The Roles of Soil Conservation Service Plant Materials Centers in Promoting Biodiversity[1]

Wendell G. Hassell[2]

Abstract - The Soil Conservation Service (SCS) Plant Materials Centers (PMC) are expanding the plant development concept to include wider user groups. Through the PMC program, over 220 native species have been developed and are now being produced by the commercial trade. However, there is a shifting emphasis on the use of native species. As a result of increased interest in local native ecotypes, SCS PMC's are developing procedures for ecotype (ecovar) releases. SCS and the National Park Service (NPS) are cooperating in a plant materials program in the development, testing, and establishment of native species for disturbed sites within NPS units. Some of the materials being tested and technology developed will have application to areas outside of park lands. An estimated 330-350 new park indigenous ecotypes have been collected. These native species are now in the testing process or reproduction phase for use by parks and on other disturbed sites.

INTRODUCTION

The SCS operates 27 PMC located across the nation representing most geographic regions. Much of their work is done in cooperation with other agencies or institutions, such as land-grant universities and experiment stations. The centers range in size from about 40 to 300 acres. Each facility employs 2-4 full time researchers and technicians.

.In developing a native variety (ecotype) PMC researchers seldom use plant breeding techniques. Instead, they look at existing ecotypes that can perform a given job and can serve a specific role in conservation plantings. To find the best genetic lines, researchers gather ecotypes of the same species from a wide zone. PMC workers pinpoint the ones that best serve the purpose and are adapted to a wide range of conditions by comparing dozens of ecotypes of a given species.

'Paper presented at the 1992 Western Forest Nursery Conference, Fallen Leaf Lake, California, September 14-18, 1992.

[2]Wendell G. Hassell, National Technical Advisor on assignment from the USDA Soil Conservation Service to the USDI National Park Service, Lakewood, Colorado.

Today PMC priorities deal with a broad array of projects relating to soil and water conservation: waste water treatment, water quality, cropland erosion, and erosion control on highly erodible lands. They also work on a variety of cooperative projects from coastal wetland preservation to water harvesting techniques and preserving native plant diversity. Through the PMC program, over 220 native species are now being produced by the commercial trade and utilized by consumers. Below are examples of the PMC testing program promoting biodiversity.

MAINTAINING BIODIVERSITY IN NORTHERN GREAT PLAINS

Bismarck PMC has targeted large areas for systematic collection of native ecotypes. Seed collections were made of chokecherry, silver buffaloberry, and hawthorn from native populations in the Northern Great Plains. The hawthorn collection also included some introduced species from outside the US. Individual evaluation nurseries have been established for each species. The nurseries include 179 accessions of chokecherry, 134 accessions of silver buffaloberry, and 184 accessions of hawthorn. Evaluation continue for each of the species. Selections of superior accessions are planned in the near future for seed increase and eventual field testing. The objectives are to develop improved cultivars for reclamation planting, windbreak planting, wildlife habitat and other conservation uses.

Chokecherry, *Prunus* virginiana: In 1979, SCS field office personnel were instrumental in locating stands and collecting a total of 179 accessions from North Dakota, South Dakota, and Minnesota. Without this concerted effort and cooperation large scale assemblies would not be possible. In 1983, seedlings grown at the Bismarck PMC were transplanted into test plantations near Bismarck, North Dakota and Pierre South, Dakota. Survival at the North Dakota site was 95 percent in 1985. One hundred fifty (150) of the original 179 accessions were established. Survival totaled 56 percent at the South Dakota planting in 1985. Both tree-like and dense suckering forms were apparent.

Sixteen accessions at the Bismarck plantation had at least one tree showing symptoms of western-X disease in 1987. In 1988 these same trees did not show those symptoms. In 1989 a few chokecherry plants died due to two years of severe drought and/or disease. Plant specimens were collected by James Walla, Plant Pathologist, NDSU, Fargo, North Dakota. These plant samples were diagnosed for the presence of Western-X disease. Western-X was present in those samples which had displayed typical symptoms. In 1991, survival notes were recorded. A combination of drought and disease has reduced the number of surviving trees to 76 percent. Chokecherry selections will be made based on long-term disease resistance and drought tolerance.

