 2015 and 2016. The nursery was artificially

inoculated with a composite of common pathogenic races of *T. controversa*. The percentage of diseased spikes (0% = immune resistance and 100% = susceptible) of Cheyenne and UI Sparrow was determined at plant maturity.

The snow mold resistance of UI Sparrow was assessed in a naturally infected nursery in Tetonia, ID, over 2 yr (2015 and 2016). The snow mold rating is a visual estimate of growth approximately 4 wk after snowmelt that is based on both the percentage of recovery and vigor. The scale ranges from 0 to 9, where 0 = no recovery and 9 = complete recovery.

## Statistical Analysis

Data generated from Washington State Cereal Variety Trials were analyzed with the general lattice (ALS) procedure in Agrobases Generation 2, version 38.10.1 (Agronomix Software). Since four major wheat-producing regions with distinct agroclimatic conditions are present in Washington State, data were analyzed across locations within regions instead of over all locations. The final data analysis used only entries common to the trials across all years.

Data generated from the University of Idaho State Variety Trials were analyzed with randomized complete block design using SAS Versions 9.2–9.4 (SAS Institute). Data from rainfed and irrigated trials were analyzed separately. The final data analysis used only entries common to the trials across all years. The LSD test ( $\alpha = 0.05$ ) was used to determine the significance of mean differences among genotypes for the traits evaluated.

## Seed Purification and Increase

The breeder seed was produced at the Aberdeen Research Station. Four hundred selected heads were individually threshed and planted in 400 headrows in 2013. Based on the uniformity and agronomic performance, 216 headrows were harvested in which 74 headrows were selected for lower grain protein content and higher test weight in 2014. The 74 lines were simultaneously planted in 1.5-m by 3-m plots and evaluated for stripe rust resistance in the USDA stripe rust nursery in Pullman in 2015.

Based on the uniformity and stripe rust resistance, approximately 35 plots were harvested and composited, resulting in about 160 kg of breeder seed in summer 2015. Approximately 54 kg of breeder seed was planted (0.5 ha) in fall 2015 for foundation seed production in 2016. Additional breeder seed was produced from 4.5 kg of the 2015 increase, and the remaining breeder seed was used in variety trials in Idaho, Washington, and Oregon in 2016.

## Characteristics

### General Description

UI Sparrow is a semidwarf, strong straw, medium-late soft white winter wheat cultivar. It has prostrate juvenile plant growth. The plants exhibit a blue-green color with slightly twisted flag leaf. At maturity, heads are semi-erect, long-awned, strap, and brown-chaffed. Anthers are yellow. Stems do not have hair or wax and are purple colored on the bottom stem at boot stage. There are typically three nodes present with hollow internodes. The peduncle is erect, averaging 15 cm in length. At maturity, the heads are brown colored with glumes that are long, narrow, and lacking pubescence. Glume shoulders are oblique. Seed is white in color, soft, with elliptical and angular cheeks, and has a medium brush end. This description was mainly based on the trials conducted in the breeding program in Aberdeen.

### Agronomic Performance

Results summarized herein were mainly derived from the Idaho and Washington State Variety Trials. Mean yield of UI Sparrow was 9361.2 kg ha<sup>-1</sup> in nine irrigated environments of 3 yr (2014–2016) in southeastern Idaho (Table 1), which was not significantly different from Bobtail, Bruneau, and UI-WSU Huffman. However, it was significantly greater than Brundage (Zemetra et al., 1998), Stephens (Kronstad et al., 1978), and Madsen (Allan et al., 1989), while lower than SY Ovation. Grain volume weight of UI Sparrow was 70.0 kg hL<sup>-1</sup>, which was not significantly different from Bobtail and Stephens

**Table 1. Agronomic performance of soft white winter wheat UI Sparrow compared with adapted cultivars in irrigated and rainfed environments in southeast Idaho over 3 yr, 2014–2016.†**

Cultivar	Irrigated (16 cultivars)					Rainfed (13 cultivars)		
	Yield	Volume weight	Days to heading	Height	Lodging	Yield	Volume weight	Height
	kg ha <sup>-1</sup>	kg hL <sup>-1</sup>	d	cm	%	kg ha <sup>-1</sup>	kg hL <sup>-1</sup>	cm
UI Sparrow	9361.2	70.0	151.0	104.1	21	4304.0	69.1	73.7
Bobtail	9643.7	69.6	148.0	94.0	17	4324.2	66.7	63.5
Bruneau	9220.0	71.5	149.0	96.5	21	4061.9	70.3	71.1
SY Ovation	9845.4	72.3	146.0	96.5	12	4404.9	71.6	66.0
UI-WSU Huffman	9011.5	71.0	150.0	99.1	20	3490.3	68.0	66.0
Brundage	8271.8	71.7	143.0	94.0	9	2111.7	71.1	61.0
Stephens	8688.7	70.6	145.0	94.0	16	3685.3	69.0	68.6
Madsen	8540.8	71.3	150.0	99.1	14	3840.0	70.6	68.6
Otto	NA‡	NA	NA	NA	NA	3840.0	70.2	68.6
Eltan	NA	NA	NA	NA	NA	3449.9	69.5	68.6
Site-year	9	9	9	9	9	4	4	4
Average	9172.9	71.3	146.0	94.0	15	3651.7	69.5	66.0
LSD (0.05)	410.2	0.7	0.7	2.5	6	343.0	0.7	2.8

