

TEXAS A&M UNIVERSITY-KINGSVILLE
CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
TEXAS NATIVE SEEDS
KINGSVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
JAMES E. "BUD" SMITH PLANT MATERIALS CENTER
KNOX CITY, TEXAS

And

TEXAS AGRILIFE RESEARCH
STEPHENVILLE, TEXAS

And

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
E. "KIKI" DE LA GARZA PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

And

SUL ROSS STATE UNIVERSITY
BORDERLANDS RESEARCH INSTITUTE
ALPINE, TEXAS

NOTICE OF RELEASE OF GUADALUPE GERMPLOSM WHITE TRIDENS
SELECTED PLANT MATERIAL

Texas Native Seeds (TNS), Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, Texas; the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), James E. "Bud" Smith Plant Materials Center, Knox City, Texas; USDA NRCS, E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas; Sul Ross State University, Borderlands Research Institute, Alpine, Texas, and the Texas AgriLife Research, Stephenville, Texas announce the release of a selected plant material of white tridens [*Tridens albescens* (Vasey) Woot. & Standl.] for south, central, and west Texas.

This plant will be referred to as Guadalupe Germplasm white tridens and is released as a selected plant material class of certified seed (natural track). Seed of Guadalupe Germplasm white tridens will be identified by USDA NRCS accession number 9112221.

This release is justified because there are no existing commercial sources of tested and adapted seed of white tridens for the south, central, and west Texas regions. The potential for immediate use is high, especially for critical area revegetation, right-of-way seedings, erosion control, inclusion in range seeding mixes, and wildlife plantings.

A. Proposed Variety Name and Temporary Designation:

GUADALUPE GERMPLASM WHITE TRIDENS

B. Family, kind, genus and species:

Family: Poaceae

Kind: white tridens

Genus and species: *Tridens albescens* (Vasy) Woot. & Standl.

C. Origin and breeding history of the variety:

Collection Site Information: Accessions comprising Guadalupe Germplasm white tridens were collected from native populations originating from the Cross Timbers (MLRA 084B & C), Blackland Prairie (MLRA 086A & B), Edwards Plateau (MLRA 081A-D), Trans Pecos (MLRA 042), and South Texas Plains (MLRA 083A-D).

Accession **9093652** was collected from the San Angelo State Park on 11/4/2011 by Colin Shackelford of Texas Native Seed (TNS). This collection originated from a Cho gravelly loam soil in Tom Green County near 31° 31' 8" Latitude and 100° 33' 12" Longitude. This site is classified as a Very Shallow ecological site (MLRA 081B-Edwards Plateau, Central Part) (Web Soil Survey Staff 2014).

Accession **9093653** was collected from the road right-of-way along Farm to Market road 70 on 4/19/2011 by Forrest Smith of TNS. This collection originated from a Raymondville clay soil in Nueces County near 27° 53' 2" Latitude and 97° 55' 37" Longitude. This site is classified as a Clay Loam ecological site (MLRA 083A-Northern Rio Grande Plain) (Web Soil Survey Staff 2014).

Accession **9093655** was collected from the road right-of-way along County Road 152 on 4/19/2011 by Forrest Smith of TNS. This accession originated from a Houston black soil in Guadalupe County near 29° 45' 13" Latitude and 97° 56' 4" Longitude. This site is classified as a Blackland ecological site (MLRA 086A-Texas Blackland Prairie, Northern Part) (Web Soil Survey Staff 2014).

Accession **9109570** was collected from the road right-of-way along Farm to Market road 51 on 11/10/2011 by Mia McCraw formerly of TNS. This accession was collected from a Duffau loamy sand in Parker County near 32° 59' 24" Latitude and 97° 41' 0" Longitude. This site is classified as a Sandy Loam ecological description (MLRA 084B-West Cross Timbers) (Web Soil Survey Staff 2014).

Accession **9109575** was collected from the road right-of-way along Farm to Market road 1492 on 10/13/2010 by Anthony Falk of TNS. This collection originated from a Regan clay soil in Upton County near 31° 31' 7" Latitude and 102° 10' 32" Longitude. This location is classified as a Loamy ecological site (MLRA 081A-Edwards Plateau, Western Part) (Web Soil Survey Staff 2014).