Silver buffaloberry, *Shepherdia argentea:* SCS field personnel collected 134 accessions in North Dakota and South Dakota in 1977-79. Four additional accessions were obtained from the Canada Agriculture Research Station, Morden, Manitoba. Seedlings grown at the PMC were transplanted into test plantations near Bismarck and Pierre in the spring 1983. The South Dakota planting was discontinued because of poor survival. Survival at the North Dakota site was 85 percent in 1985. One hundred one accessions remain from the original assembly. In 1988, flower type and branch angle of the lower branches was evaluated. In 1991 these plants continue to be healthy, with no significant differences between accessions.

Weaker appearing plants will be removed (510%) and remaining plants will be left to freely cross pollinate. Seed will be harvested from this plantation in 1993 for field testing.

Hawthorn, Crataegus: Seed of 139 accessions from native stands in North Dakota and South Dakota were collected in 1976-79. An additional 45 collections were obtained from the Canada Agriculture Research Station, Morden, Manitoba. Seedlings were transplanted into test plantations near Bismarck and Pierre in 1983. From the original assembly, 75 native and 31 introduced accessions were established. Survival at the North Dakota site was 98 percent in 1985. Unfortunately, because of poor survival the South Dakota planting was discontinued.

Survival, vigor, animal damage, and disease and insect resistance were recorded in 1988 on 1,432 plants. Several native hawthorn accessions showed superior growth rates. In 1989, for the first time, mature fruit developed on the native hawthorn. Eighteen percent of the native hawthorn set fruit, while 13 percent of the Canadian hawthorn plants set fruit. In 1991, survey notes were recorded. The native hawthorn has performed better, with a survival rate of 95 percent. The Canadian hawthorn currently show 77 percent of the plants surviving. Plant specimens from three of the better native hawthorn accessions were identified as Crataegus chrysocarpa (round leaved hawthorn). Outstanding ecotypes will be selected and increased for field testing in 1993.

Systematic collections have also been assembled at Bismarck for Bluegrama, *Bouteloua gracilis; western* wheatgrass, *Agropyron smithii;* little bluestem, *Schizachyrium scoparium;* and prairie sandreed, *Calamovilfa longifolia.* Of the 1,000-1,600 ecotypes collected, 18-20 similar outstanding ecotypes are often combined to develop an accession for a general region. Similar work has been ongoing at other SCS PMC's.

ALTERNATIVE PMC ECOTYPE RELEASE PROPOSAL

Historically SCS PMC programs have emphasized the release of outstanding selections as a commercial "cultivar". However, there is a shifting emphasis on the use of native species by states, federal agencies and private concerns. This interest in local native ecotypes is directing SCS PMC's to develop procedures for ecotype (ecovar) releases. The purpose would be to identify the source and maintain identity of native plant materials in the commercial trade.

Several states have defined seed classes that could be adapted for identification of ecotypes. This effort would be coordinated with state seed certification agencies. A proposal to use "source identified" and "progeny tested" is being reviewed in SCS.

The following information must be made available from the originator (developer, owner, or his agent) when progeny tested certification is requested. Eligibility requirements for progeny tested seed/plant materials.

A. Name of the variety or ecotype. (The term "ecovar" has been suggested derived from ecotype and cultivar.) It implies selection and increase of an ecotype(s) without genetic manipulation or minimal selection of the germplasm.

B. A statement concerning the original source and the collection, selection procedures used in the development.

C. A detailed description of the morphological, physiological, and other characteristics of the seed/plants.

D. Evidence supporting maintenance of the identity of the source.

E. A statement identifying the projected geographic area of adaptation.

F. A statement of the plans and procedures for maintenance of seed/plant class.

G. Any addition restrictions on the variety (ecovar) specified by the originator, with respect to geographic area of seed/plant production, age of stand, or other factors assuring maintenance of identity and purity.

Establishing the origin of "Source-Identified" seed/vegetative plant materials.

A. It is required that complete verification of the origin shall be given by geographic location-state, county, latitude, longitude, and elevation (to the nearest 100 feet). If known, legal description (section, township, and range) site history, and present property owner shall also be given. Maps shall be provided to the certifying agency on request.

