



# 2018 Progress Report of Activities East Texas Plant Materials Center Nacogdoches, Texas

## Study Update

### Evaluation of Swamp sunflower Accessions

The East Texas Plant Materials Center (ETPMC) is working jointly with the US Forest Service (USFS) and East Texas Natives to develop a locally adapted swamp sunflower ecotype for use in longleaf pine habitat in the Western Coastal Plain. Swamp sunflower (Fig.1), a native, warm season perennial, is an important fall nectar source for pollinators, particularly migrating Monarch butterflies. This ecotype release would support USDA-Natural Resources Conservation Service pollinator conservation efforts as well as USFS longleaf pine habitat restoration initiatives.



**Figure 1. Swamp sunflower blooms in mid-October at the ETPMC.**

Thirty-one swamp sunflower collections from east Texas were evaluated for seed germination, seedling vigor, and survival in the greenhouse during spring 2017. Twenty-two accessions were selected for further evaluation and transplanted into an initial evaluation field study plot at the ETPMC in June 2017. There were significant differences in mature plant height, reproductive stem number, leaf width, and stem lodging between accessions in 2018. Accessions 9094902, 9095030, 9095071, 9095072, 9095073 and 9095087 were top performers in the 2018 evaluation. They exhibited an upright growth habit and 90% or greater fall survival (Table 1). Selections for the ecotype release will be made in late 2019 based upon information from this three-year study.

Table 1. Swamp sunflower stem lodging rating, number of reproductive stems, and percent fall survival of top performing accessions in 2018. East Texas Plant Materials Center, Nacogdoches, Texas. 2019.

Accession No.	Stem lodging rating <sup>1/</sup>	Reproductive stems (no.)	Fall survival (%)
9094902	2.6	47	100
9095030	1.0	22	97
9095071	1.6	32	90
9095072	1.3	28	97
9095073	2.2	28	100
9095087	1.6	41	95
2018 mean <sup>2/</sup>	1.8	26	80

<sup>1/</sup>=stem lodging rating where 1=majority of reproductive stems were upright (~90°), 3=majority of reproductive stems were approximately 45°, 5=majority of reproductive stems were less than 45°, <sup>2/</sup>= mean of all twenty-two initial evaluation accessions.

## Native Grass Conversion Demos

The ETPMC is completing the Bermudagrass and bahiagrass pastures conversion demonstration in Houston County, Texas. Four best management practices referenced in literature for control of Bermuda and bahiagrass when converting to native warm season grasses were evaluated. One site was dominated by bahiagrass and the other by Bermudagrass. The bahiagrass conversion site was deemed a successful conversion with native plant densities ranging from 1 to 1.3 plants/ft<sup>2</sup> for all treatments. This exceeded the satisfactory establishment criteria of 0.5 plants/ft<sup>2</sup> found in the USDA NRCS Pasture Planting Job Sheet- Standard 512.

The Bermudagrass site was found to be more challenging. All four initial treatments failed to establish natives or control annual warm season weedy species and Bermudagrass. The demonstration project plan for the Bermudagrass site was amended in 2017 by reducing the site to an untreated control and a plot that was treated as needed to control the Bermudagrass. The Bermudagrass treatment plot was mowed and sprayed with glyphosate as needed throughout the summer and fall of 2017 to reduce competition and control residual Bermudagrass. Imazapic and glyphosate were applied in November to control cool season weeds and provide residual control through the winter. A burn down treatment of glyphosate was applied in early April 2018 to prepare for planting. The treatment plot was planted on April 20, 2018 with a mix of 30% 'Cheyenne' Indiangrass, 30% Coastal Plains Germplasm little bluestem, 15% 'Sabine' Illinois bundleflower, 15% Crockett Germplasm herbaceous mimosa, and 10% 'Comanche' partridge pea. Imazapic was applied in June as a post-emergent to control warm season annuals and Bermudagrass in the treatment plot.



**Figure 2. Warm season native grasses were established in the Bermudagrass treatment plot 145 days after planting.**

The mean plant density for the native grass and legumes was 1.2 plants/ft<sup>2</sup> and 1.5 plants/ft<sup>2</sup> respectively at 145 days after planting, meeting the success guidelines outlined in the practice standard 512 listed previously (Fig.2). The treatment plot will receive selective herbicide applications to control weedy species in 2019 as part of the maintenance phase. The stand will be evaluated for warm season grass and legume plant density/ft<sup>2</sup> in September 2019 to determine establishment success as per NRCS Pasture Planting guidelines.

