United States Department of Agriculture

Cape May Plant Materials Center
2022 Annual Progress Report of Activities

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The New Jersey Plant Materials Center (NJPMC) provides plant solutions for natural resource conservation concerns pertaining to coastal shorelines, sand dunes, critical areas, and coastal grassland habitat serving the Mid-Atlantic region. Significant accomplishments and major activities or findings from 2022 are covered in this report.

Groundwork Laid for Bushy Bluestem Study

From 1 November to 6 December of 2021, former USDA-NRCS Plant Materials Program (PMC Manager and Plant Materials Program National Leader, 2004-2008) and U.S. Fish and Wildlife Service (Natural Resource Planner) employee, Robert Glennon, conducted a collection of bushy bluestem (*Andropogon glomeratus*) germplasms. Robert targeted brackish and saline coastal collection sites from eight Virginia and three North Carolina counties to collect a total of 35 germplasm accessions. Robert transferred those collections to the NJPMC for the purpose of examining their potential use in the application of USDA-NRCS conservation practice standards.

The bushy seed heads of bushy bluestem. Photo Credit: USDI Bureau of Land Management, United States, Nevada, Clark Co.

The bushy bluestem plant guide recommends the species for 15 NRCS conservation practice standards. Of those 15 standards, the Plant Materials Program (PMP) has standardized plant attribute measurement protocols for Conservation Cover (327), Field Border (386), Riparian Herbaceous Cover (390), and Filter Strip (393). Stem diameter, stems/ft^2, plant height, and dry matter yield data can all be gathered from a single set of replicated trial plots to determine if any accessions display superior performance for those attributes and their associated practice standards. NJPMC staff proceeded to start seedlings of all 35 accessions for comparison trials and drafted a preliminary study plan this year detailing testing methods.

Virginia Saltmarsh Mallow Planted in Living Shoreline and Invasive Plant Removal Projects

Coordinating with the New Jersey Aquaculture Innovation Center (AIC) staff, NJPMC staff contributed to a living shoreline project on the northern bank of the Cape May Canal. Excessive erosion occurred at the site of concern, accelerated by a synergistic combination of regular tidal action, wakes from watercraft navigating the canal, and the return of discharge water from the AIC back to the canal via an outflow pipe terminating at the restoration site.

The living shoreline project site at the New Jersey Aquaculture Innovation Center.

With Oyster Castles® installed and smooth cordgrass (*Spartina alterniflora*) planted from near the low tide line to the mid tide line, the bulk of the living shoreline project was completed prior to NJPMC involvement. However, areas from the mid to high tide line were left completely unvegetated. NJPMC staff planted these areas with four species in July: Eastern baccharis (*Baccharis halimifolia*) at or slightly above the high tide line, eastern gamagrass (*Tripsacum dactyloides*) and Southampton Germplasm prairie cordgrass (*Spartina pectinata*) at or near the high tide line, and Virginia saltmarsh mallow (*Kosteletzkya virginica*) in the remaining area until reaching the previously planted smooth cordgrass plugs. The Virginia saltmarsh mallow plants consisted of two accessions originating from DE and LA that are being considered for release development.

NJPMC staff also coordinated with New Jersey Audubon staff to install Virginia saltmarsh mallow plants as part of an invasive plant removal and native plant restoration project at a site near the Delaware Bay. The project site is owned by an Audubon Healthy Land and Waters Grant recipient and former NRCS EQIP contract holder for shellfish aquaculture. It was dominated by invasive plants including European common reed (*Phragmites australis* ssp. *australis*), English ivy (*Hedera helix*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and bamboo (*Arundinaria* sp.). Audubon staff conducted invasive plant control methods for two growing seasons prior to any effort to revegetate with native, non-invasive species. The project site has a freshwater pond that was breached during Superstorm Sandy introducing saline water to the environment. The breach was repaired but future breaches are likely to occur with sea level rise and more intense storms due to climate change. Installing saline tolerant native species such as Virginia saltmarsh mallow is a proactive strategy to address future saltwater breaches.

This trial/demonstration planting could provide justification for the use of Virginia saltmarsh mallow for NRCS Conservation Practice Standards Wildlife Habitat Planting (420), Herbaceous Weed Treatment (315), Restoration of Rare or Declining Natural Communities (643), and Conservation Enhancement Activity (E327A), Conservation cover for pollinators and beneficial insects.

NJPMC and NJ Audubon staff plant native Virginia saltmarsh mallow plugs.

