No. 9700343

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

NDSU Research Foundation

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT 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 THEREFROM, TO THE EXTENT PROVIDED [illegible] THE PLANT VARIETY PROTECTION ACT, IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL [illegible]D BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF [illegible]IONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'Keene'

**Original grant July 31, 1997*

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 thirtieth day of June in the year of our Lord one thousand nine hundred and ninety-nine.

PLANT VARIETY PROTECTION OFFICE · U.S. DEPARTMENT OF AGRICULTURE

Attest:

Acting Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

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 DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

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 APPLICANT(S) *(as it is to appear on the Certificate)*
NDSU RESEARCH FOUNDATION

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
ND678

3. VARIETY NAME
Keene

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
c/o Executive Director
PO Box 5014
Fargo, ND 58105-5014

5. TELEPHONE *(include area code)*
701-231-8931

6. FAX *(include area code)*
701-231-1013

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PVPO NUMBER 9700343

FILING DATE: 6-18-97

7. GENUS AND SPECIES NAME
Triticum aestivum L.

8. FAMILY NAME *(Botanical)*
Gramineae

9. CROP KIND NAME *(Common name)*
Hard red spring wheat

FEES RECEIVED
FILING AND EXAMINATION FEE: $ 2450.00
DATE 6-18-97
CERTIFICATION FEE: $ 300.00
DATE 07/11/97

10. IF THE APPLICANT NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.) (Common name)*
501 (c) (3) Corporation - NDSU Research Foundation

11. IF INCORPORATED, GIVE STATE OF INCORPORATION
North Dakota

12. DATE OF INCORPORATION
May 1989

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
Richard C. Frohberg
Department of Plant Sciences
North Dakota State University
PO Box 5051
Fargo, ND 58105-5051

Dale Zetocha
Executive Director
NDSU Research Foundation
PO Box 5014
Fargo, ND 58105-5014

14. TELEPHONE *(include area code)*
701-231-8143

15. FAX *(include area code)*
701-231-8474

16. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow instructions on reverse)*

a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of the Variety
d. ☒ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☒ Exhibit E. Statement of the Basis of the Applicant's Ownership
f. ☒ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☒ Filing and Examination Fee ($2,460), made payable to "Treasurer of the United States" *(Mail to PVPO)*

17. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY, AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☒ YES *(If "yes," answer items 18 and 19 below)* ☐ NO *(If "no," go to item 20)*

18. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

19. IF "YES" TO ITEM 18, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? AAA per letter 10 Apr 1998
☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

20. HAS THE VARIETY OR A HYBRID PRODUCED FROM THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☒ YES *(If "yes," give names of countries and dates)* ☐ NO
USA - Release date June 28, 1996

21. The applicant(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned applicant(s) is(are) the owner(s) 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.

Applicant(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*
Dale Zetocha

NAME *(Please print or type)*
Dale Zetocha

CAPACITY OR TITLE Executive Director NDSU Research Foundation

DATE 6/17/97

SIGNATURE OF APPLICANT *(Owner(s))*

NAME *(Please print or type)*

CAPACITY OR TITLE

DATE

STD-470 (03-96) *(Previous editions are to be destroyed)*

(See reverse for instructions and information collection burden statement)

Exhibit A - Origin and Breeding History 'Keene' Wheat

Fall 1984	Original cross made at North Dakota State University (NDSU) greenhouse. Pedigree - Stoa sib/3/IAS20*4/H567.71//Amidon
	IAS20*4/H567.71 is a public breeding line received from CIMMYT, Mexico.
Spring 1985	F_1 plants, NDSU greenhouse.
Summer 1985	F_2 plants, spaced plant nursery, NDSU research land.
Summer 1986	F_3 head row, NDSU research land.
Summer 1987	F_4 progeny plot, NDSU research land.
Summer 1988	F_5 progeny plot, NDSU research land.
Summer 1989	F_6 head row (F_5 - derived), NDSU research land.
Summer 1990	F_7 preliminary yield trial, 2 locations, NDSU research land.
Summer 1991	F_8 elite yield trial, 4 locations, NDSU research land. Seed increase (64 lbs) Prosper, ND.
Summer 1992	Seed increase (163 lbs) Casselton, ND.
Summer 1992-95	North Dakota HRS wheat variety trial, 7 locations each year. Experimental line designation - ND678.
Summer 1993-95	Uniform Regional HRS Wheat Nursery, about 20 locations each year, Upper Midwest, USA.
June 28, 1996	ND678 released as a named cultivar, 'Keene'.