Breeding history: Plants evaluated in the initial trials were grown from the original seed collections. Breeder seed of each accession was grown in isolation from other collections and

wild populations of white tridens. There was no intentional breeding, selection or genetic manipulation of the accessions used in the development of Guadalupe Germplasm.

D. Objective description of the variety:

Description: White tridens is a warm season perennial with short-knotty, hard rhizomatous bases. Culms average 15 to 40 inches tall (40-100 cm) with 6 to 12 inch long (15-30 cm) blades that are flat, glabrous, with blue-green color. The inflorescence is a dense panicle to 8 inches (20 cm) long with appressed branches. Spikelets are white to pinkish purple-tinged (Blackworth et al. 2007 and Shaw 2012). Caryopses are pale yellow to white. White tridens averages 4,535,900 seed per pound.

White tridens occurs primarily in Texas, Oklahoma and New Mexico west of US Highway 45, extending south into Mexico. It is found primarily on clay or loamy soils that periodically receive an abundance of water. White tridens is listed as good livestock forage and the seeds are consumed by birds including wild turkeys and rodents (Powell 1994 and Everitt et al. 2011).

Potential Uses: Guadalupe Germplasm white tridens can be used for critical area revegetation, erosion control, rights-of-way plantings, inclusion in range seed mixes and wildlife plantings. This species ability to withstand saturated soil makes it an excellent candidate for right-of-way plantings. Use by livestock and wildlife also make it an excellent addition to any range or wildlife planting. White tridens may also have value for riparian and wetland restoration plantings.

E. Evidence

Method of Breeding and Selection:

Initial Evaluation

Accessions 9093655, 9109570, 9093652, 9109575, and 9093653 were evaluated as part of a common garden study consisting of 33 accessions of white tridens planted at 5 locations in Texas. Initial evaluations were conducted from 2012-2013 at Rio Farms Inc. near Monte Alto, TX., *South Texas Natives* Farm in Kingsville, TX., Texas AgriLife Research in Uvalde and Stephenville, TX respectively, and the at USDA NRCS James E. “Bud” Plant Material Center near Knox City, TX. These evaluation sites are representative of the major Texas ecoregions, as well as variations in soils and climate along a north to south and east to west gradients across South, West, and Central Texas.

Evaluations at each location contained two replications of 10 plants of each accession planted in a completely randomized block. Each accession was visually evaluated for 6 different criteria throughout the 2-year evaluation period. Criteria included overall plant health (vigor), foliage density, stand uniformity, development stage, seed production, and forage production. Measurements were made for plant survival, plant height and germination of seed produced at each location. There was minimal variation among the collections for plant survival, uniformity, development stage, and plant height among all accessions tested at all sites. Consequently, these data were not included in the selection process (Tables 1-5). Attributes of the original collection site such as soils and ecoregion were important to the selection process because of the desire to

select a blend of accessions for release that would have broad geographic adaptation and utility on common soil types.

Accession 9093652 was originally collected in Tom Greene County from a rocky soil. This collection represents an ecotype that originates from the Edwards Plateau ecoregion which is characterized by shallow rocky soils receiving 20-26 inches of rain annually. 9093652 had the highest seed germination of all accessions evaluated in Stephenville, the nearest evaluation location to the Edward Plateau. It was also in the top 5 for seed germination in evaluation at Knox City which also has similar climate as the Edwards Plateau region. The accession was among the top 10 accessions for plant health and foliage density in evaluations near Monte Alto. This accession was also among the top 10 for forage and seed production in evaluations at Kingsville.

Accession 9093653 was originally collected from a clay soil in Nueces County. This collection originates from the furthest south and east and was chosen for inclusion as an ecotype adapted to the Rio Grande Plains and Gulf Coast Prairies and Marshes ecoregions. Accession 9093653 had the highest seed germination from evaluations in Uvalde. It was also among the top 10 for seed germination in evaluations in Kingsville. This accession was one of the best overall plants at all south Texas evaluation sites, ranking among the top10 accessions for plant health, foliage density, seed production and forage production in evaluations at Monte Alto, foliage density and forage production in Uvalde, and it was the best overall performer for forage production in Kingsville.

