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Cape May Plant Materials Center

USDA-NRCS Plant Materials Program

Table of Contents

Staff and Contact Information 3

Introduction, Weather, and Climate 4

Active Studies 6

Plant Development and Evaluation 6

Technology Development 11

Interagency Cooperative Agreements 22

Publications 23

Presentations 23

Seed and Vegetative Production 24

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Introduction

The mission of the Cape May Plant Materials Center (PMC) is to provide plant materials and conservation technical assistance to the public, government agencies, non-profit organizations, and commercial growers in a nine-state area that includes Connecticut, Delaware, Maryland, Massachusetts, Long Island-New York, New Jersey, North Carolina, Rhode Island, and Virginia. The Cape May PMC was established in 1965 in response to shoreline restoration needs following Hurricane Donna, and has focused on developing plant technologies for specific concerns pertaining to coastal shoreline protection, sand dune establishment, restoration of mined lands and critical areas, and enhancement of Coastal Plain habitat. Because the Cape May PMC is uniquely situated near coastal dune communities, wetlands, and large tidal marsh estuaries, it is able to be a leader in product and technology development for coastal ecosystems and conserving the health and productivity of Coastal Plain soils.

Location and Site Description

The Cape May PMC is located in Cape May County and is New Jersey's southern-most county. The nearest tidal marsh, Great Sound, is only 500 feet east of the PMC. The average annual maximum and minimum temperature is 64.95°F and 44.32°F respectively, with an annual average precipitation of 42.97 inches. The Cape May PMC service area consists of thinly-developed Mid-Atlantic Coastal Plain soils that are threatened by wind, water, and streambank erosion that can degrade plant and water resources in tidal estuaries, marshes, freshwater wetlands, bays, river inlets, and coastlines. The soils at the Cape May PMC are low to moderately fertile, well-drained, nearly-level, sand to loamy sand. The predominant soil series at the PMC are Downer and Sassafras; with Fort Mott, and Woodstown also represented. The predominant agricultural operations in the service include cash row crops, orchards, truck crops, specialty crops, and poultry. Other important industries are fisheries, sand and gravel mining, recreational and wildlife tourism, and industrial and residential development. These land uses are critical to the local economy and can directly benefit from conservation plant products and seeding technology.

2013 Weather Summary

After one of the worst storms on record and one of the largest earliest snowstorms on record, chilly conditions continued in November 2012, with first freezing point (28˚F) reached in Cape May on Nov. 28th. Despite a chilly finish, the first 11 months of 2012 were New Jersey's warmest on record with an average temperature of 57.4˚F. Of all weather stations located in the state, Cape May had the longest growing season from March 12th–November 27th (261 days) in 2012. The following Dec.–Feb. New Jersey experienced milder than usual conditions, yet the cool season dragged on with a cooler and snowier than average March. It was a drier than average March, with a notable coastal storm producing heavy rains, winds over 60 mph, and coastal flooding breaching some dunes. The 2012–2013 snow season reached a state average of 20.8", (4.1" below average) with the southern third of the state (including Cape May) as 7.1" below average. June 2013 was the wettest June on record (dating back to 1895) at 9.57" with an above-average 71˚F. The summer months of June, July, and August combined to produce the fourth wettest summer on record, with July marking the 5th warmest on record. Colder than average temperatures predominated throughout fall, with the first statewide freeze occurring on November 13th. Overall, the fall was extremely dry throughout the state. The longest growing season in the state was 222 days in 2013.

Temperature and Precipitation Data Oct 2012–Oct 2013 for Cape May, NJ

Year	Month	Temp. (˚F) Monthly Average			Precip. (in) Monthly Total
		High	Low	Avg	
2012	Oct	66.3 67.1†	53.3 49.9	60 58.5	6.27 3.70
	Nov	50.9 56.8	36.8 41.1	43.8 49	0.72 3.29
	Dec	50.9 46.8	37.3 31.9	44.1 39.4	3.99 3.47
2013	Jan	43.3 42.3	30.2 27.9	36.6 35.1	1.84 3.32
	Feb	41.6 44.3	29.5 29.2	35.6 36.8	3.37 2.82
	Mar	45.6 51.4	34.2 35.2	39.9 43.3	3.41 4.26
	Apr	60.4 60.8	44.4 43.8	52.4 52.3	2.94 3.53
	May	68.5 70.4	54.2 52.7	61.5 61.5	1.74 3.53
	Jun	78.7 79.4	63.5 62.5	71.2 71.0	6.12 3.37
	Jul	84.3 84.5	70.5 67.7	77.5 75.1	1.26 3.70
	Aug	79.2 83.4	65.1 66.8	72.2 75.1	4.19 3.62
	Sept	74.1 77.8	56.5 60.7	65.3 69.2	0.78 3.27
	Oct	66.7 67.1	51.7 49.9	59.1 58.5	4.33 3.70
	Nov	52.4 56.8	37.9 41.1	45.1 49	2.87 3.29
	Dec	48.1 46.8	32.8 31.9	40.5 39.4	5.26 3.47
2013	Annual	61.9 63.8	47.5 47.5	54.7 55.53	38.11 41.88

† NOAA National Climatic Data Center, 30–year climate normal, 1981–2010.

ACTIVE STUDIES

PLANT DEVELOPMENT AND EVALUATION

DEVELOPMENT OF SEA OATS FOR COLD-TOLERANCE

Study no. NJPMC-R-1001 (ongoing)
PI: Chris Miller, Don Hamer (retired), Scott Snell, Elizabeth Marshall

NJPMC installed an increase block of sea oats (*Uniola paniculata*) from germplasm dating back to an original 1991 planting in Avalon, NJ. Don Hamer and Curtis Sharp salvaged plants from a 2012 installation, and these plants were divided, potted, and grown in the NJPMC greenhouse in 2013. Plants were installed in three off-center sites in the Borough of Cape May Point in spring, 2013. Evaluations will continue in 2014. Seed was also collected from the existent 1991 population in mid-November 2013. There was no observed natural recruitment from this 1991 planting. PMC staff also performed a germination study on previously collected 2012 sea oat seed. Germination results are given below.

Table 1. Number of seedlings per gram for various sea oat seed collections.