† Data provided by J. Marshall; complete data can be found in Marshall et al. (2017).

‡ NA, not available.



although it was lighter than the rest of lines tested. Mean height of UI Sparrow was 104 cm under irrigation, which was the tallest cultivar in the trial. Because UI Sparrow has strong straw, its lodging resistance was similar to Bobtail, Bruneau, UI-WSU Huffman, and Stephens. Mean heading date of UI Sparrow was 151 d, which was later than most of lines tested, although the maturity date of UI Sparrow was similar to UI-WSU Huffman and Madsen (data not shown).

Under dryland conditions, mean yield of UI Sparrow was 4304 kg ha<sup>-1</sup> over four dryland environments of 3 yr in southeastern Idaho (Table 1), which was not significantly different from SY Ovation, Bobtail, and Bruneau but was greater than Madsen, Otto, Stephens, UI-WSU Huffman, Eltan, and Brundage. UI Sparrow had better grain volume weight than Bobtail and UI-WSU Huffman. UI Sparrow headed 1 d earlier than Otto, similar to Eltan, Bruneau, and Madsen, and later than the rest of cultivars. Mean height of UI Sparrow was 73.7 cm, which was not significantly different from Bruneau but taller than the rest of the lines tested (Table 1).

Under dryland production in northern Idaho, the mean yield of UI Sparrow was significantly greater than Stephens, Madsen, and Brundage 96 (Zemetra et al., 2003) while not significantly

different from Bobtail, Bruneau, WB Junction, and UI/WSU Huffman (Table 2). Grain volume weight of UI Sparrow was greater than Bobtail but not significantly different from other cultivars. Despite its height, UI Sparrow displayed good resistance to lodging in most trials.

The overall performance of UI Sparrow was exceptional in all precipitation zones in Washington over 3 yr (Table 3). Mean yield of UI Sparrow (8318.8 kg ha<sup>-1</sup>) was highest in the >500-mm precipitation zones. In the 400- to 500-mm zones, UI Sparrow had similar yield to Xerpha (Jones et al., 2010) and SY Ovation, >400 kg ha<sup>-1</sup> higher than Madsen and WB Junction, although 229 kg ha<sup>-1</sup> lower than Bobtail. In the 300- to 400-cm zones, UI Sparrow had higher yield than Eltan, Otto, WB Junction, and Madsen, although lower than Xerpha. In the <300-mm zones, the mean yield of UI Sparrow was similar to Otto, slightly lower than Xerpha, and higher than Eltan, WB Junction, and Madsen.

## Flour and Baking Quality

The overall end-use quality of UI Sparrow is similar to Bruneau and Eltan but better than Simon and Stephens (Table 4). Flour protein content of UI Sparrow was less than Simon and

**Table 2. Agronomic performance of soft white winter wheat UI Sparrow compared with adapted cultivars in northern Idaho environments over 3 yr, 2014–2016.†**

Cultivar	2015 (44 entries)			2016 (40 entries)			2014–2016 (16 entries)		
	Yield	Volume weight	Height	Yield	Volume weight	Height	Yield	Volume weight	Height
	kg ha <sup>-1</sup>	kg hL <sup>-1</sup>	cm	kg ha <sup>-1</sup>	kg hL <sup>-1</sup>	cm	kg ha <sup>-1</sup>	kg hL <sup>-1</sup>	cm
UI Sparrow	6772.1	69.2	98.6	8971.2	73.8	107.4	6940.2	70.8	94.0
Bobtail	6476.2	67.6	86.4	9475.5	73.4	97.3	6980.6	69.0	82.9
Bruneau	7128.5	71.3	98.0	8776.1	76.6	105.9	7041.1	72.6	91.2
WB-Junction	7047.8	72.9	91.2	8527.3	76.6	97.8	6960.4	73.2	85.6
UI/WSU Huffman	6778.8	69.8	94.0	8507.1	76.2	103.1	6819.2	71.8	88.9
Stephens	6496.4	69.8	90.4	8150.7	75.2	97.3	6523.3	71.2	84.8
Madsen	6368.6	70.2	92.2	8076.7	76.2	96.8	6415.7	72.0	86.6
Brundage 96	6698.1	70.0	90.7	8144.0	75.3	93.2	6583.8	71.5	83.6
Site	6	6	6	5	5	5	17	17	17
Mean	6536.7	70.7	89.7	8339.0	76.1	97.3	6745.2	72.1	85.9
LSD (0.05)	282.5	1.1	1.8	309.4	0.6	2.3	181.6	0.5	1.5

† Data provided by Dr. Curtis Schroeder.