Accession 9093655 was originally collected from a clay soil in Guadalupe County. This collection is representative of an ecotype from the Blackland Prairie ecoregion. Accession 9093655 had the second highest seed germination in Uvalde and was among the top 10 in seed production at Knox City. This accession was the one of the best performers in the central Texas region ranking in the top 5 for plant health and foliage density, and top 10 for forage production at Stephenville. It rated second best for plant health, foliage density and forage production at Knox City, and was among the top 10 accessions for plant health and forage production at Uvalde.

Accession 9109570 was originally collected from Parker County. It is the furthest north of the selected accessions and is representative of an ecotype originating from the High Plains ecoregion. This accession had the highest and most consistent seed germination of the accessions tested across all sites. It rated second best for seed germination at Stephenville and was in the top 10 for seed germination in Uvalde, Kingsville, and Monte Alto.

Accession 9109575 was originally collected from a saline soil in Upton county and is representative of an ecotype from the Southern Desert Basins, Plains, and Mountains (Trans Pecos) ecoregion which covers a large area of west Texas. Accession 9109575 was among the top 5 for seed germination in Knox City, and in the top 10 at Uvalde and Monte Alto. This accession was also in the top 10 for seed production in Knox City and Monte Alto. Accession 9109575 was in the top 10 for forage production in Uvalde.

Table 1. Plant performance of white tridens accessions used in the development of Guadalupe Germplasm from comparative evaluation in 2012-2013 at Rio Farms Inc. near Monte Alto, Texas*.

Accession	Plant ^{1/}	Plant Health ^{2/}	Foliage Density ^{3/}	Seed Production ^{4/}	Forage Production ^{5/}	Plant Height ^{6/}	% Germination ^{7/}
9093652	9.9	2.8	2.6	3.8	3.0	79.2	70.7
9093653	10.0	2.6	2.4	3.0	2.4	92.9	45.8
9093655	10.0	2.9	2.7	3.5	2.8	88.0	16.8
9109570	9.3	3.5	3.9	3.6	4.3	75.5	71.2
9109575	9.9	3.8	3.6	3.4	3.5	81.3	58.0

1/ Plant = number of plants; 2/ plant health; 3/ foliage density; 4/ seed production; 5/ forage production; 6/ plant height in centimeters; 7/ germination percentage

*Note: Plant health, foliage density, seed production and forage production are based on ocular estimates where 1 = best and 10 = poor.

Table 2. Plant performance of white tridens accessions used in the development of Guadalupe Germplasm from comparative evaluation in 2012-2013 at the South Texas Natives Farm in Kingsville, Texas*.

Accession	Plant ^{1/}	Plant Health ^{2/}	Foliage Density ^{3/}	Seed Production ^{4/}	Forage Production ^{5/}	Plant Height ^{6/}	% Germination ^{7/}
9093652	10.0	4.0	3.2	3.8	3.1	63.8	86.6
9093653	10.0	3.8	2.7	3.9	2.6	62.5	88.7
9093655	10.0	3.5	3.5	4.4	3.7	57.2	61.0
9109570	9.5	3.9	4.6	5.0	4.8	57.6	84.8
9109575	10.0	4.0	3.5	4.7	3.5	56.2	75.3

1/ Plant = number of plants; 2/ plant health; 3/ foliage density; 4/ seed production; 5/ forage production; 6/ plant height in centimeters; 7/ germination percentage

*Note: Plant health, foliage density, seed production and forage production are based on ocular estimates where 1 = best and 10 = poor.

Table 3. Plant performance of white tridens accessions used in the development of Guadalupe Germplasm from comparative evaluation in 2012-2013 at the USDA NRCS James E. “Bud” Smith Plant Materials Center near Knox City, Texas*.

Accession	Plant ^{1/}	Plant Health ^{2/}	Foliage Density ^{3/}	Seed Production ^{4/}	Forage Production ^{5/}	Plant Height ^{6/}	% Germination ^{7/}
9093652	10.0	4.4	3.4	3.4	4.8	30.3	86.0
9093655	10.0	3.5	2.9	3.1	3.5	32.9	70.6
9109570	10.0	4.5	3.8	3.4	4.9	25.1	59.0
9109575	10.0	4.1	4.0	3.0	4.6	29.2	89.0

1/ Plant = number of plants; 2/ plant health; 3/ foliage density; 4/ seed production; 5/ forage production; 6/ plant height in centimeters; 7/ germination percentage; 8/ no data was collected

*Note: Plant health, foliage density, seed production and forage production are based on ocular estimates where 1 = best and 10 = poor.