Collection	Amount (g)	# of Seedlings	Seedlings / gram
Early	4	42	10.5
Pre Sandy	7	138	19.7
Post Sandy	7	142	20.3

DEVELOPMENT OF SHORTBEARD PLUMEGRASS AND SUGARCANE PLUMEGRASS

Study no. NJPMC-R-1204 (ongoing)
PI: James Futrell, Elizabeth Marshall

Initial evaluations and selection will continue in Spring 2014 on 104 total accessions of shortbeard plumegrass (*Saccharum brevibarbe*) and sugarcane plumegrass (*Saccharum giganteum*) collected by Bob Glennon, former PMC manager. Staff measured percent survival after the first year of growth. After a cold and prolonged winter, *S. brevibarbe* showed slightly better survival than *S. giganteum*, but not significantly so. Both species, however, had a low survival rate at 35% and a 32%, respectively. Staff will replace lost plants and gather more data on height, spread, and survival in the second year. Both *S. giganteum* and *S. brevibarbe* are facultative wetland plants (FACW) that usually occur in wetlands. This may have contributed to the low survival rate in a well-drained cropland.

EVALUATION OF AMBERIQUE-BEAN

Study nos. NJPMC-P-1308 (complete) and NJPMC-P-1401 (ongoing)
PI: Scott Snell

In 2013, NJPMC installed an increase block of 10 accessions of amberique-bean (fuzzy bean) (*Strophostyles helvola*) at the PMC for the purposes of increasing seed production. These 10 accessions were gathered from a larger group of 39 accessions collected by NJPMC staff in the 70's–80's, and were chosen for their ability to produce seed. Additionally, three similar species other than *S. helvola* were included from a 1989 evaluation: least snoutbean (*Rhynchosia minima*); spurred butterfly pea (*Centrosema virginianum*); and pink fuzzy bean (*Strophostyles umbellata*). These other species are all also legumes with a vining growth habit. However, unlike *S. helvola*, they are perennial species. NJPMC staff recorded: date-of-bloom and seed set; spread; dry-weight; root length; and total seed production. The seed from these native legumes will be used in technology development for farmland, critical area stabilization, and beach restoration seeding trials.

Accessions were seeded out in trays in the PMC greenhouse and seedling counts were made 10, 17, and 45 DAP.

Table 2. Species, accession number, seedling counts, and percent germination for select accessions of *S. helvola*, *S. umbellata*, *Centrosema virginianum*, and *Rhynchosia minima*.

		---------DAP---------			
Species	**Accession #**	**10**	**17**	**45**	**% Germ**
S. helvola	9017145	4	14	57	14.63
S. helvola	9043912	17	34	64	12.69
S. helvola	9017147	12	75	152	35.77
S. helvola	9039028	18	44	88	19.61
S. helvola	9057781	4	57	109	25.87
S. helvola	9047142	21	130	243	43.23
S. helvola	9043918	49	82	128	30.06
S. helvola	9041956	5	42	123	28.63
S. helvola	9057779	9	31	114	25.96
S. helvola	9017146	18	57	96	16.98
S. umbellata	9013735	64	83	174	na
Centrosema virginianum	9043901	≧100	≧100	147	na
Rhynchosia minima	9043962	≧100	≧100	270	na

Accessions were field planted as plugs in a seed increase field on July 9, 2013. Staff recorded survival, time of bloom, and the average spread. To measure spread, staff selected 10 plants from each accession and sampled on 8/27/13 (50 DAP) and 12/2/13 (end of season). Data did not show any significant difference in spread between accessions. Root length was also measured at the end of the growing season. There was a significant difference in root length between the accessions. Accession #9047142 and #9017146 had the greatest root length (in). Two accessions stood out at season's end for the large number of seeds produced per plant (9043912 and 9043918). These seeds were naturally smaller, and passed through cleaning with a lower percentage of damaged seed. These attributes made these two accessions in particular a good choice for further increase and development.

In March 2014, seed from all 10 accessions were seeded out in cell plug trays and germinated in a greenhouse trial for 50 days. Germination counts were performed in 10 day intervals for 50 days during the trial. A rolled paper towel germination chamber test was also performed using the 10 select accessions from both the original 1989 and 2013 seed lots. The germinator was set at 82˚F (high) with light for 14 hr. and 21 min. and 45˚F (low) without light for 9 hr. and 39 min.

Studies planned for 2014 will compare a direct seeding of *S. helvola* on site at the NJPMC and offsite in a recently constructed sand dune in the Borough of Avalon.

Table 3. Plant vegetative spread of 10 accessions of amerique bean (*Strophostyles helvola*) measured 50 DAP and at the end of season (12/2/13), USDA-NRCS, Cape May, NJ.

Amberique Bean Accession #	Vegetative Spread (in)
9043912	69.650 a[1/]
9017146	69.175 a
9017147	68.650 a
9017145	67.775 a
9057779	63.800 a
9047142	63.650 a
9043918	62.200 a
9041956	61.975 a
9039028	60.375 a
9057781	58.950 a
Mean	64.62

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 3. Amberique bean (*Strophostyles helvola*) root length of 10 accessions measured at the end of season (12/2/13), USDA-NRCS, Cape May, NJ.

Amberique Bean Accession #	Root Length (in)
9047142	26.425 a[1/]
9017146	19.875 ab
9017145	16.875 bc
9039028	16.700 bc
9057779	15.450 bc
9017147	15.100 bc
9041956	14.125 bc
9043918	13.475 bc
9057781	11.725 bc
9043912	9.175 c
Mean	15.89

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 4. Vegetative spread (in) recorded for 10 accessions of *S. helvola* planted at the NJPMC in 2013.

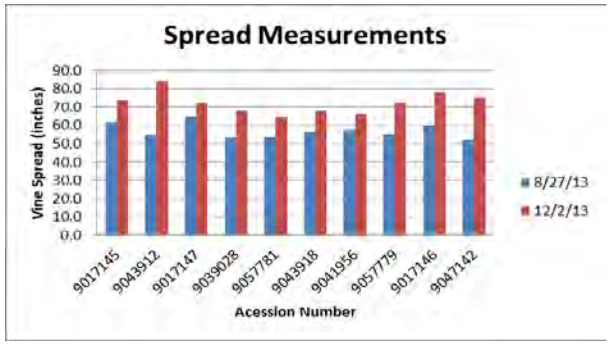


Table 5. Root mass (g) and root length (in) recorded for 10 accessions of *S. helvola* planted at the NJPMC in 2013.