## National Cover Crop Adaptation Study

The 2018 growing season marked the final year of data collection at the ETPMC for the national cover crop adaptation trial. Fifty-four commercially available cool season cover crop varieties were planted on October 4, 2016 and October 27, 2017 at the ETPMC for evaluation. Most cultivars did well over all with differences in stand emergence and winter survival noted due to different planting dates.

All vetch varieties performed well in the evaluation. Average winter survival for the two-year evaluation was 71%. There was no significant difference in disease resistance between varieties during the study. ‘Lana’ woolly pod vetch and ‘Purple prosperity’ hairy vetch were the earliest maturing varieties and ‘TNT’ and ‘Villana’ were the latest maturing both evaluation years (Table 2).

Table 2. Hairy and woolly pod vetch variety emergence rating, mature foliage height, and days after planting to 50% bloom in 2016 - 2018 cool season cover crop evaluation. USDA NRCS East Texas Plant Materials Center. Nacogdoches, Texas. 2019.

Variety	Emergence rating <sup>1/</sup>		Mature foliage height (in)		DAP <sup>2/</sup> to 50% bloom	
	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018
CCS Groff	3	1	27	27	182	171
Lana	3	0.75	26	20	152	145
Purple bounty	3	1	26	27	180	169
Purple prosperity	3	1	25	26	175	168
TNT	3	1.75	24	28	187	181
Villana	2.75	0.5	27	28	183	187
Mean	2.9	1	26	26	176	170

1/= Emergence ratings based upon scale where 0=poor (<25%), 1=moderate (30%-60%), 2=good (65%-85%), and 3=excellent (90%-100%), 2/=days after planting.

All crimson clover varieties performed well in the trial. ‘Contea’ and ‘AU Sunup’ showed poor emergence at 28 days after planting in 2018 (Table 3) but made complete stands by early spring. Percent winter survival was similar for both evaluation years (Table 3). There was no significant difference between the varieties for disease resistance. ‘AU Sunup’ and ‘AU Sunrise’ were the earliest maturing varieties and ‘KY Pride’ was the latest variety both years (Table 3).

Table 3. Crimson clover variety emergence rating, percent winter survival, mature foliage height, and days after planting to 50% bloom in 2016 -2018 cool season cover crop evaluation. USDA NRCS East Texas Plant Materials Center. Nacogdoches, Texas. 2019.

Variety	Emergence rating <sup>1/</sup>		% winter survival		Mature foliage height (in.)		DAP <sup>2/</sup> to 50% bloom	
	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018
AU Robin	3	1.5	86	100	17	21	157	146
AU Sunrise	3	2	95	100	20	19	144	138
AU Sunup	1.5	0	59	95	18	13	140	135
Contea	3	0.25	98	100	18	21	153	150
Dixie	3	2.5	98	100	16	22	165	150
KY Pride	3	2.25	88	100	22	19	182	153
Mean	2.75	1.4	88	100	18	19	157	146

1/= Emergence ratings based upon scale where 0=poor (<25%), 1=moderate (30%-60%), 2=good (65%-85%), and 3=excellent (90%-100%), 2/=days after planting.

Red clover varieties also performed well during the evaluation. ‘Cinnamon Plus’, ‘Dynamite’, ‘Freedom’, ‘Cyclone II’, and ‘Wildcat’ had higher emergence ratings than ‘Mammoth’, ‘Kenland’, or ‘Starfire’ in both evaluation years (Table 4). Average winter survival was slightly higher in 2017-2018 compared to 2016-2017 (Table 4). All varieties except ‘Mammoth’ reached 50% bloom within eight days of each other during both evaluation years (Table 4). ‘Mammoth’, a single cut clover, is vegetative the first growing season and blooms the second growing season. There were no notable differences in disease resistance between the varieties during the two-year evaluation. Red clover varieties did not senesce until mid-July and show potential for excellent early summer forage in east Texas.

Table 4. Red clover variety emergence rating, percent winter survival, mature foliage height, and days after planting to 50% bloom in 2016 - 2018 cool season cover crop evaluation. USDA NRCS East Texas Plant Materials Center. Nacogdoches, Texas. 2019.

Variety	Emergence rating <sup>1/</sup>		% winter survival		Mature foliage height (in.)		DAP <sup>2/</sup> to 50% bloom	
	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018
Cinnamon Plus	1.75	1	43	100	23	23	213	183
Cyclone II	1.75	0.75	48	100	19	28	214	179
Dynamite	2	1	63	100	25	28	211	178
Freedom!	3	1	60	100	17	27	211	179
Kenland	0.75	0	36	100	24	24	206	184
Mammoth	1	0.25	37	100	---3/	---3/	---3/	---3/
Starfire	1.5	0	60	100	25	19	212	186
Wildcat	2.25	0.5	43	100	22	17	216	186
Mean	1.75	0.5	48	100	22	24	211	182

1/= Emergence rating based upon scale where 0=poor (<25%), 1=moderate (30%-60%), 2=good (65%-85%), and 3=excellent (90%-100%), 2/=days after planting, 3/=did not bloom.