Hydroponic Salinity Tolerance Trials Continue With 'Flageo' Saltmeadow Cordgrass

Hydroponic systems used to conduct Flageo saltmeadow cordgrass salinity tolerance trials at the NJPMC.

NJPMC staff continued greenhouse hydroponic salinity tolerance trials using a set of four automated hydroponic ebb and flow systems to subject 'Flageo' saltmeadow cordgrass (*Spartina patens*) to treatments of flooding with solutions of varying salinity concentrations. Leaf length of plants receiving the freshwater treatment were statistically significantly greater than all saline treatments; there was no significant difference between any levels of salinity treatments (5, 15, and 25 ppt). Freshwater and salinity treatments up to and including 15 ppt formed a homogenous group with no significant differences in above nor below ground biomass. Both biomass measurements of plants receiving the 25 ppt treatment were significantly less than all other treatments.

As this test is repeated with additional species and varieties, relative salinity tolerance will be calculated to allow evaluation between species and conservation plant release varieties. NJPMC staff plan to test and compare the salinity tolerance of Timber Germplasm switchgrass (*Panicum virgatum),* High Tide Germplasm switchgrass, 'Meadowcrest' Eastern gamagrass, and two additional varieties of saltmeadow cordgrass: 'Avalon' and 'Sharp'. The long-term goal of these trials is to determine appropriate plant recommendations for use on marginal farmland to mitigate the impacts of saltwater intrusion due to climate change. Repurposing the land as a wetland easement, installing conservation practices, and converting to production of salt tolerant crops are all forms of adaptation to saltwater intrusion on agricultural land, and they all require plants with some degree of salinity tolerance.

NJPMC Ships Record Setting Seed Distribution

A record setting shipment of switchgrass seed destined for biofuel production.

The NJPMC received a request for 2,000 lbs of Timber Germplasm switchgrass and/or 'Carthage' switchgrass seed from FDC Enterprises Conservation and Bioenergy (FDCE) in March. Unfortunately, the commercial market was unable to meet the needs of FDCE for their plans of expansion in the biofuels/bioenergy sector. NJPMC staff cleared out a substantial amount of inventory from their seed cooler to provide nearly 400 lbs PLS (193.9 lbs Timber Germplasm and 188.7 lbs Carthage). In doing so, a new record was set at the NJPMC for the most seed distributed in a single shipment.

The team of professionals at FDCE have been involved in the establishment phase of conservation projects since 2003 and expanded their services into the biofuels/bioenergy sector in 2006. FDCE is a welcome partner to add to our list of commercial suppliers.

NJPMC Assists Coastal Community with Late Season Dune Stabilization

Amberique bean growing at a dredged sand dune stabilization project in Lewes, DE.

The Delaware Department of Natural Resources and Environmental Control (DNREC) requested technical assistance from the NJPMC regarding a dredged sand dune stabilization project. The request was received mid-April, just a few weeks after the recommended planting window for American beachgrass (*Ammophila breviligulata*), the most commonly used species for dune stabilization projects in the Mid-Atlantic region. After some brainstorming and discussion of options between NJPMC, DNREC, and the property owners funding and implementing the project, it was decided to forego the greater risk of loss that a late American beachgrass planting would entail and attempt a direct seeding trial of amberique bean (*Strophostyles helvola*). NJPMC provided seed of 10 accessions that have been used in multiple trial plantings with success. The property owners and volunteers planted the seed from 23 May to 29 May, following guidelines provided by NJPMC staff, and have continued to provide updates on the status of the planting. The seed had an estimated germination rate of over 50% and trailing vines of the leguminous plant began running across the constructed dune within three months. Property owners hope the amberique bean vines and roots will provide some protection of the sand until American beachgrass can be planted at an appropriate time in 2023.

Preliminary, First, and Second Year Data Show Statistically Significant Differences Between Saltmeadow Cordgrass Releases

NJPMC staff collected and analyzed data from the second full growing season of the saltmeadow cordgrass variety trial. Data for all three years has shown a reliable trend for height, stem diameter, and percent cover with statistically significant differences between all three varieties (Sharp with the highest average and Avalon with the lowest for all three attributes). Significant differences between varieties have varied year to year for stem density and biomass production. This year all three varieties showed statistically significant differences for stem density, Avalon with the highest average and Sharp the lowest. There was no significant difference in biomass production between Sharp and Flageo, but Avalon produced significantly less biomass. None of the varieties met the vegetative barrier standard's guideline for minimum vegetative stiffness index (VSI) (0.10) for concentrated flow areas. Sharp was the only variety to meet the standard's guideline for minimum VSI (0.05) for other purposes. VSI data may be skewed because the plots are mowed annually for the purpose of collecting biomass data. A final VSI data collection will be conducted at the end of the 2024 growing season after the biomass production portion of the study is complete. An additional plant attribute examined this year was forage quality. Samples of each variety were lab tested. Results showed minimal differences between varieties.