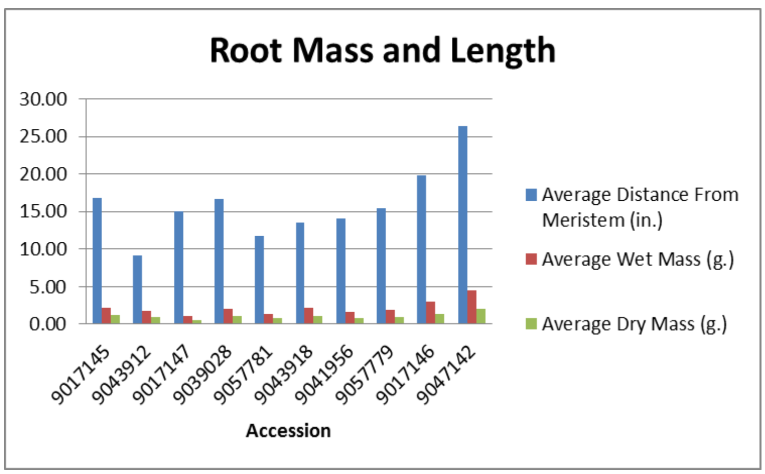


Table 6. Average number of seeds produced for 10 accessions of *S. helvola* planted at the NJPMC in 2013.

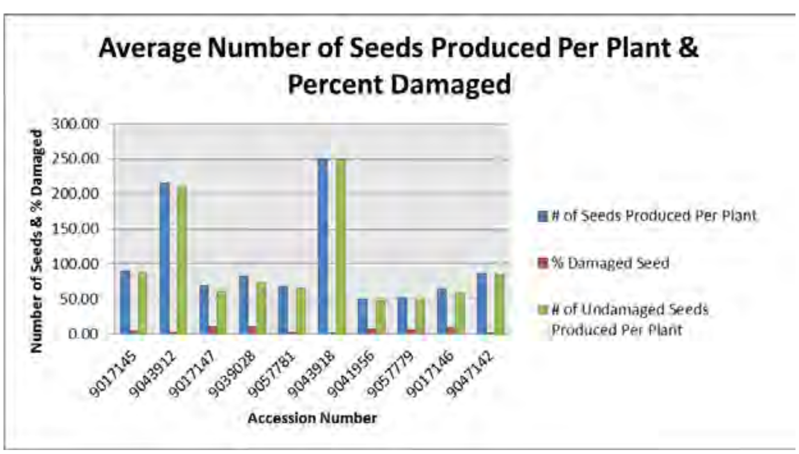


Table 7. Percent germination for 5 accessions with the highest percent germination.

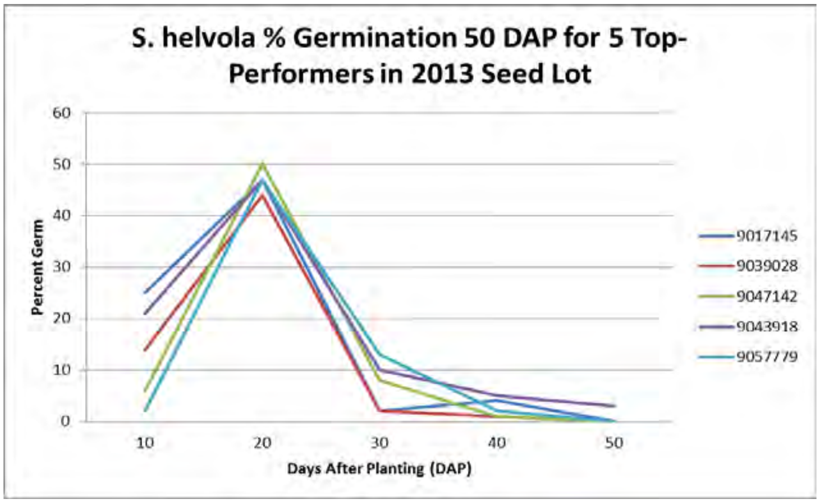
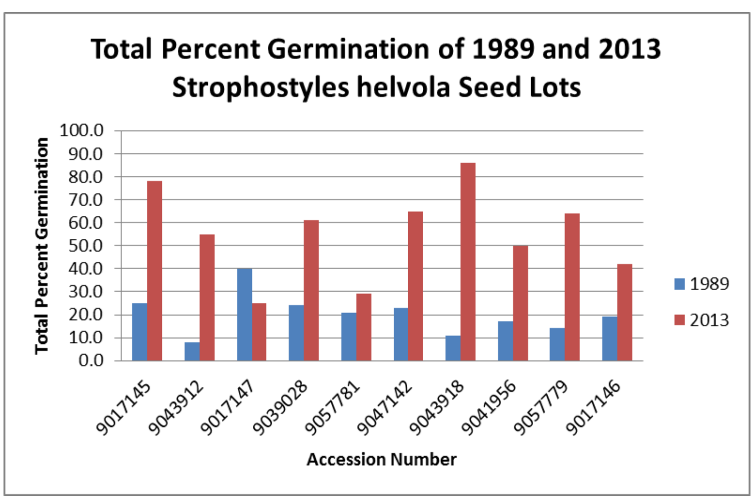


Table 8. Ranked top 5 accessions with highest germination rate.

Ranked Top 5 Total Percent Germination of S. helvola (2013 Seed Lot)

Accession	Total Germ
9043918	86
9017145	78
9047142	65
9057779	64
9039028	61

Table 9. Comparison of *S. helvola* total percent germination between 1989 and 2013 seed lots.



EVALUATION OF SEASHORE MALLOW
Study no. NJPMC-P-1402 (started)
PI: James Futrell, Elizabeth Marshall

The Halophyte Biotechnology Center at the University of Delaware College of Marine and Earth Studies has contacted the NJPMC regarding a partnership in the development of seashore mallow (*Kosteletzkya virginica*) for potential use in farmland/aquatic ecosystems in transition. Seashore mallow is a novel salt-tolerant crop that has the potential to increase coastal ecosystem resilience currently threatened by climate change and to potentially expand biofuel and feed supplies. This perennial halophyte crop can be successfully grown in poorly drained saline soils, providing a potential source of income for farmers on otherwise non-arable land. In spring 2014, PMC staff will install two trials at the PMC: in a periodically flooded wetland pit; and in an upland field for initial evaluation and comparison.

RELEASE OF PRAIRIE CORDGRASS
Study no. NJPMC-P-0903 (complete)
PI: PMC Staff

In 2013, NJPMC released Southhampton Germplasm prairie cordgrass (*Spartina pectinata*) as a selected class ecotype from Long Island. This release was developed with the cooperation of the Plant Materials Center in Big Flats, NY. Southampton Germplasm was selected from a collection of 53 accessions assembled and evaluated at the Big Flats PMC from 1994 to 1997.