Observations indicate Keene is uniform and stable within commercially acceptable limits for all traits as described in Exhibit C. Uniformity and stability of Keene were observed 1990-1995 for six generations (F_7 - F_{12}). Variants (taller plants, 5-8 cm) occurrence at a frequency of 4/10,000 and awnless plant variants at a trace frequency of less than 1/10,000.

Selection criteria for the breeding of Keene wheat were highly heritable traits (i.e. plant height, maturity, disease resistance) in the early segregating generations, F_2 - F_6. Beginning in the F_7 generation, selection criteria also included lodging resistance, shattering resistance, test weight, grain yield and breadmaking characters (grain protein, milling extraction, dough mixing, loaf volume, etc.). Data were obtained from multiple locations and over years to evaluate and identify the experimental line ND678 that was named Keene. Overall, the selection criteria were a

combination of traits used to identify a superior hard red spring wheat genotype adapted to North Dakota wheat production, and a genotype having acceptable (compared to check cultivars) milling and breadmaking properties for domestic and export markets.

Exhibit B - Statement of Distinctness

To my knowledge 'Keene' most nearly resembles 'Amidon' and 'Stoa'. Differences include but are not necessarily restricted to the following:

1. Keene differs from Amidon for gel electrophoresis pattern (PAGE) shown in photographic print (Figure 1). An arrow (A) indicates a band difference. *
2. Keene differs from Stoa for gel electrophoresis pattern (PAGE) shown in photographic print (Figure 1). An arrow (B) indicates a band difference. *

These are gliadin protein differences, fide Frohberg, per telephone call, AAA 19 June 1997