Table 1. Forage quality lab results of three varieties of saltmeadow cordgrass.

Variety	Protein (crude) %	Fiber (acid detergent) %	Total Digestible Nutrients %
Avalon	11.7	39.8	57.2
Flageo	13.5	38.8	58.3
Sharp	11.4	39.8	57.2

Collaborative Project Between Universities and Plant Materials Centers Examining Plant Technology to Mitigate Saltwater Intrusion on Agricultural Land Yields Data

Coauthored by Shawn Belt, Chris Miller, and Scott Snell

With research partners from University of Maryland and George Washington University, MDPMC and NJPMC staff assisted with survival and biomass data collections conducted on research plots established in 2021 using bare root propagules harvested from Cape May and Beltsville PMCs. These plots were established at the Fitzgerald Farm and Elmwood Farm in Somerset County, Maryland where saltwater intrusion presents a growing threat to crop production.

All conservation plants tested displayed relatively high survival rates (55–80%) in salty, wet soils during the 2022 growing season. These high percentages show all tested plant types are well suited. Both eastern gamagrass and Florida paspalum (previously untested for salt tolerances) showed high survival rates (≈75%) during the establishment year (2021). In addition to recording survival and biomass data, researchers made note of several key observations. First, 'Atlantic' coastal panicgrass (*Panicum amarum* var. *amarulum*) and High Tide Germplasm switchgrass both displayed markedly slower establishment rates than other species in the study. Second, Mid-Atlantic Germplasm Florida paspalum (*Paspalum floridanum*) appeared particularly robust compared to other species when soil conditions were dry. Third, direct seeded plots failed to establish due to excessive weed competition.

Table 2. Survival rates of tested conservation plants and reported flood and salinity tolerances.

Common Name	Variety	Survival % (2021)*	Flood Tolerance	Salinity Tolerance
saltmeadow cordgrass[1]	'Avalon'[2]	85	high	high
Florida paspalum[1]	Mid-Atlantic Germplasm[2]	75	med-high	TBD
eastern gamagrass[1]	NA	75	med	TBD
switchgrass[1]	High Tide Germplasm[2]	75	high	med-high
prairie cordgrass[1]	Southampton Germplasm[2]	58	high	med
coastal panicgrass[1]	'Atlantic'[2]	55	med	med-high

[1]Native warm season grass
[2]NRCS Plant Materials Program named conservation plant release
*Percent survival figures are estimates based on a chart presented by Caitlin DiCara at the 2022 Eastern Native Grass Symposium.

University partners and PMP staff will conduct additional data collections in 2023 with the potential to expand the project to examine other native species. The findings of this study could be applicable to the vegetative selection for the implementation of a variety of USDA-NRCS conservation practice standards: Critical Planting Area (342), Riparian Herbaceous Cover (390), Stream Habitat Improvement and Management (395), Streambank and Shoreline protection (580), Saturated Buffer (604), Vegetated Treatment Area (635), Constructed Wetland (656), Wetland Restoration (657), Wetland Creation (658), and Wetland Enhancement (659).

Data Collected from Collaborative Pollinator Habitat Demonstration at NJPMC

NJPMC staff conducted plant counts of three flowering forbs included in the seeding mix used to establish pollinator habitat at the NJPMC. Plant counts of lanceleaf tickseed (*Coreopsis lanceolata*), blackeyed Susan (*Rudbeckia hirta*), and partridge pea (*Chamaecrista fasciculata*) were conducted during the peak bloom time of each species. Other flowering species included in the seed mix have failed to establish to a degree to justify conducting plant counts. Several common milkweed (*Asclepias syriaca*), New England aster (*Symphyotrichum novae-angliae*), and seaside goldenrod (*Solidago sempervirens*) individuals were observed and noted.

A monarch caterpillar feeds on common milkweed in the recently established NJPMC pollinator habitat.

The pollinator habitat demonstration has also been subdivided into replicated experimental plots to examine varied mowing and herbicide application regimes. Partridge pea displayed a statistically significant difference between spray treatments. Plots that received an additional spray treatment had a significantly lower average number of plants than plots that received one less herbicide application (17.5 and 27.1 plants/m^2 respectively). Neither lanceleaf tickseed nor blackeyed Susan showed a statistically significant difference in plant counts between spray regimes. None of the three species examined showed a statistically significant difference in plant counts between mowing regimes.