GIANT CANE
Study no. NJPMC-P-1204 (inactive)
PI: PMC Staff

Giant cane, (*Arundinaria gigantea*) is a perennial, cool-season woody grass that was once widespread throughout much of Midwestern and Eastern North America. Current evaluations of this plant have been postponed pending the acquisition of more accessions from a wider distribution range.

TECHNOLOGY DEVELOPMENT

DIRECT-SEEDING TRIAL FOR DUNE RESTORATION USING LEGUMES, GRASSES, AND FORBS
Study no. NJPMC-T-1303
PI: Scott Snell, Christopher Sheahan (complete)

In early May 2013, a direct-seeding trial was installed on the back side of a newly constructed dune at Cape May Point, NJ. The goal was to find suitable plants that would help increase diversity in dune restoration projects. Six species were drilled at two depths in three replications each. The six species were: amberique-bean (*Strophostyles helvola*), pink fuzzy bean (*Strophostyles umbellata*), beach pea (*Lathyrus japonicus*), spurred butterfly pea (*Centrosema virginianum*), 'Monarch' seaside goldenrod (*Solidago sempervirens*), and 'Atlantic' coastal panicgrass (*Panicum amarum var. amarulum*). Staff also planted three varieties of American beachgrass: 'Cape', 'Bogue', and 'Van Pine', and bitter panicgrass (Panicum amarum) 'Northpa'. Staff performed evaluations each month from May–October 2013. For seedling counts, the average of three random samples of 1 ft was taken per row and recorded to determine average seedling count/foot.

Table 10. Comparison of percent survival of four warm-season grasses planted in spring 2013.

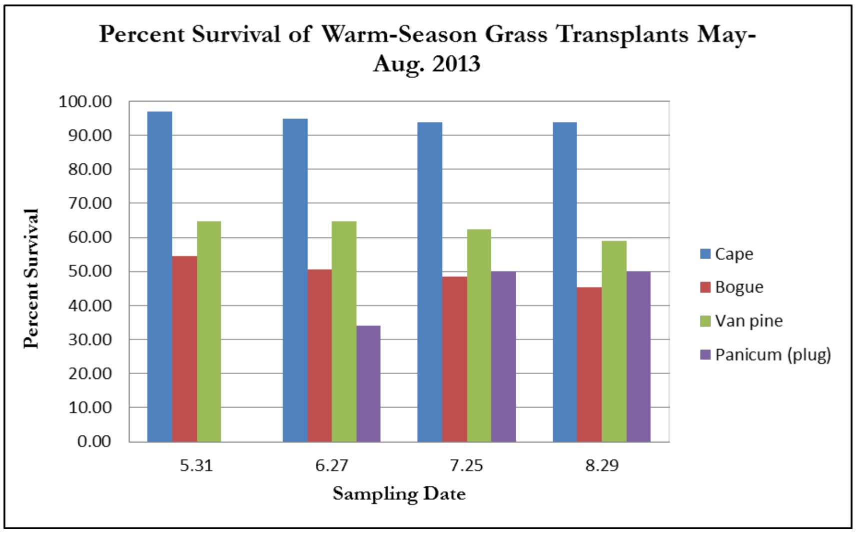
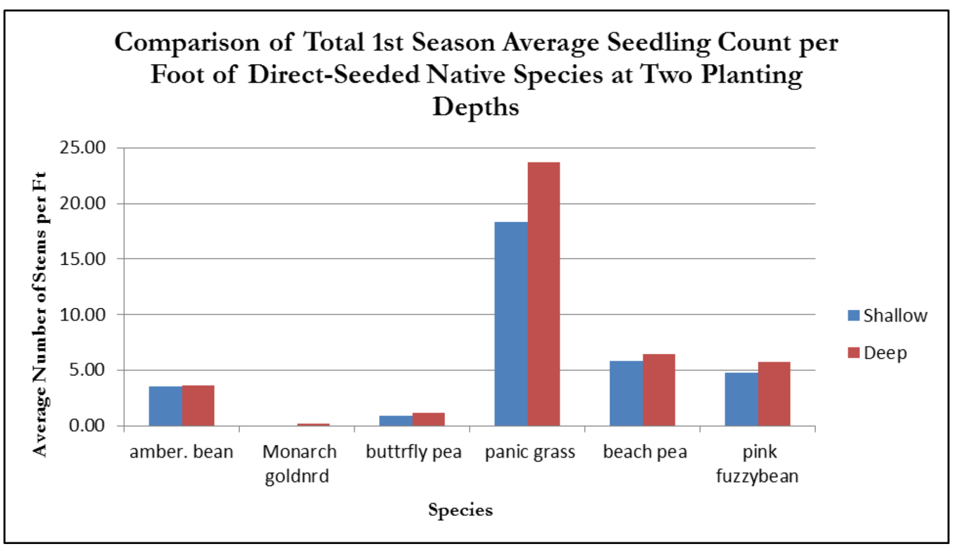


Table 11. Comparison of seedling counts for direct-seeded native species at two planting depths.



COVER CROP FIELD EVALUATION
Study no. NJPMC-T-1305 (complete)
PI: Christopher Sheahan

In support of the NRCS Soil Health Initiative the NJPMC experimented with several cover crops more commonly used in southern, subtropical, and tropical regions. PMC staff direct-seeded pigeon pea (*Cajanus cajan*), velvet bean (*Mucuna pruriens*), lablab (*Lablab pupureus*), and cowpea (*Vigna unguiculata*) into PMC fields. Although jack bean (*Canavalia ensiformis*) did grow, blossom, and initiate seedpod development during the summer of 2012, it was excluded from the 2013 study due to lack of growth and vigor. All four species were direct-seeded at a variety of seeding rates in several demonstration plots.

PIGEON PEA-Pigeon pea was direct-seeded with and without inoculation in both the field and greenhouse on 05/22/2013. Pigeon pea was sown 10 lb/A = 43,360 seeds/A interplanted with rows of lab lab at 20 lb/A, and buckwheat at 50 lb/A. Staff measured plant heights, canopy spread, stem thickness, and seed production in both field and hoophouse. Additionally staff counted, measured, and weighed root nodules from the hoophouse experiment to determine the effect, if any, of inoculation on root nodule formation.