Balansa clovers failed to establish in the 2016-2017 evaluation. The stand failure was attributed to soil collapsing into planter furrows during a rainstorm and burying the seeds too deep. Both varieties made a stand in 2017-2018. ‘Fixation’ showed better adaptation than ‘Frontier’ in the 2017-2018 evaluation. ‘Fixation’ was taller, 13 inches versus 7 inches, and reached 50% bloom twenty-seven days later than ‘Frontier’. Balansa clover shows potential as a cool season cover crop for East Texas. Further study is needed to determine optimum planting date, best seeding method, and additional information on adaptation to East Texas and western Louisiana.

Winter pea varieties showed better stand establishment with the earlier planting date in 2016-2017. However, the earlier planting date made them more susceptible to freeze damage and disease which contributed to lower plant survival at the end of the 2017 season. ‘Arvica4010’ ‘Dunn’ and ‘Maxum’ the least cold tolerant cultivars, resulting in significant stand loss (Table 5). ‘Survivor15’ was bred to tolerate freezing conditions and was a notable standout the first year of the evaluation. ‘Frostmaster’, ‘Whistler’, and ‘Windham’ were also notable cold hardy cultivars. Increased winter survival in the 2017-2018 evaluation is attributed to the later planting date which allowed the seedlings to be insulated from freezing temperature by the ground. ‘Arvica4010’ and ‘Maxum’ were the earliest varieties to reach 50% bloom and ‘Survivor15’ was the latest blooming variety both evaluation years (Table 5). Foliar disease was notably less during the second growing season for all cultivars.

Table 5. Winter pea variety emergence rating, percent winter survival, mature foliage height, days after planting to 50% bloom, and disease resistance at 50% bloom in 2016 - 2018 cool season cover crop evaluation. USDA NRCS East Texas Plant Materials Center. Nacogdoches, Texas. 2019.

Variety	Emergence rating <sup>1/</sup>		% winter survival		Mature foliage height (in.)		DAP <sup>2/</sup> to 50% bloom		Disease resistance at 50% bloom <sup>3/</sup>	
	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018
Survivor 15	3	1.5	90	62	24	28	182	178	0.8	1.8
Whistler	3	0.75	78	77	20	22	155	160	3.0	0.3
Windham	3	1	81	74	17	18	157	162	3.0	0.3
Frostmaster	2.75	0.25	68	72	28	26	163	166	1.5	0.8
Lynx	2.5	0	55	88	17	18	164	162	4.0	0.0
Arvica4010	3	1.25	5	60	8	22	57	126	1.7	0.8
Dunn	3	1.25	8	55	11	21	---4/	127	2.0	0.8
Maxum	3	1.25	4	71	20	24	60	128	4.0	0.5
Mean	2.9	0.9	48	70	18	22	134	151	2.5	0.6

1/= Emergence rating based upon scale where 0=poor (<25%), 1=moderate (30%-60%), 2=good (65%-85%), and 3=excellent (90%-100%), 2/=days after planting, 3/=based upon a subjective scale of 0=no damage, 1=slight, 3=moderate, and 5=severe, 4/=did not bloom.

‘Soilsaver’ black oats showed better adaptation to regional growing conditions than ‘Cosaque’ black oats. ‘Soilsaver’ increased percent winter survival from 9% to 47% with the later planting date in 2017-2018 evaluation. Mature plant height of the black oats ranged from 30 to 37 inches. ‘Soilsaver’ reached 50% bloom six days earlier than ‘Cosaque’. ‘Cosaque’ showed severe rust infection during both years of the study while ‘Soilsaver’ showed better disease resistance.

All oilseed radish varieties winterkilled in the 2016-2017 evaluation but survived freezing temperatures in 2017-2018. Increased winter survival is attributed to a later planting date that let plants overwinter in a rosette stage closer to the ground, protected from freezing temperatures. All varieties performed well in the 2017-2018 evaluation. There was no significant difference in seedling emergence, disease or winter survival. ‘Concorde’, at 34 inches, was the tallest variety and ‘Lunch’ was the shortest at 19 inches. All oilseed radish varieties reached 50% bloom within 135 days after planting excluding ‘Graza’ which required an additional two weeks (Fig.3). Oilseed radish shows potential as a cool season cover in East Texas. Later planting dates may significantly improve winter survival of cold sensitive species in East Texas and should be studied.



