USDA NRCS

United States Department of Agriculture
Natural Resources Conservation Service
Plant Materials Program

National Plant Materials Manual
Fourth Edition

July 2010






Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

National Plant Materials Manual

Table of Contents

Subpart C – Plant Selection

Subpart D – Exhibits

Subpart D – Exhibits (continued)

Part 541 – Information Management

Subpart A – Plant Materials Reports

Subpart B - Exhibits

Part 542 –Plant Science Reference Section

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

Part 539 - Introduction

Subpart A – General Information

539.0 Mission

The mission of the Natural Resources Conservation Service (NRCS) Plant Materials Program (PMP) is to develop, test, and transfer plant science technology to meet customer and natural resource needs. NRCS PMP activities are consistent with the objectives of the current United States Department of Agriculture (USDA) and NRCS Strategic Plans (Section 539.20), namely to provide timely and effective vegetative solutions for identified resource needs.

539.1 Purpose

A. The purpose of the NRCS PMP is to:

(1) Assemble, test, and release plant materials for conservation use.

(2) Determine techniques for successful use and management of conservation plants.

(3) Facilitate the commercial increase of conservation plants.

(4) Provide for the timely development and transfer of effective applied plant science technology to solve conservation problems.

(5) Promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plans (Sections 539.20 and 539.21).

B. To accomplish this purpose, NRCS maintains and operates a PMP utilizing a network of Plant Materials Centers (PMC) (see Section 539.22) and Plant Materials Specialists to coordinate its on-going conservation operations activities. PMP strategic goals and objectives are described in Section 539.21.

539.2 Policy

The Plant Materials Program:

(1) Works to meet the goals and objectives of the USDA and NRCS Strategic Plans and to comply with the authorities described in Section 539.11.

(2) Works to meet the objectives of other Federal, State, and local programs and initiatives.

(3) Cooperates with other partners, with the major emphasis being to provide timely and effective state-of-the-art plant science technology.

(4) Performs activities and provides services consistent with USDA and NRCS Affirmative Action, Equal Employment Opportunity, and Civil Rights policies.

539.3 Purpose of the Manual

The National Plant Materials Manual (NPMM) establishes policies and procedures for plant materials activities within NRCS. This manual is meant to complement all established USDA and NRCS policies and guidelines.

539.4 Changes to the Manual

A. Periodic review of the NPMM may be undertaken by the National Program Leader (NPL)-Plant Materials with revisions to policy and procedures made as needed.

B. All deviations from policy or procedure found in the NPMM must be reviewed and approved by the NPL in writing prior to implementation. Deviations typically affect only local operations or the local PMC for which the deviation is approved. Approved deviations to policy or procedure will be filed in the appropriate section(s) of the NPMM.

C. Proposed amendments to policy or procedure found in the NPMM must be submitted to the NPL for consideration. Amendments typically pertain to national operations. The NPL will determine the appropriate procedure for review and final disposition of the proposed amendment.

D. The following items should be submitted to the NPL to evaluate requests for deviations or changes to the NPMM.

(1) Date of request.

(2) Requestor's name, address, email address, and phone number.

(3) Is this a deviation or amendment?

(4) Does this request affect local, State, regional, or national level(s)?

(5) Reference the parts and page numbers in the NPMM dealing with the request for deviation or amendment.

(6) Describe proposed changes to the existing text in the NPMM or proposed new text to be added to the NPMM.

(7) Justification for why the deviation or an amendment is needed.

(8) Letter must include areas for concurrence by the appropriate State Conservationist and approval by the NPL. All requests should be forwarded to the NPL through the State Conservationist.

539.5 Supplements to the Manual

A. Supplements may be required to provide additional details to accommodate specific national, regional, State, or local plant materials needs, policies, or regulations. Supplements are not meant to change the policies and procedures found in the NPMM. Supplements must be filed in accordance with the NRCS Directives System. Copies of all supplements to the NPMM will be provided to the NPL.

B. Examples of supplements include Long Range Plans (LRP) for State PM activities, PMC LRP, PMC Business Plan, PMC Workload Analysis, and details of State regulations pertaining to plant release selection, certification, or marketing.

Part 539 - Introduction

Subpart B - Authorities for the Plant Materials Program

539.10 General

The authority to operate a PMP is provided for in Federal law. A brief description of the authorities relevant to the PMP is found in Section 539.11. Full text for each of these authorities can be found on the Internet or requested from the NPL.

539.11 Description of Authorities

Authority for the NRCS PMP is provided by:

(1) Soil Conservation Act of 1935

The Soil Conservation Act of 1935 (Public Law (P.L.) 74-46, 49 Statute 163; 16 USC 590 [a-f]) declares that it is the policy of Congress to provide permanently for the control and prevention of soil erosion and, thereby, preserve natural resources. This act provides for basic authority for the Soil Conservation Service (SCS) (now NRCS) PMP.