In the hoophouse trial, there was no significant difference in number of nodules, or plant height (in); however, there was significant differences between the width of nodules (mm), size of nodules (small, med, or large), and stem diameter (mm). Nodules were larger (mm) in non-inoculated seed and fewer in number. Stem diameter was significantly greater in inoculated seed and plant height was also greater, but not significantly so. At this point, it does not seem that the use of inoculant significantly improves the health, growth, or productivity of the pigeon pea. A germination trial begun in early June failed to show any advantage of using inoculant for increase germination.

In a concurrent directly-seeded field trial, there were significant differences in plant height (in), canopy spread (in), and stem diameter (mm) between inoculated and non-inoculated treatments. However here, non-inoculated pigeon pea had a greater height, canopy spread, and stem diameter than the inoculated treatment. This finding was unexpected, as inoculation produced an opposite effect than the beneficial one desired or expected. Anecdotal observations found that soils in the inoculated treatment suffered from compaction and poor drainage that could have contributed to its overall poor performance. Total seed production in inoculated plots was 35% of total seed produced in non-inoculated plots. This finding perhaps highlights the limitations of using inoculants in mitigating the negative influence of poor soil health/quality.

Given these seemingly contradictory results, the results from the more controlled hoophouse study are probably more accurate; namely, that there is no significant difference in plant height when using inoculated seed, and any small advantage, say in stem width (a significant finding in hoophouse study) will not offset the larger influence of soil health/quality on crop productivity in the field more generally.

At the end of the season seed was collected for further development.

Table 12. Influence of Seed Inoculant on Pigeon Pea Growth and Root Nodulation at 69 DOP.

Pigeon Pea Root Nodules Measured at 69 DOP							
Pigeon Pea Treatment	# Nodules	Av Size of Nod	Size of Nod (mm)	Position of nod (tap root or fine root)	Activity	Stem Diameter (mm)	Height (in)
Inoculated Seed	15.1 a[1/]	large + small	11.4 b	tap and fine root	Y	6.5 a	29.84 a
Non-Inoculated Seed	13.7 a	large	13.3 a	fine root	Y	5.1 b	27.86 a
Mean	14.4	na	12.35	na	na	5.8	28.85

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 13. Results of germination count of inoculated and non-inoculated legumes pigeon pea, cowpea, and lab lab after 20 days.

Germination Count of Inoculated and Non Inoculated Legumes after 20 days		
	6/20/2013	7/3/2013
	---------% Germ---------	
Pigeon Pea Inoculated	11	28
Pigeon Pea Non-Inoculated	21	32
Cowpea Inoculated	90	91
Cowpea Non-Inoculated	82	91
Lab Lab Inoculated	(planted on 6/20)	83
Lab Lab Non-Inoculated	(planted on 6/20)	84

Table 14. Pigeon pea height, spread, and stem diameter for inoculated and non-inoculated seed directly sown into a loamy sand field.

	Height (in)	Canopy Spread (in)	Stem Diameter (mm)
Non-Inoculated Seed	29.343 a	16.7 a	10.871 a
Inoculated Seed	22.772 b[1/]	12.417 b	8.723 b
Mean	26.06	14.56	9.80

[1/]Means in column followed by the same letter are not significantly different according to Tukey's HSD at $P<0.05$.

MUCUNA- *Mucuna pruriens* was direct-seeded into 1-year old, tilled, sunn hemp residue at two seeding rates into a former time trial block in late June 2013. Seed was not inoculated. Although the planting occurred at the late end of the planting window, plants produced viable seed in the fall. Seed was counted and collected for further development.

COWPEA '#83060'- This tropical cultivar has been developed and valued for its ability to grow well in poor and acidic soils and to be resistant to insects and disease. In 2012, seedlings grown in the greenhouse were transplanted into a replicated block trial. The plant demonstrated tremendous spread (>20 ft) and impressive seed production. Seed was collected in 2012 and directly drilled in late June 2013 into a disked crimson clover cover crop. The crimson clover had been allowed to go to seed before incorporation. The interest in this study was to see how well the crimson clover would return in the inter-rows of a spreading, summer cowpea cover crop; and how to manage weeds during the interim. Weeds in the inter-rows were periodically mowed. Half of the cowpea field was mowed to the height of 8 inches after 1 month of growth to simulate grazing and to test plant's recovery. Overall, although the cowpea established solid rows and put on good growth with a late-season planting, it did not spread well when direct-seeded at high seeding rates, and did not recover well after mowing. Only one or two plants produced seed in fall, suggesting that a June 28th planting date was a good date to use when establishing cover, but too late in the summer to produce seed in fall. In comparison, the very successful 2012 planting was on May 8th.

HYACINTHBEAN- *Lablab purpureus* is the only species of this 'Southern' cover crop mix that does not bloom or set seed at this latitude—yet its rapid growth, vine-like spread, and heavy biomass production makes this plant a suitable candidate as a cover crop/nurse crop in NJ. Both non-inoculated and inoculated seed was directly tilled in two combinations: 1) interseeded with buckwheat in the inter-rows of pigeon pea; and 2) inter-seeded with pigeon pea in the inter-rows of buckwheat. PMC staff recorded plant heights and canopy spread of inoculated and non-inoculated lab lab.

Table 15. Lablab (hyacinthbean) height and spread for inoculated and non-inoculated seed directly sown into a loamy sand field. Measurements taken after 28 days and 67 days.

	------------28 Days----------		-----------67 Days-----------	
	Height (in)	Canopy Spread (in)	Height (in)	Canopy Spread (in)
Non-Inoculated Seed	2.09 a[1/]	5.01 a	23.48 a	na[2/]
Inoculated Seed	2.03 a	4.34 b	19 b	na
Mean	2.06	4.68	21.24	na

[1/]Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.
[2/]After 67 days of growth plants grew into each other, were entangled, and could not be separated for measurement.

Height measurements were not significantly different between inoculated and non-inoculated seed early in the trial after 28 days of growth. However, canopy spread was significantly different, and similar to the pigeon pea trial, the non-inoculated seed performed better. This finding showed an opposite effect than the beneficial one desired or expected. Later measurements taken at 67 DAP also found significant difference in plant height, with non-inoculated seed growing much taller than inoculated. So again, these results highlight the deleterious effect that poor soil health/quality can have on plant growth, and the inability of inoculated seed to mitigate these conditions.