B. In case of seed derived from initial increase fields containing selected seed/plants from a number of geographic areas, the location of the field shall be given and the original geographic sources of its individual components (clones or seedlings) shall be kept on file and furnished on request.

C. In the case of seed derived from planted or otherwise artificially established increase fields, the geographic origin of the plant material must be known.

D. In case of seedlings, the production location and the origin/source data for the seeds shall be given.

E. In case of propagules, the propagation location and the origin/source data for the clones shall be given.

POINTS OF ORIGIN OF NATIVE PLANTS MAP

The use of specialized native plant species frequently is required in revegetation and restoration of disturbed lands. If the indigenous species for a specific area are not available, it may be necessary to use the nearest or best-adapted source where the point of origin is known.

PMCs have been collecting native seeds, testing plants, and developing seed sources and technology for conservation land uses since the 1930s. These native species are generally maintained at plant materials centers or through state seed certification in a manner that will ensure genetic integrity and identification.

Different species have gone through different methods in development. Some species are a direct increase of the particular ecotype; others may have gone through a selection process.

The SCS and NPS are publishing a map showing the "Point of Origin of Native Plants" for some 275 indigenous species developed by the SCS and cooperating agencies. This map and information will be available by December 1992. The map, together with the species list on the reverse side, will help to locate the closest available species of trees, shrubs, grasses, and forbs available for revegetation in parks and other specific sites. Plants are listed by state, with their origins shown on the map. The point of origin identifies a general location where the parent seed was initially collected.

NATIONAL PARK SERVICE - SOIL CONSERVATION SERVICE PLANT MATERIALS PROGRAM

The National Park System of the United States comprises 356 areas covering almost 80 million acres in 49 states, the District of Columbia, America Samoa, Guam, Puerto Rico, Saipan, and the Virgin Islands. These areas are of such national significance as to be afforded protection by various acts of Congress.

Preservation of native plant genetic resources with their natural ecosystem is a high priority in the NPS. The National Parks recognize that historical and cultural landscapes are important and worth protecting. To the extent possible, plantings in park units consist of species that are native to the park or that are historically appropriate for the event commemorated.

Cooperative Program

A cooperative agreement between the NPS and the SCS was developed in 1989. This cooperative Plant Materials Program seeks to draw upon the strengths of the two federal agencies in the development, testing, and establishment of native species on disturbed sites within NPS units.

The NPS park roads program with the Federal Highway Administration is the ideal starting point for the plant material program. Advanced scheduling and funding gives sufficient lead time

to complete plant production schedules. Basic information about the development and growth habits of these plants is often lacking. Specialized vegetation and required techniques are tested and developed.

The plant materials program between the two agencies initial focuses on development of native plants for the revegetation of areas disturbed by road construction. The NPS is allocated funds to construction or repair of approximately 200 miles of road.

Park Projects

Prior to 1989, when SCS and NPS formally signed a memorandum of understanding, four centers were conducting plant materials work with specific parks. In 1990 and 1991 eleven (11) and twelve (12) cooperative agreements respectively were initiated each of the two years. Nine (9) agreements were signed in 1992 making a total of thirty nine (39) projects to date.

Initially the cooperative plant materials projects focused on road related revegetation work. These projects vary in size from 10 to 120 acres. However, the technology and plant materials can be applied to adjacent areas. These agreements include working with a total of about 350 native plant species at PMC's across the U.S. as shown below:

Plant Materials Agreements Established - FY '86-89

PARK	PM Center	DURATION	NO. SPECIES
Yellowstone WY	Bridger MT	FY86-89	22
Glacier MT	Bridger MT	FY87-91	42
Grand Teton WY	Meeker CO	FY88-92	6
Yosemite CA	Lockeford CA	FY88-92	12
Bandelier NM	Los Lunas NM	FY89-90	

Plant Materials Agreements Established - FY '90

PARK	PM Center	DURATION	NO. SPECIES
Great Smoky Mtn. TN	Quicksand, KY	FY90-94	17
Big Bend TX	Knox City TX	FY90-94	8
Bryce Canyon UT	Meeker, CO	FY90-96	9
Chickasaw OK	Knox City, TX	FY90-95	10
Mount Rainier WA	Corvalis, OR	FY90-95	14
Grand Canyon AZ	Los Lunas, NM	FY90-94	15
Natchez Trace MS	Coffeeville MS	FY 90-94	15
Cumberland Gap TN	Beltsville, MD	FY90-95	16
Montezuma Castle AZ	Tucson, AZ	FY90-95	0
Wupatki AZ	Los Lunas, NM	FY90-93	6
Yellowstone WY	Bridger, MT	FY90-93	
Mesa Verde CO	Meeker, CO	FY90-95	17