(2) Soil and Water Resources Conservation Act of 1977

The Soil and Water Resources Conservation Act of 1977 (P.L.95-192; 16 USC 40) declares that it is the policy of Congress to ensure that USDA possesses information, technical expertise, and a delivery system for providing assistance to land users with respect to conservation and use of soils; plants; woodlands; watershed protection and flood prevention; the conservation, development, utilization, and disposal of water; animal husbandry; fish and wildlife management; recreation; community development; and related resource uses.

(3) Department of Agriculture Reorganization Act of 1994

The Department of Agriculture Reorganization Act of 1994 (7 USC 6962) authorizes the Secretary to establish and maintain within the Department an agency called the Natural Resources Conservation Service. This Act changed SCS to NRCS.

(4) NRCS Policy on the Operation of Plant Materials Centers (2009)

This policy, issued January 9, 2009, is contained in 7 CFR 613 and the Federal Register, Vol. 72 No. 234 (September 3, 2008) and clarifies the role, activity, and function of NRCS PMCs to support NRCS conservation activities. This CFR updates information on NRCS conservation activities and PMCs as described in P.L. 74-46. This CFR is presented in Section 539.23 because of its importance to the PMP.

539.20 NRCS Goals and Objectives

The goals and objectives for NRCS are referenced in the USDA and NRCS Strategic Plans: 2006-2010. The goals and objectives for NRCS are:

(1) Mission Goal 1: High Quality, Productive Soils

Soil Quality Outcome: The quality of intensively used soils is maintained or enhanced to enable sustained production of a healthy and abundant food supply.

Objective: In 2010, farmers will manage 70 percent of cropland under systems that maintain or increase soil condition and soil carbon. Baseline: In 2003, 60 percent of cropland was farmed under systems that maintained or increased soil condition and soil carbon.

(2) Mission Goal 2: Clean and Abundant Water

(i) Water Quality Outcome: Water quality that supports desired uses.

- Objective: Between 2006 and 2010, reduce potential sediment delivery from agricultural operations by 70 million tons. Baseline: In 2003, potential sediment delivery was 970 million tons.
- Objective: Between 2006 and 2010, reduce potential delivery of nitrogen from agricultural operations by 375,000 tons. Baseline: In 2003, potential annual delivery was an estimated 6 million tons.
- Objective: Between 2006 and 2010, reduce potential delivery of phosphorus from agricultural operations by 70,000 tons. Baseline: In 2003, potential annual delivery was an estimated 360,000 tons.

(ii) Water Quantity Outcome: An abundant and reliable water supply for the Nation.

Objective: By 2010, conserve or store an additional 8 million acre-feet of water for more efficient or future use. Baseline: In 2005, an estimated 2.5 million acre-feet of water was conserved.

(3) Mission Goal 3: Healthy Plant and Animal Communities

(i) Grassland Outcome: Productive, diverse, and resilient grassland, range, and forest ecosystems

Objective: Between 2006 and 2010, farmers, ranchers, and non-industrial forest landowners will apply management that will maintain or improve vegetative condition over the long term on 150 million acres of rangeland and forestland that are at risk. Baseline: In 1999, 500 million acres of non-Federal grazing lands and non-industrial forestlands were at risk.

(ii) Wildlife Habitat Outcome: Working lands and waters provide habitat for diverse and healthy wildlife, aquatic species, and plant communities.

Objective: In 2010, an additional 9 million acres of essential habitat will be improved and managed to benefit at-risk and declining species. Baseline: In 2005, NRCS helped improve habitat for declining and at-risk species on 2 million acres.

(iii) Wetland Outcome: Under development

Objective: By 2010, resource managers will create, restore, or enhance 1.5 million acres of wetlands on non-Federal lands. Baseline: In 2003, there were

111 million wetland acres on non-Federal lands within the contiguous United States.

(4) Mission Goal 4: Air Quality

Outcome, Objective, and Baseline TBD

(5) Mission Goal 5: An Adequate Energy Supply

Outcome, Objective, and Baseline TBD

(6) Mission Goal 6: Land Fragmentation

Landscape Outcome: Connected landscapes sustain a viable agricultural sector and natural resource quality.