Table 4. Plant performance of white tridens accessions used in the development of Guadalupe Germplasm from comparative evaluation in 2012-2013 at the Texas A&M AgriLife Research and Extension Center Stephenville, Texas*.

Accession	Plant ^{1/}	Plant Health ^{2/}	Foliage Density ^{3/}	Seed Production ^{4/}	Forage Production ^{5/}	Plant Height ^{6/}	% Germination ^{7/}
9093652	10	4.3	4.3	5.0	4.5	29.0	100.0
9093655	10	3.8	3.0	4.3	3.8	31.6	74.3
9109570	10	4.5	4.3	4.6	4.8	26.9	97.5
9109575	10	4.3	4.5	4.3	4.3	27.4	80.5

1/ Plant = number of plants; 2/ plant health; 3/ foliage density; 4/ seed production; 5/ forage production; 6/ plant height in centimeters; 7/ germination percentage

*Note: Plant health, foliage density, seed production and forage production are based on ocular estimates where 1 = best and 10 = poor.

Table 5. Plant performance of white tridens accessions used in the development of Guadalupe Germplasm from comparative evaluation in 2012-2013 at the Texas A&M AgriLife Research and Extension Center Uvalde, Texas*.

Accession	Plant ^{1/}	Plant Health ^{2/}	Foliage Density ^{3/}	Seed Production ^{4/}	Forage Production ^{5/}	Plant Height ^{6/}	% Germination ^{7/}
9093652	10	5.2	3.8	4.6	4.1	85.5	45.0
9093653	10	5.2	3.4	3.5	3.7	85.8	83.0
9093655	10	5.0	3.6	4.5	3.6	87.0	82.3
9109570	10	5.7	5.3	4.4	5.3	75.3	71.3
9109575	10	5.2	3.9	3.3	3.7	82.0	76.0

1/ Plant = number of plants; 2/ plant health; 3/ foliage density; 4/ seed production; 5/ forage production; 6/ plant height in centimeters; 7/ germination percentage

*Note: Plant health, foliage density, seed production and forage production are based on ocular estimates where 1 = best and 10 = poor.

Seed Increase

Accessions 9093655, 9109570, 9093652, 9109575, and 9093653 were increased using transplants grown from the original seed collections. Seed was harvested from isolated seed increase plots averaging 400 plants/accession twice annually during 2014 and 2015. Average seed production was 0.65 pounds of pure live seed (PLS) per harvest with an average of 62% PLS. Yields are estimated at 95 pounds PLS per year per acre on 36" bedded rows with a plant population of 14,000 plants per acre (plants established using transplants spaced 12 inches on beds).

Seed Production, Harvest, and Cleaning

Seed production fields of Guadalupe Germplasm can be started from transplants or direct seeded on bedded rows or flat ground. Well maintained seed production plots can be expected to produce a marketable seed crop the first production year, especially if the field was established from transplants. Seed is harvested using a Flail-Vac harvester. If a Flail-Vac harvester is the preferred harvest method, remove stripped seedheads to stimulate production of new seedheads for later harvests. Mowing is the recommended management practice for removal of previously harvested seedheads. Depending on desired cleanliness, little to no cleaning is required when a

Flail-Vac harvester is used for seed harvest. Removal of the palea and lemma to expose the bare caryopsis is generally not required as seed fill generally ranges from 50-80%. Caryopsis's are not readily removed from the palea and lemma without causing excessive seed damage that leads to loss of seed quality.

G. Area of Adaptation

It is anticipated Guadalupe Germplasm will perform best in the Rio Grande Plains (MLRA 083A-D), Gulf Coast Prairies and Marshes (MLRA 150A & B), Edwards Plateau (MLRA 081A-D), Rolling Plains (MLRA 78A-C), Cross Timbers (MLRA 084B & C), Southern Desert Basins, Plains, and Mountains (MLRA 042), and Blackland Prairies (MLRA 086A & B) ecoregions. Guadalupe Germplasm may be adapted to other ecoregions, but additional plantings will need to be conducted to verify its full range of adaptation.