INFLUENCE OF A GRASS/LEGUME COVER CROP MIX ON SOIL HEALTH

Study no. NJPMC-T-1306 (Active)
PI: Christopher Sheahan

PMC staff established a multi-year study to investigate the effects of a grass/legume cover crop mixture on soil health. Cowpea (*Vigna unguiculata*) and sorghum sudangrass (*Sorghum bicolor x S. bicolor var. Sudanese*) were drilled with a Truax no-till drill in mid-June, 2013. Cowpea and sorghum were planted alone and in combination at recommended seeding rates terminated the crop by mowing (m) or disking (d). Before seeding, soil microbial activity was analyzed for each of the treatment plots using the Soil Health Tool (SHT) developed by Dr. Rick Haney, USDA-ARS. Seeding rates, time of emergence, stems/sq ft, plant height, percent weed cover, and dry matter yield were recorded. A buckwheat and browntop millet mixture was used as a control.

The wheat crop of 2013 could not be planted early enough in the fall planting window to guarantee the plants would successfully overwinter, so residue was left standing over winter to protect against wind erosion, and incorporated in the early spring before an early spring no-till planting of wheat. Although not commonly grown in the spring in the Mid-Atlantic, wheat can provide a quick growing, weed-suppressing cover in April if the grower happens to miss the fall planting window. Cowpea and sorghum was then planted with a no-till drill in the first week of June into both the overwintered dead residue from fall 2013 (still on the surface) and the living wheat mulch of spring 2014.

The percentage of ground covered by the cowpea and sorghum mix is not significantly different than using cowpea alone, or control, but is significantly higher than using sorghum alone. The percentage of total weed cover in sorghum is significantly higher than control, cowpea, and the cowpea and sorghum mix. At the end of the first season, the dry weight for cowpea and sorghum cover mix, cowpea (alone), sorghum (alone), and control was not significantly different. Wheat and weed percent cover were measured 52 DAP before planting with the sorghum and cowpea treatments to determine if spring-planted wheat was effective at reducing weed competition.

There was no significant difference between cover treatments (cowpea+sorghum, cowpea, sorghum, and control) in regards to percent bare ground, residue cover, weed cover, wheat cover, and wheat height in the early spring wheat planting. When comparing the effect of termination treatments (mowing versus disking the overwintered residue) on the following spring-planted wheat crop there was significant differences in wheat height, percent bare ground, and percent residue; but no difference in weed cover or percent weed cover. Thus, termination practices appear to be more important than cover crop or choice of mix in influencing the fate of residue and plant height of the following crop. Surprisingly, disking was not significantly better than mowing for reducing weed in a spring-planted crop.

Table 16. Comparison of percent cover and percent weed cover for cowpea and sorghum cover crop mix 34 DAP.

	% Cover	% Weed Cover
Cowpea + Sorghum	80.50 a[1/]	39.33 b
Control	80.17 a	42.50 b
Cowpea (alone)	77.67 a	41.67 b
Sorghum (alone)	48.17 b	56.25 a

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at $P<0.05$.

Table 17. Comparison of stem width (mm) and plant height (in) for cowpea and sorghum cover crop mix 34 DAP. Average stem count was measured at the end of 2013 season.

	Cowpea Measured With and Without Sorghum			Sorghum Measured With and Without Cowpea		
Treatment	Stem Width (mm)	Plant Height (in)	Av. Stem Count (per ft²)	Stem Width (mm)	Plant Height (in)	Av. Stem Count (per ft²)
Cowpea + Sorghum	26.6 a[1/]	6.07 a	4.48	4.38 a	31.05 b	2.6
Cowpea (alone)	25.6 a	5.43 a	9.33	na	na	na
Sorghum (alone)	na	na	na	5.1 a	36.05 a	12.29

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 18. Comparison of oven dry weight of vegetative cover at the end of season.

Treatment	**Mean Oven Dry Weight (g)**
Sorghum + Cowpea Mix	63.33 a
Sorghum	54.75 a
Cowpea	53.33 a
Control	39.00 a

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 19. Comparison of effect of early spring termination treatments (disk and mow) on overwintered cover crop residue and wheat height.

Termination Treatment	**% Bare Ground**	**% Overwintered Residue**	**% Weed**	**% Wheat**	**Wheat Height (cm)**
Disk	24.91 a	27.56 b	8.03 a	42.38 a	13.65 a
Mow	9.36 b	63.31 a	16.78 a	28.13 a	11.85 b