**Table 3. Mean grain yield of soft white winter wheat UI Sparrow compared with seven adapted cultivars in different precipitation zones in Washington over 3 yr, 2013, 2014, and 2016.†**

Cultivar	Precipitation zone			
	<300 mm	300–400 mm	400–500 mm	>500 mm
	kg ha <sup>-1</sup>			
UI Sparrow	3443.2	6388.8	7128.5	8318.8
Xerpha	3550.8	6758.6	7047.8	7989.3
Eltan	3315.4	6227.4	NA	NA
Otto	3463.4	5978.5	NA	NA
Bobtail	NA‡	NA	7357.2	7935.5
SY Ovation	NA	NA	7249.6	7532.0
WB-Junction	3039.7	6045.8	6691.4	7431.1
Madsen	2992.6	5891.1	6725.0	7431.1
Site-years	15	17	12	12
Mean	3302.0	6213.9	7034.4	7774.1
LSD	80.7	121.1	161.4	148.0

† Data provided by Washington State University Cereal Variety Testing Program (2017).

‡ NA, not available.

**Table 4. Flour quality and cookie diameter of soft white winter wheat UI Sparrow compared with four adapted cultivars in Rockland (dryland [Dry]) and Aberdeen (irrigated [IR]) over 3 yr, 2013–2015.**

Cultivar	Flour protein		Flour Yield		Break flour		Cookie diameter	
	Dry	IR	Dry	IR	Dry	IR	Dry	IR
	g kg <sup>-1</sup>		%		%		cm	
UI Sparrow	120	97	59.6	66.3	40.5	43.0	8.7	8.9
Eltan	122	97	58.7	66.1	45.1	46.3	8.7	9.0
Bruneau	129	96	58.5	67.2	43.7	46.8	8.8	9.0
Simon	130	110	61.6	67.4	36.5	41.9	8.6	8.9
Stephens	112	110	61.3	62.9	38.0	42.3	8.4	8.7
Mean	122	102	59.9	66.0	40.7	44.2	8.6	8.9
LSD (0.05)	9	22	6.2	3.3	6.8	3.6	0.4	0.2

Bruneau but not different from Eltan and Stephens under rainfed conditions. Flour protein of UI Sparrow under irrigation and flour yield under both irrigated and rainfed conditions were not significantly different from the four checks. Break flour yield of UI Sparrow was less than Bruneau but not different from the other three checks under irrigation. Cookie diameter was greater than Stephens but not different from the other three checks under both irrigated and rainfed conditions.

### Stripe Rust Resistance

UI Sparrow has all-stage resistance to all tested predominant races of stripe rust except for PSTv-40 and also has moderate to high levels of high-temperature adult-plant resistance to stripe rust (Table 5). The resistance level was similar to Otto but better than Eltan. In the greenhouse seedling tests, UI Sparrow was resistant to races PSTv-4, PSTv-14, and PSTv-37 but susceptible to PSTv-40 and PSTv-51 in 2014; in 2016, UI Sparrow was resistant to PSTv-4, PSTv-14, PSTv-37, and PSTv-51, susceptible only to PSTv-40. In the adult-plant test, UI Sparrow showed a mix of resistant (IT 2) and moderate resistant (IT 5–6) in 2014, but resistant (IT 2–3) in 2016. The field data agreed with the greenhouse data. The highest infection type (5) and severity (30%) were observed at Pullman in the Western Regional Soft Winter Wheat Nursery in 2014, while 2 and 10% were observed in the Washington State Extension Soft Winter Wheat Nursery in 2016.

### Other Disease Resistance

UI Sparrow has excellent resistance to dwarf bunt and comparable level of resistance to snow mold (5.0 on a 0-to-9 scale, where 9 is the most resistant) with Eltan (4.5) and Otto (4) in 2015 (Marshall et al., 2016). In addition, resistance of UI Sparrow to eyespot (disease index = 41) was similar to Madsen (35) but better than Eltan (67); resistance to *Cephalosporium stripe* (disease index = 63) was similar to Madsen (66) but worse than Eltan (33) based on the mean data of 2 yr (Sexton and Murray, 2015). UI Sparrow has the *SrTm<sup>p</sup>* gene for resistance to stem rust including the UG99 race group of *P. graminis* f. sp. *tritici* (Jin and Rouse, personal communication, 2014).