Figure 3. ‘Graza’, on the left, is vegetative but ‘Concorde’, on the right, is blooming in mid-March 2018.

Cereal rye seedling emergence was similar for both evaluation years (Table 6). The southern cereal rye varieties were taller and had less disease damage than northern varieties ‘Rymin’, ‘Hazlet’, ‘Guardian’, and ‘Brasetto’ during both evaluation years (Table 6). The northern varieties were severely impacted by rust in 2017-2018 (Table 6). ‘Merced’ and ‘FL401’ did not go dormant and were the earliest maturing cereal rye varieties in the study (Table 6). ‘Guardian’, ‘Brasetto’, and ‘Wheeler’ were the latest maturing varieties both evaluation years (Table 6).

Table 6. Cereal rye variety emergence rating, mature foliage height, days after planting to 50% bloom, and disease resistance at 50% bloom in 2016 - 2018 cool season cover crop evaluation. USDA NRCS East Texas Plant Materials Center. Nacogdoches, Texas. 2019.

Variety	Emergence rating <sup>1/</sup>		Mature foliage height (in.)		DAP <sup>2/</sup> to 50% bloom		Disease resistance at 50% bloom <sup>3/</sup>	
	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018	2016-2017	2017-2018
Wrens Abruzzi	3	3	41	43	146	153	0.5	1
Maton	3	3	37	37	153	157	1	1.5
Maton II	3	2.5	40	38	145	155	0.8	1.5
Elbon	3	2.5	35	38	169	158	0.8	1.5
Oklon	3	2.75	36	34	157	158	2	2
Wintergrazer70	3	3	37	38	148	156	0.8	2
Florida 410	3	2.25	45	43	64	139	1	1.5
Merced	3	2.75	32	35	59	139	2	3
Wheeler	3	3	33	36	184	173	1.5	4
Aroostook	3	3	31	34	159	157	1.5	2.5
Bates	3	2.75	43	38	141	153	1	2.5
Rymin	3	3	32	31	164	176	2	5
Hazlet	3	2.5	25	27	167	174	1.5	5
Guardian	3	1.5	29	31	183	180	1	5
Brasetto	3	1.5	33	31	172	177	2	5
Mean	3	2.6	35	35	147	185	1.3	2.9

1/= Emergence rating based upon scale where 0=poor (<25%), 1=moderate (30%-60%), 2=good (65%-85%), and 3=excellent (90%-100%), 2/= days after planting, 3/= based upon a subjective scale of 0=no damage, 1=slight, 3=moderate, and 5=severe.

## Outreach

The ETPMC has continued its partnership with the Caddo Mounds Historic Site in Alto, Texas, and aided the site manager in restoring the areas around the mounds back to native grasses (Fig. 4). The ETPMC provided technical assistance with site prep seed mixes and management of the planting. Restoration at this site has the potential to reach a much wider audience than the ETPMC could alone and provides an excellent teaching site for training conservationists and others on seeding natives.



Figure 4. Planting a native seed mix in front of the ceremonial mound at the Caddo Mounds State Park.

## **Trainings and Presentations**

The ETPMC provided multiple technical trainings throughout 2018 covering the role of the Plant Materials Program, soil health, rainfall simulator and soil function, and understory plant identification. A total of 49 NRCS employees attended these trainings. The ETPMC represented the Plant Materials Program at the National Conference on Ecosystem Restoration in New Orleans, LA, discussing current and future work to address longleaf and shortleaf pine understory restoration. A poster was presented at the annual Longleaf Pine Alliance Conference in Alexandria, LA covering understory plant work at the center.

## **Plant Materials Staff**

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## **Who We Are**

The East Texas Plant Materials Center (ETPMC) is one of 25 centers operated by the Natural Resources Conservation Service (NRCS), United States Department of Agriculture. The ETPMC services 42 million acres and covers portions of Texas, Louisiana, Arkansas, and Oklahoma. The center was established in 1982 and is a joint venture between Soil and Water Conservation Districts in east Texas and northwestern Louisiana, NRCS, Stephen F. Austin State University (SFASU), and US Forest Service.

## **What We Do**

The mission of the NRCS Plant Materials Program is to develop and transfer effective plant technology for the conservation of natural resources. In working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the program seeks to address priority needs of NRCS field offices and land managers in both public and private sectors. Emphasis is focused on using native plants to solve conservation problems and to protect and restore ecosystems. Center personnel develop research projects and technical reports for use in developing technical guides for agency personnel and landowners on the use of plant materials in various conservation practices.

## **Contact Information**

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