Eleven new plant materials agreements were established in fiscal year 1991 as shown below:

Plant Materials Agreements Established - FY '91

PARK	PM Center	DURATION	NO. SPECIES
Cumberland Gap TN	Beltsville, MD	FY91-97	16
Mount Rainier WA	Corvalis, OR	FY91-95	9
Assateague MD	Cape May, NJ	FY91-95	16
Canyonlands UT	Los Lunas NM	FY91-94	18
Lake Meredith TX	Knox City TX	FY91-94	6
Glacier MT	Bridger, MT	FY91-SP	0
Gateway NJ	Cape May, NJ	FY91-95	12
Crater Lake OR	Corvalis, OR	FY91-97	23
Great Smoky Mtn. TN	Quicksand, KY	FY91-93	0
Agate Fossil NE	Manhatten, KS	FY91-94	10
Jean Lafitte LA	Baton Rge, LA	FY91-94	14
Grand Tetons WY	Meeker, CO	FY91-95	5

Plant Materials Agreements Established - FY '92

PARK	PM Center	DURATION	NO. SPECIES
Acadia ME	Big Flats NY	FY92-96	14
Big Bend TX	Knox City TX	FY92-97	6
Big Bend TX	Tucson AZ	FY92-94	2
Canyonlands UT	Los Lunas NM	FY92-95	21
Lake Meredith TX	Knox City TX	FY92-95	6
Lava Beds CA	Aberdeen ID	FY92-95	8
Natchez Tra MS	Coffeeville MS	FY92-94	7
Natchez Tra MS	Coffeeville MS	FY92-96	11
Shenandoah VA	Beltsville MD	FY92-97	13

Program Activities

The NPS\SCS Plant Materials program functions can generally be grouped into four main activities:

1. Seeds are collected within the parks to preserve the unique characteristics of the original plant genetic diversity.

2. Seed and plants are grown and reproduced at centers located with approximately the same topography and climatic conditions.

3. New technology (testing and evaluating) is often needed to reproduce and grow these plants. New techniques are also tested to successfully use the native species.

4. And finally quality seed of known genetics along with the needed technology for establishment are returned to the park for use by resource managers.

In most parks, it is dictated by policy that native plant or plants appropriate to the occasion be used for restoration work. If possible, it is desirable to restore the native vegetation that was previously there before disturbance. Where disturbance is severe, restoration may have to begin at a lower successional stage and pioneer species considered.

It is proposed by some that preservation of genetic integrity (genetic resources) is the preservation of not only the full range of genotypes but also the natural proportions of and the natural interactions between genotypes. The interpretation and practical application of this policy can be very difficult.

Method of pollination, seed dispersal and plant longevity effect the common gene pool of a species. In working with parks, general guidelines are suggested for seed collection where specific species information is not available:

1. Collect ecotypes having approximately the same flowering time.

2. Collect where site conditions are similar and ecotypes are not isolated by geographic or vegetative features.

3. Collect ecotypes with less than 600 to 1200 feet elevation range.

SUMMARY

There are several positive spin-offs from this program. One of the intended benefits of the cooperative work with the NPS is sharing propagation technology. The SCS is planning to assemble new technology in a publication "Propagation of Native Plants for Revegetation" in 1993. This publication format will include collecting, cleaning, propagating, storing, and reestablishment information.

Some of the materials being tested and developed will have application to areas outside of park lands as well as technology being refined. An estimated 330-350 new park indigenous ecotypes have been collected. These native species are now in the process of testing or reproduction for use on park roads and other disturbed sites. The Plant Materials program and information generated over the coming years will add to the base information and help develop parent seeds for locally adapted indigenous species. These programs will help provide the needed revegetation technologies and biodiversity to improve restoration of natural ecosystems on disturbed sites.