970343

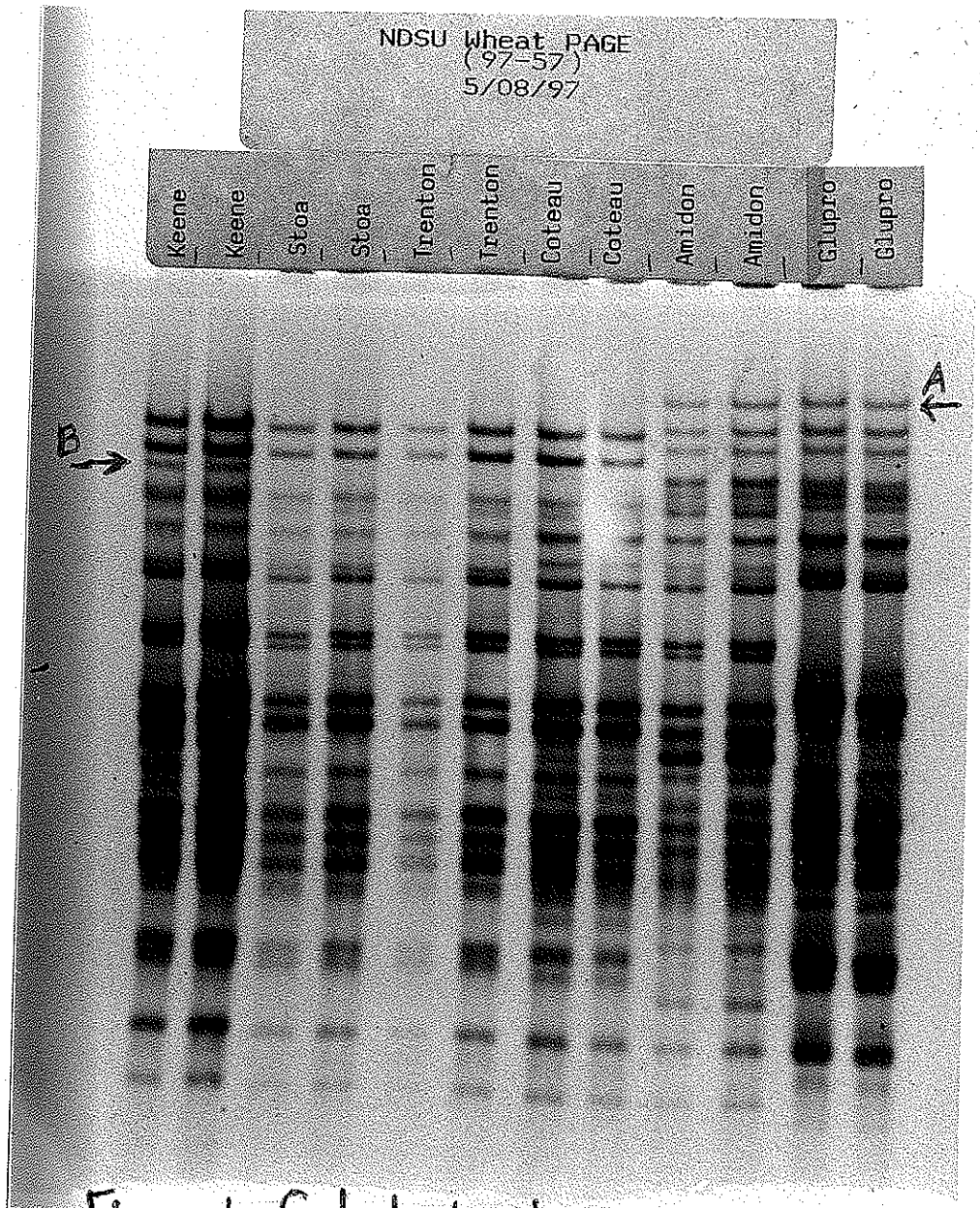

Figure 1. Gel electrophoresis pattern.

[illegible]

5

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
[redacted]
BELTSVILLE, MARYLAND 20705

C EXHIBI
(Wheat
p1

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

R 1769 in P/WHEA 18 June AMA 1997

NAME OF APPLICANT(S) NDSU Research Foundation

ADDRESS (*Street and No. or R.F.D. No., City, State, and Zip Code*)
c/o Executive Director
PO Box 5014
Fargo, ND 58105-5014

FOR OFFICIAL USE ONLY

PVPO NUMBER 9700343

VARIETY NAME

TEMPORARY OR EXPERIMENTAL DESIGNATION

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. [ ][ ][ ] or [ ][ ]) 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:**

[1] 1=Common 2=Durum 3=Club 4=Other (SPECIFY) _____

2. **VERNALIZATION:**

[1] 1=Spring 2=Winter 3=Other (SPECIFY) _____

3. **COLEOPTILE ANTHOCYANIN:**

[1] 1=Absent 2=Present

4. **JUVENILE PLANT GROWTH:**

[2] 1=Prostrate 2=Semi-erect 3=Erect

5. **PLANT COLOR (boot stage):**

[2] 1 = Yellow-Green 2 = Green 3 = Blue-Green

6. **FLAG LEAF (boot stage):**

[2] 1 = Erect 2 = Recurved [2] 1 = Not Twisted 2 = Twisted

7. **EAR EMERGENCE:**

[0][4] Number of Days Earlier Than 'Era' *

[0][2] Number of Days Later Than 'Butte 86' *

8. **ANTHER COLOR:**

[1] 1 = YELLOW 2 = PURPLE

9. **PLANT HEIGHT (from soil to top of head, excluding awns):**

[0][9] cm Taller Than 'Butte 86' *

[0][1] cm Shorter Than 'AC Cora' *

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9700343

10. STEM:

A. ANTHOCYANIN

[1] 1= Absent 2=Present

B. WAXY BLOOM

[1] 1=Absent 2=Present

C. HAIRINESS (last internode of rachis)

[2] 1=Absent 2=Present

D. INTERNODE (SPECIFY NUMBER) 6

[1] 1=Hollow 2=Semi-solid 3=Solid

E. PEDUNCLE

[2] 1=Absent 2=Present

[28] cm Length

11. HEAD (at Maturity):

A. DENSITY

[2] 1=Lax 2=Middense 3= Dense

B. SHAPE

[1] 1 = Tapering 2= Strap 3 = Clavate 4 = Other (SPECIFY) _____

C. CURVATURE

[1] 1 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS

[4] 1 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

12. GLUMES (at Maturity):

A. COLOR

[3] 1 = White 2 = Tan 3 = Other (SPECIFY) Yellow

B. SHOULDER

[5] 1 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK

[3] 1 = Obtuse 2 = Acute 3 =Acuminate

D. LENGTH

[1] 1 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

E. WIDTH

[2] 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm) 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

[2] 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK

[2] 1=Rounded 2=Angular

C. BRUSH

[2] 1=Short 2=Medium 3=Long

D. CREASE

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

[1] 1 = Not Collared 2 = Collared

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

13. SEED: (continued)

E. COLOR

[3] 1 = White 2 = Amber 3 = Red 4 = Other (SPECIFY) _____

F. TEXTURE

[1] 1=Hard 2=Soft

G. PHENOL REACTION *(see instructions)*:

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

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

Stem Rust *(Puccinia graminis* f. sp. *tritici)*
[2] CRL-QFB, CRL-TNMK

Stripe Rust *(Puccinia striiformis)*
[0]

Tan Spot *(Pyrenophora tritici-repentis)*
[3] ND field isolates

Halo Spot *(Selenophoma donacis)*
[0]

Septoria nodorum (Glume Blotch)
[0]

Septoria avenae (Speckled Leaf Disease)
[0]