[1/] Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

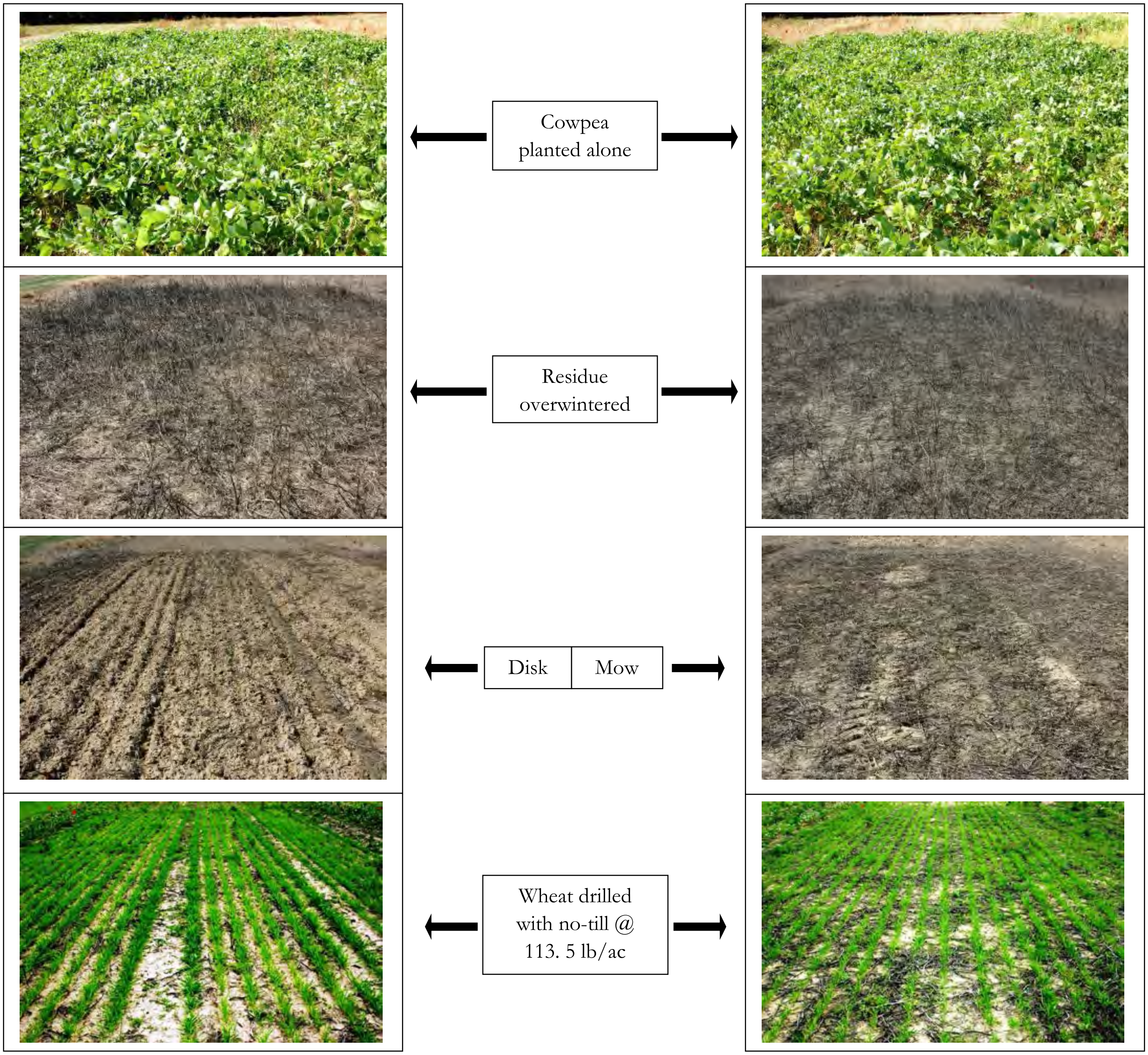


Figure 1. Example of cover crop residue management from Fall 2013 to Spring 2014 in cowpea treatment (planted alone) with disking (left) and mowing (right) termination treatments.

CARBON SEQUESTRATION IN THE CONVERSION FROM C-3 TO C-4 PASTURE PLANTS

Study no. NJPMC-T-9904-GW (Active)
PI: Center Staff

A study was initiated at the USDA-NRCS Cape May Plant Materials Center in 1999 to quantify soil carbon sequestration changes with the conversion from a cool season grass to native warm season grasses in a sandy, coastal plain soil (Downer sandy loam). Five native warm season grasses were studied: 'Shelter' switchgrass (*Panicum virgatum*); 'Atlantic' coastal panicgrass (*Panicum amarum var. amarulum*); 'Niagara' big bluestem (*Andropogon gerardii*); indiangrass (*Sorghastrum nutans*); and 'Pete' eastern gamagrass (*Tripsacum dactyloides*). Data reviewed in 2003 suggests that initial soil C concentrations in the upper 24 in of the soil profile may have already been near the saturation point for our sandy coastal soil with the previous cool season grass, but the deeper rooting of some warm season species creates the potential to increase sequestration at deeper depths where initial C concentration is very low. Data collection will continue in 2014.

COMPARISION BETWEEN AMERICAN BEACHGRASS CULTIVARS 'CAPE' AND 'BOGUE'

Study no. NJPMC-T-1302
PI: Scott Snell, Christopher Sheahan

In late April 2013, PMC staff installed a randomized block design comparing the survival and growth between two varieties of American beachgrass: 'Cape' and 'Bogue' (the former from Cape Cod, MA; and the latter from Bogue, NC) at Cape May Point, NJ. A similar study was performed decades before with the predictable result showing 'Cape' more suitable for restoration projects in the region. However, due to the lack of 'Cape' availability and increased demand for dune restoration plants more generally, (also the influence of climate change pushing limits of what can be grown in the area), we thought another look at 'Bogue' was merited. Plots will be reevaluated throughout 2014.

Initial evaluations from the first season found that 'Cape' had a significantly higher survival rate than 'Bogue', although the latter did not perform poorly and could be used successfully as a substitute in the region if 'Cape' material was unavailable. 'Cape' also had significantly greater stem count, culm bunch width (the width of all culms measured together), and individual stem diameter (mm).

Table 20. Percent survival measured at the end of 1st season, on Aug 29th is significantly different.

	6/27/13	7/25/13	8/29/13
	Stem Count		
Cape	4.46 a	5.77 a	6.19 a
Bogue	1.99 b	3.58 b	3.87 b
	Culm Bunch Width		
	6/27/13	7/25/13	8/29/13
Cape	10.08 a	14.69 a	18.67 a
Bogue	6.16 b	8.41 b	9.87 b
	Stem Diameter (mm)		
	6/27/13	7/25/13	8/29/13
Cape	4.54 a	5.52 a	5.48 a
Bogue	3.89 b	4.21 b	4.89 b

1/ Means in column followed by the same letter are not significantly different according to Tukey's HSD at P<0.05.

Table 21. Percent survival measured at the end of 1st season, on Aug 29th is significantly different.

	Average Percent Survival 2013				
	5/3/13	5/31/13	06/27/13	07/25/13	08/29/13
Cape	na	97.5	96.8	96.5	91.8 a
Bogue	na	82.5	81.3	80.3	74.8 b

PROPAGATION OF HARDWOOD CUTTINGS OF BLACK LOCUST "STEINER-GROUP"

Study no. NJPMC-T-1304
PI: Scott Snell

PMC staff conducted an experiment to propagate three "Steiner Group" accessions ('Appalachia' 9030613; 'Allegheny' 9030614; and 'Algonquin' 9030615) from hardwood cuttings. The rationale of this project was to find easier and more efficient ways of propagating black locust besides the traditional, more labor-intensive approach of using root cuttings. Small, pliable branches were taken in mid-April 2013, treated with Hormodin 3 rooting hormone, and placed vertically into trays with three different substrates as treatments: 100% Pro-mix; 50/50 Pro-Mix and sand; and 100% sand. The cuttings grown in 100% sand had the highest and most consistent survival rate across accessions.