### Availability

The Idaho Agricultural Experiment Station will maintain breeder and foundation seed of UI Sparrow. Multiplication and distribution rights of other classes of certified seed will be handled by the licensed partners to be identified. Recognized seed classes will include the foundation, registered, and certified seed classes. UI Sparrow has been submitted for US Plant Variety Protection (PVP) under Public Law 91-577 with the Certification Only option. Seed of UI Sparrow has been deposited in the USDA National Plant Germplasm System, where it will be available for distribution on expiration of Plant Variety Protection, 20 yr after the date of publication. Small quantities of seed

**Table 5. Stripe rust infection type of soft white winter wheat UI Sparrow compared with check cultivars and susceptible check to selected *Puccinia striiformis* f. sp. *tritici* (PST) races under controlled greenhouse conditions at low temperature for the seedling tests and at high temperature for the adult-plant tests.**

Cultivar	Infection type								Field HTAP‡
	Seedling test (4–20°C)					Adult plant test (10–30°C)†			
	PSTv-4	PSTv-14	PSTv-37	PSTv-40	PSTv-51	PSTv-14	PSTv-37	PSTv-40	
0–9§									
2014 Western Regional Soft Winter Wheat Nursery									
UI Sparrow	2	2	2	8	8	2,2,2	2,2,2	6,6,5	Moderate
PS279 (sus.)¶	8	8	8	8	8	8,8,8	8,8,8	8,8,8	No
2016 Washington State Soft White Winter Wheat Nursery									
Otto	2	8	2	2	2	2,3,2	2,2,2	2,2,2	High
Eltan	8	8	8	8	8	5,5,5	5,5,5	5,5,5	Moderate
UI Sparrow	2	2	2	8	2	2,2,2	2,2,2	2,2,3	High
PS279 (sus.)	8	8	8	8	8	8,8,8	8,8,8	8,8,8	No

† Three numbers indicated three readings in three replications.

‡ HTAP, high-temperature adult-plant resistance.

§ Infection type scale, where 9 = most susceptible.

¶ sus., susceptible check.

for research purposes may be obtained from the corresponding author for at least 5 yr from the date of this publication.

## Acknowledgments

UI Sparrow was developed with financial support from the Idaho Wheat Commission; the Idaho Agricultural Experimental Station Hatch Projects; and the National Research Initiative Competitive Grants 2011-68002-30029 and 2017-67007-25939 from the USDA National Institute of Food and Agriculture. The authors are grateful to growers Hans Hayden and Gilbert Hoffmeister for providing technical support and land for trials.

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U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE  <b>EXHIBIT E - STATEMENT OF THE BASIS OF OWNERSHIP</b>	<b>FOR OFFICIAL USE ONLY</b>  PVPO NUMBER
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1. Name of Owner <b>University of Idaho</b>	2. Temporary Designation or Experimental Name <b>IDO1108DH</b>	3. Variety Name <b>UI Sparrow</b>
--	---	--------------------------------------

4. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain.

YES       NO

5. Is the applicant a U.S. national or a U.S. based entity? If no, give name of country.

YES       NO

6. Is the applicant the original owner?

YES       NO      If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

YES       NO      If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

YES       NO      If no, give name of country

7. Additional explanation on ownership (*Trace ownership from original breeder to current owner*).

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1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

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AGRICULTURAL MARKETING SERVICE  
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BELTSVILLE, MD 20705**

**EXHIBIT F  
DECLARATION REGARDING DEPOSIT**

NAME OF OWNER (S)  University of Idaho	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) University of Idaho Office of Technology Transfer 875 Perimeter Dr., MS 3003, Moscow, ID 83844-3003, United States	TEMPORARY OR EXPERIMENTAL DESIGNATION <b>IDO1108DH</b>
		VARIETY NAME <b>UI Sparrow</b>
NAME OF OWNER REPRESENTATIVE (S) Jianli Chen, Breeder Karen Stevenson, Licensing Associate	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) Jianli Chen, University of Idaho R & E Center, 1691 S 2700 W, Aberdeen, ID 83210 Karen Stevenson, University of Idaho, Office of Technology Transfer, 875 Perimeter Dr., MS 3003, Moscow, ID 83844-3003	FOR OFFICIAL USE ONLY
		PVPO NUMBER

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

  
Signature

March 24, 2017  
Date