Septoria tritici (Speckled Leaf Blotch)
[0]

Scab (*Fusarium* spp.)
[1] Fusarium graminearum

"Black Point" (Kernel Smudge)
[0]

Barley Yellow Dwarf Virus (BYDV)
[0]

Soilborne Mosaic Virus (SBMV)
[0]

Wheat Yellow (Spindle Streak) Mosaic Virus
[0]

Wheat Streak Mosaic Virus (WSMV)
[0]

Other (SPECIFY) _____
[ ]

Other (SPECIFY) _____
[ ]

Other (SPECIFY) _____
[ ]

Leaf Rust *(Puccinia recondita* f. sp. *tritici)*
[2] Predominant ND field races

Loose Smut *(Ustilago tritici)*
[0]

Flag Smut *(Urocystis agropyri)*
[0]

Common Bunt *(Tilletia tritici* or *T. laevis)*
[0]

Dwarf Bunt *(Tilletia controversa)*
[0]

Karnal Bunt *(Tilletia indica)*
[0]

Powdery Mildew *(Erysiphe graminis* f. sp. *tritici)*
[0]

"Snow Molds"
[0]

Common Root Rot *(Fusarium, Cochliobolus* and *Bipolaris* spp.)
[3] Cochliobolus sativus

Rhizoctonia Root Rot *(Rhizoctonia solani)*
[0]

Black Chaff *(Xanthomonas campestris* pv. *translucens)*
[0]

Bacterial Leaf Blight *(Pseudomonas syringae* pv. *syringae)*
[0]

Other (SPECIFY) _____
[ ]

Other (SPECIFY) _____
[ ]

Other (SPECIFY) _____
[ ]

Other (SPECIFY) _____

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

Hessian Fly *(Mayetiola destructor)* [0] _____

Stem Sawfly *(Cephus spp.)* [1] _____

Cereal Leaf Beetle *(Oulema melanopa)* [0] _____

Russian Aphid *(Diuraphis noxia)* [0] _____

Greenbug *(Schizaphis graminum)* [0] _____

Aphids [0] _____

Other (SPECIFY) [ ] _____

Other (SPECIFY) [ ] _____

Other (SPECIFY) [ ] _____

Other (SPECIFY) [ ] _____

Other (SPECIFY) [ ] _____

Other (SPECIFY) [ ] _____

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

None.

Exhibit D - Additional Description 'Keene' Wheat

When 'Keene', is compared to 'Butte 86', 'Kulm' and 'Trenton', it is photoperiod sensitive. Butte 86, Kulm and Trenton are photoperiod insensitive (daylength neutral).

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

FORM APPROVED - OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

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.

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1. NAME OF APPLICANT(S)
NDSU RESEARCH FOUNDATION

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
ND678

3. VARIETY NAME
Keene

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
c/o Executive Director
PO Box 5014
Fargo ND 58105-5014

5. TELEPHONE *(include area code)*
701-231-8931

6. FAX *(include area code)*
701-231-1013

7. PVPO NUMBER
9700343

8. Does the applicant own all rights to the variety? *Mark an "X" in appropriate block.* If no, please explain. [X] YES [ ] NO

9. Is the applicant *(individual or company)* a U.S. national or U.S. based company? [X] YES [ ] NO
If no, give name of country _____

10. Is the applicant the original owner? [ ] YES [X] NO *If no, please answer the following:*

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?
[X] YES [ ] NO *If no, give name of country* _____

b. If original rights to variety were owned by a company, is the original owner(s) a U.S. based company?
[X] YES [ ] NO *If no, give name of country* _____

11. Additional explanation on ownership *(If needed, use reverse for extra space):*
See reverse - Statement of the basis of the applicant's ownership.

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

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 final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD).
To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

Exhibit E Item 11.

Statement of the Basis of the Applicant's Ownership

Dr. Richard C. Frohberg, an employee of the North Dakota Agricultural Experiment Station and North Dakota State University, is a plant breeder who developed 'Keene' the hard red spring wheat cultivar for which Plant Variety Protection is hereby sought. The employee by agreement and because of the condition of the use of facilities and funds of the North Dakota Agricultural Experiment Station and North Dakota State University has assigned all ownership rights to 'Keene' hard red spring wheat to the North Dakota Agricultural Experiment Station and North Dakota State University.

North Dakota State University on behalf of the North Dakota Agricultural Experiment Station has assigned all ownership to the NDSU Research Foundation. The NDSU Research Foundation is a nonprofit corporation set up to own and manage the intellectual property of North Dakota State University.

USDA-AMS-PVPO
'97 JUN 18 A10:58