Black Locust (Steiner Group) Hardwood Cuttings (planted 4/11/13)				
Accession #		Surviving (83 DAP)	% Survival	% Survival (treatment)
Pro-Mix	9030614	0	0	9
	9030613	3	33.3	
	9030615	0	0	
	9030613	2	22.2	
	9030615	0	0	
	9030614	0	0	
Accession #		Surviving (83 DAP)	% Survival	% Survival (treatment)
50/50 Mix	9030615	1	11.1	9
	9030613	2	22.2	
	9030614	1	11.1	
	9030613	1	11.1	
	9030615	0	0	
	9030614	0	0	
Accession #		Surviving (83 DAP)	% Survival	% Survival (treatment)
Sand	9030615	3	33.3	30
	9030614	2	22.2	
	9030615	3	33.3	
	9030613	3	33.3	
	9030614	2	22.2	
	9030613	2	22.2	

INTERAGENCY COOPERATIVE AGREEMENTS

GATEWAY NATIONAL RECREATION AREA SUPERSTORM SANDY RECOVERY

Study no. NJPMC-T-1401
PI: PMC Staff

The Cape May PMC has been busy this year providing plant materials for Superstorm Sandy recovery efforts. Over 380,000 stems of American beachgrass (*Ammophila breviligulata*) were dispensed; with more stems slated to be grown, increased, and distributed for an ongoing National Park Service (NPS) reimbursable project in Gateway National Recreation Area, NY for FY 2013-15. PMC staff also collected seed from the refuge to propagate and increase for the project. These plants included: bayberry, beach plum, black cherry, eastern red cedar, seaside amaranth, eastern baccharis, American sea rocket, partridge pea, saltgrass, rosemallow, amberique-bean, Virginia rose, prickly pear cactus; and several others.

DIRECT SHRUB SEEDING TO BENEFIT MIGRATORY SONGBIRDS
NJPMC-T-1301
PI: James Futrell

The Cape May PMC is working together with the US Fish and Wildlife Service (USFWS) to direct seed native shrubs in efforts to restore 3 agricultural fields (45, 15, and 10 acres). This wildlife planting will help provide needed food and shelter for migratory songbirds during autumn migration. This project will continue in 2014.

2013 CAPE MAY PMC PUBLICATIONS

Copies of the following publications are available at:
http://www.nrcs.usda.gov/wps/portal/nrcs/publications/plantmaterials/pmc/northeast/njpmc/pub/

Plant Guides
Sheahan, C. 2013. Plant guide: Cajanus cajan. Cape May Courthouse, NJ. February 2013. 4p.
Sheahan, C. 2013. Plant guide: Crotalaria juncea. Cape May Courthouse, NJ. February 2013. 4p.
Sheahan, C. 2013. Plant guide: Lablab purpureus. Cape May Courthouse, NJ. February 2013. 3p.
Sheahan, C. 2013. Plant guide: Vigna unguiculata. Cape May Courthouse, NJ. 2013. 3p.
Sheahan, C. 2014. Plant guide: Canavalia ensiformis. Cape May, NJ. Jan 2014. 4p.

Conservation Plant Release Brochures
Snell, S. 2013. Southampton Germplasm prairie cordgrass. Cape May PMC, Cape May Court House, NJ. 2p.

Newsletters
Sheahan, C. 2013. Coastlines Winter Newsletter. Cape May, NJ. Winter 2013. 3p.
Sheahan, C. 2014. Coastlines Winter Newsletter. Cape May, NJ. Winter 2014. 3p.
Sheahan, C. 2014. Coastlines Summer Newsletter. Cape May, NJ. Summer, 2014. 2p.

Other Publications
Sheahan, C., Snell, S., and C. Miller. 2013. 2012 Annual Technical Report. NJ. 2012. 27p.
Sheahan, C., and S. Snell 2013. 2012 Progress Report of Activities. Cape May Courthouse. 2012. 6p.
Miller, C. 2013. The Evolving Understanding of Grassland Restoration Seeding Protocols. Ecological Restoration, Madison, WI. June 2013, Vol.31:127-129. 3p.
Miller, C., and C. Dell. 2013. Quantifying the Role of Native Warm Season Grasses in Sequestering Soil Organic Carbon. 8th Eastern Native Grass Symposium, Charlottesville, VA. October 2012. 1p.
Snell, S. 2013. Notice of Release of Southampton Germplasm Prairie Cordgrass. Cape May Plant Materials Center, Cape May Court House, NJ. 2013. 9p.

2013/2014 CAPE MAY PMC PRESENTATIONS

Title: PMC Tour for Visiting Chinese Agricultural Teachers
Location: Cape May, PMC
Date Presented: 12/7/2013
Presenter: Chris Miller
Topic: General overview of PMC and PMP history, function, and current activities

Title: NJ Agricultural Business Association
Location: Cape May, PMC
Date Presented: 3/21/2013
Presenter: Chris Miller
Topic: General overview of PMC and PMP history, function, and current activities

Title: NJ NRCS Staff Training/Work Day
Location: Sea Girt, NJ
Date Presented: 11/14/2013
Presenter: Chris Miller
Topic: General overview of PMC and PMP role in developing and providing plants for dune stabilization

Title: Barnegat Bay Science Retreat
Location: Ocean County College, Toms River, NJ
Date Presented: 1/10/2014
Presenter: Chris Miller
Topic: General overview of PMC and PMP role in developing and providing plants for dune stabilization; along with providing dune and shoreline planting recommendations to scientists, NGOs, local government, and general public.

2013 CAPE MAY PMC SEED AND VEGETATIVE PRODUCTION

Table 22. Production of NRCS conservation plant releases.

Release Name	Scientific Name	Common Name	Seed (lb)	Rooted Cuttings	Bare Root Stems
Cape	*Ammophila breviligulata*	American Beachgrass			380,000
	Ammophila breviligulata	American Beachgrass (Gateway Collection)			40,400
Suther Germplasm	*Andropogon gerardii*	Big Bluestem	1.96		
New England Germplasm	*Andropogon gerardii*	Big Bluestem	6.06		
Wildwood	*Morella pensylvanica*	Bayberry		152	
Timber	*Panicum virgatum*	Switchgrass	18.5		
Ocean View	*Prunus maritima*	Beach Plum		959	
Dune Crest Germplasm	*Schizachyrium littorale*	Shore Little Bluestem	2.98		
Suther Germplasm	*Schizachyrium littorale*	Shore Little Bluestem	7.14		
Monarch Germplasm	*Solidago sempervirens*	Seaside Goldenrod	17.54		
Suther Germplasm	*Sorghastrum nutans*	Indiangrass	4.6		
	Spartina cynosuroides	Big Cordgrass	0.82		
Southhampton Germplasm	*Spartina pectinata*	Prairie Cordgrass	4.52		