H. Procedure for maintaining stock classes of seed

The parent populations of each component of Guadalupe Germplasm will be maintained by *Texas Native Seeds*. Generation 0 is seed harvested from isolated plantings of the parent lines. Generation 1 seed is harvested from seed produced from G0 seed. Generation 1 seed can be replanted for production of G2 seed. Increase of Guadalupe Germplasm from G2 seed is prohibited. Breeder seed will consist of equal amounts of 20% PLS of each (+/- 10%) of the 5 accessions.

I. Additional restrictions, etc.

All commercial seed fields of Guadalupe Germplasm must be grown in Texas and isolated from other cultivated varieties and wild populations of *Tridens albescens* by a minimum of 300 feet. Following a request for bids to produce the germplasm, Bamert Seed Company (Muleshoe, TX) and Douglass W. King Seed Company (San Antonio, TX) were granted non-exclusive licenses to produce the germplasm from 2017-2027. For sub-licensed production opportunities these companies should be contacted.

G0 and G1 seed fields have a 7-year production limit.

Will application be made to the Plant Variety Protection Office? YES__ NO X

If yes will the application specify that the variety is to be sold by variety name only as a class of certified seed? YES__ NO__

Ecological Considerations and Evaluation: An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS, and the best available information for this species. Results of this evaluation determined that Guadalupe Germplasm white tridens was suitable for release based on the criterion contained in this document. White tridens is a naturally occurring species in Texas and planting it would not constitute an introduction of an exotic species into local ecosystems. Any negative impacts on other native plant species would likely be minimal to non-existent. Also, release of this species will make available an additional native species for rangeland planting, will provide a good source of forage for cattle, wildlife habitat, and provide ecological benefits by maintaining and

contributing to grassland restoration, especially in saline habitats that are often difficult to revegetate.

Conservation Use: Guadalupe Germplasm is recommended for upland wildlife plantings, critical area revegetation, right-of-way plantings, and inclusion in range seeding mixes. Guadalupe Germplasm is likely to perform best in the Rio Grande Plains (MLRA 083A-D), Gulf Coast Prairies and Marshes (MLRA 150A & B), Edwards Plateau (MLRA 081A-D), Rolling Plains (MLRA 78A-C), Cross Timbers (MLRA 084B & C), Southern Desert Basins, Plains, and Mountains (MLRA 042), and Blackland Prairies (MLRA 086A & B) ecoregions.

Availability of Plant Materials: Breeder Seed will be maintained by *Texas Native Seeds* Program of the Caesar Kleberg Wildlife Research Institute. Generation 0 seed will only be released to qualified growers under license agreement stipulating production requirements, or for research or evaluation. Commercial seed produced as Texas Selected Native Plant Germplasm certified by the Texas Department of Agriculture is available commercially for restoration use from the licensed producers.

References:

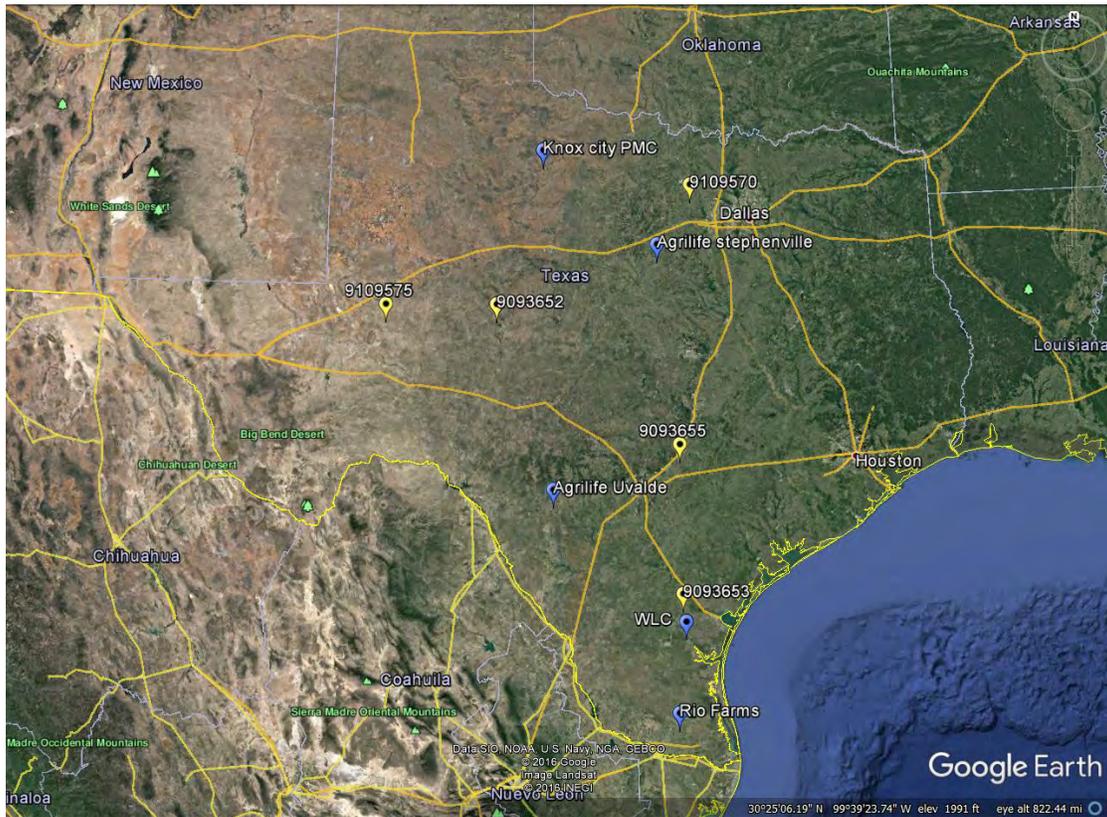
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Figure 1. Collection sites (yellow pins) and evaluation sites (blue pins) used in the development of Guadalupe Germplasm.



MARKETING PLAN

GUADALUPE GERMPLASM WHITE TRIDENS

June 2019

Finalize and obtain approval for release and print supporting documents (fact sheet and brochure).

Fall 2019

Release seed to seed companies who submitted acceptable production proposal for the release. Continue work with commercial growers to produce adequate seed harvests and establish additional production to result in commercial seed availability.

Spring 2020

Publish information on websites, newsletters, and e-newsletters to inform potential consumers about the availability of seed of Guadalupe Germplasm white tridens.

SEED AVAILABILITY/SEED PRODUCTION ESTIMATE

As of January 2019, 60 lbs. of pure live seed of Guadalupe germplasm is in storage at the *South Texas Natives* facility in Kingsville, Texas. In addition, a 0.1 acre seed increase field is established at *South Texas Natives* farm. Established production is estimated to yield 5 lbs PLS annually to be used for increase and maintenance of commercial seed production.

Signatures for release of:
GUADALUPE GERMLASM WHITE TRIDENS
Tridens albescens (Vasey) Woot. & Stuedl



Dr. David G. Hewitt
Lesly Denman, Jr. Endowed Director of Wildlife Research
Caesar Kleberg Wildlife Research Institute
Texas A&M University-Kingsville
Kingsville, TX

5/21/2020
Date



Dr. Shad D. Nelson
Dean
Dick and Mary Lewis Kleberg College of
Agriculture, Natural Resources and Human Sciences
Texas A&M University-Kingsville
Kingsville, TX

02/11/2020
Date



Dr. Louie A. Harveson
Dean Allen Hughes Jr. Endowed Director
Bowlerland's Research Institute
Sul Ross State University
Alpine, TX

2/14/2020
Date



Dr. William McCaskey
Resident Director
Texas A&M AgriLife Research and Extension Center
Stephenville, TX

3/9/2020
Date



Salvador Salinas
Texas State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

3/17/20
Date

THOMAS HEDT Digitally signed by THOMAS HEDT
Date: 2020.05.01 15:54:29 -0400

~~XXXXXXXXXXXXXXXXXXXX~~ Thomas Hedt (acting)
Director
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

5/1/2020
Date