NJPMC staff will conduct additional individual species counts and continue to document establishment and maintenance procedures. The goal of this project is to create a functional pollinator habitat establishment demonstration at the NJPMC that can be used as a teaching tool during outreach and technology transfer events offered by NRCS and partners. Lessons learned and results of the multiphase establishment method could be used to update eFTOG documents.

Plant Materials Program Outreach and Technology Transfer Accomplished at the 12th Eastern Native Grasslands Symposium

The Plant Materials Program displayed a strong presence at the 2022 Eastern Native Grass Symposium with representative employees from the Norman A. Berg National Plant Materials Center (Beltsville, MD), the Appalachian Plant Materials Center (Alderson, WV), the East Texas Plant Materials Center (Nacogdoches, TX), and the Cape May Plant Materials Center (Cape May Court House, NJ). The NJPMC submitted an oral and a poster presentation. Both proposals were accepted. The oral presentation (Advancing the Science of Coastal Ecosystem Restoration) was presented by Scott Snell (Agronomist, USDA-NRCS, NJPMC) and covered a brief overview of the Plant Materials Program, some specifics about the NJPMC, and a snapshot of a few NJPMC projects and studies (direct seeding of smooth cordgrass, salinity tolerance screening trials, and saltmeadow cordgrass variety study). The poster covered details of the projects and studies mentioned in the oral presentation.

Scott Snell presenting at the 2022 Eastern Native Grass Symposium.

Mike Yacovelli (NRCS Biological Science Technician) presents on tractor and farm safety to field staff.

NJPMC Provides Training to Multiple Agency Field Staff

NJPMC staff led sessions and hosted half of a three-day training for NRCS NJ, Soil Conservation Districts, NJ Department of Agriculture, NJ Audubon, and NJ Farm Service Agency field staff. Training topics covered included an overview and services provided by the Plant Materials Program and the NJPMC, RUSLE2 applications with equipment and tillage demonstrations, tractor and farm safety, and conservation planning with a special focus on Conservation Practice Standard High Tunnel System (325).

Fred Schoenagel (NRCS NJ Resource Soil Scientist) leads soils training.

USDA Northeast Climate Hub Team Welcomes Chris Miller as a Collaborating Scientist/Researcher

NJPMC Manager, Chris Miller, presenting at a USDA Northeast Climate Hub sponsored workshop addressing saltwater intrusion on agricultural land.

Chris Miller, NJPMC Manager, accepted an auxiliary position as Collaborating Scientist/Researcher with the USDA Northeast Climate Hub Team this past year. With the support of his amazing PMC staff, Chris will continue to fulfill his duties as NJPMC Manager in addition to taking on supplemental duties to advance the mission of the Northeast Climate Hub. The mission of the USDA Climate Hubs "is to develop and deliver science-based, region-specific information and technologies, with USDA agencies and partners, to agricultural and natural resource managers that enable climate-informed decision-making, and to provide access to assistance to implement those decisions." This mission statement aligns closely with the Plant Materials Program mission "to find plant solutions to solve conservation problems," especially in situations where plants are implemented as a solution to conservation problems exacerbated by climate change impacts. As a career Plant Materials Program employee and a former NRCS Project Liaison (2019) with the Northeast and Southeast USDA Climate Hubs, Chris possesses the necessary experience and unique perspective to recognize and pursue projects that are equally beneficial in advancing the cause of both the NJPMC and the Northeast Climate Hub.

Chris Miller Represents the Plant Materials Program at an International Soil Salinization Workshop

The Roosevelt Institute for American Studies hosted a workshop titled "Soil Salinization: Global Problem, Local Solutions" in Middelburg, Netherlands on 4 November this year. The purpose of the workshop was to address the transatlantic issue of global climate change induced soil salinization by aligning policy making and action plans with the knowledge and experience of technical experts. NJPMC Manager, Chris Miller, was invited to contribute to the workshop and present on the work and efforts of the NRCS Plant Materials Program and USDA Climate Hubs to mitigate the problem of soil salinization exacerbated by sea level rise, more frequent coastal flooding events, and other effects of climate change. The workshop provided a unique outreach and networking opportunity to further the awareness and mission of USDA-NRCS and the Plant Materials Program.

The 2022 Soil Salinization Policy Workshop hosted by the Roosevelt Institute for American Studies in Middelburg,

Retired USDA NRCS Plant Materials Program Employees Visit NJPMC

From left to right: Don Hamer, Curtis Sharp, and Chris Miller meet to reminisce and discuss future Plant Materials Program conservation plant release plans.

Don Hamer, Earth Team volunteer and former NJPMC manager, and Curtis Sharp, former Plant Materials Program National Leader, both paid a visit to the NJPMC this summer. Don Hamer served as NJPMC manager from 1985-1994 and returned from retirement to the Plant Materials Program to volunteer as a member of the Earth Team. Curtis Sharp began his career with the PMP at the Big Flats PMC in 1957. He would go on to serve as Manager there and then as Plant Materials Specialist at four locations. His career culminated with his tenure as National Plant Materials Program Leader from 1985-1993. In his retirement, Sharp authored the book "Conservation Plants, A USDA Success Story: History of the Natural Resources Conservation Service Plant Materials Program" (published 2013). The book documents over 75 years of Plant Materials Program history, activities, and products.

"FROM ITS BEGINNING, THE PLANT MATERIALS PROGRAM HAS SOUGHT SUPERIOR PLANTS AND METHODS FOR USING THEM IN THE WAR AGAINST PAST AND EVOLVING, NATURAL RESOURCES DEGRADATION. IT HAS CHANGED OVER THE YEARS, ALWAYS ADJUSTING TO MEET EVOLVING NEEDS."

Curtis Sharp

The two former Plant Materials Program employees, with their wealth of experience and knowledge of the Plant Materials Program, visited to reminisce of their careers and for a purpose: to discuss a strategy for the release of a cold tolerant variety of sea oats (*Uniola paniculata*). The development of a conservation plant release of sea oats was started in 1982 prior to Hamer's management of the NJPMC. The project was abandoned following his retirement until he returned to the program circa 2010 as an Earth Team volunteer with the specific intention of finalizing the release. With Hamer and Sharp's guidance, laboratory genetic analysis tests, and an additional five years of data from field trials examining commercially available varieties and the NJPMC developmental composite germplasm, the release of a sea oats conservation plant intended for use in the Mid-Atlantic region seems imminent.

A robust sea oats plant at a trial planting site on the dunes of Cape May Point, NJ.

Publications, Presentations, and Outreach

- Cape May Plant Materials Center 2021 Annual Progress Report of Activities
- The Importance of Seed Quality for Natural Resource Conservation Practices (Plant Materials Technical Note No. 7)
- Smooth Cordgrass (*Spartina alterniflora*) Plant Guide (revised)
- Shore Little Bluestem (*Schizachyrium littorale*) Plant Guide
- Native Warm-Season Grasses for Mid-Atlantic Producers (web feature article)
- 12th Eastern Native Grasslands Symposium - Advancing the Science of Coastal Ecosystem Restoration (oral presentation and poster)
- NJPMC Field Staff Training
- Roosevelt Institute for American Studies - Soil Salinization Policy Workshop, Middelburg, Netherlands (oral presentation/think tank)
- Restore America's Estuaries 2022 Coastal & Estuarine Summit (oral presentation and round table discussion)

Cape May Plant Materials Center

The Cape May Plant Materials Center (NJPMC) was established in 1965 and is operated by the United States Department of Agriculture, Natural Resources Conservation Service. Approximately 80 acres of land are leased from the State of New Jersey for production and field studies while all infrastructure is situated on 4 acres of federally owned land. The NJPMC was added to the Plant Materials Program network of plant materials centers to address coastal restoration needs and to mitigate the impacts of future coastal storms following Hurricane Donna (1960) and the Ash Wednesday Storm (1962 nor'easter). The NJPMC is ideally located to focus on coastal ecosystem conservation concerns given the location of the center near tidal marshes, coastal dune communities, and extensive wetlands.

Program Emphasis

The mission of the Plant Materials Program (PMP) is to find plant solutions to solve conservation problems through the development of plants and plant technology. The Plant Materials Program uses an integrated approach to transfer developed plant products and plant technology utilizing all NRCS staff levels, other government agencies, academic institutions, and private groups.

The NJPMC provides plant solutions for natural resource conservation concerns pertaining to coastal shorelines, sand dunes, mined lands and critical areas, and coastal grassland habitat serving a nine-state area, including parts of Connecticut, Delaware, Maryland, Massachusetts, Long Island- New York, New Jersey, North Carolina, Rhode Island, and Virginia.

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