Objective: By 2010, 70 percent of farms and ranches protected under easements will remain in active agriculture. Baseline: A study is being conducted by the University of Nebraska to ascertain how many farms and ranches enrolled in the Farm and Ranch Lands Protection Program remain in active agriculture.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

539.21 NRCS PMP Goals and Objectives

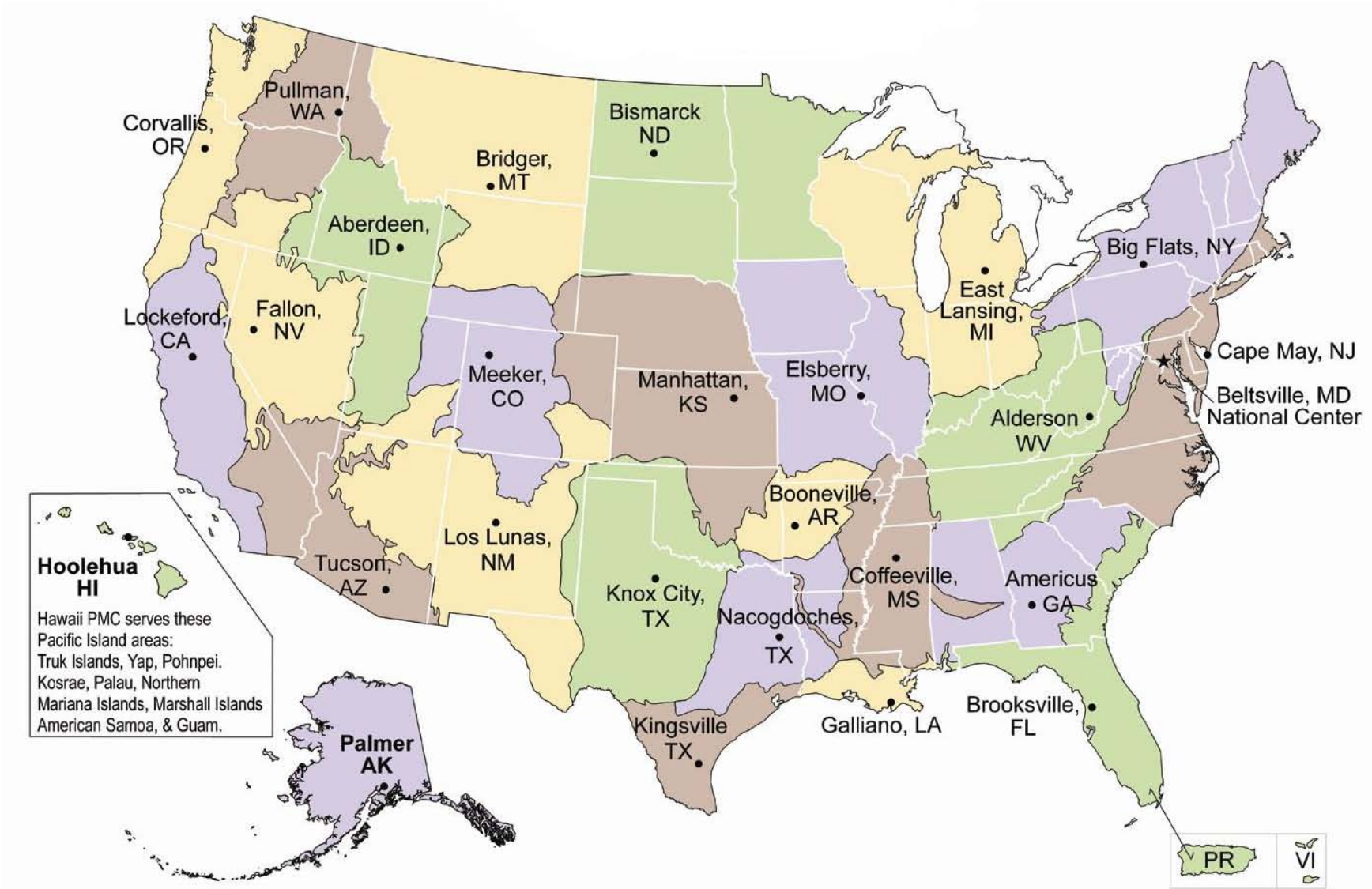
The PMP revised its Strategic Plan to reflect changes outlined in the 2006-2010 NRCS Strategic Plan. The goals and objectives for the PMP are:

(1) Strategic Goal 1 – Identify and evaluate plants and develop technology for their successful establishment and maintenance to solve natural resource conservation problems.
   (i) Objective 1.1: Conserve and enhance soil resources with plant science technology.
   (ii) Objective 1.2: Improve water quality and quantity with plant science technology.
   (iii) Objective 1.3: Enhance fish and wildlife resources with plant science technology.
   (iv) Objective 1.4: Identify and develop plants and plant technology to mitigate air quality issues.

(2) Strategic Goal 2: Provide plant materials and plant technology that are economically feasible for meeting resource concerns.
   (i) Objective 2.1: Provide for and promote the commercial production of NRCS plant releases to ensure that adequate seed and plants are available for use in cooperative conservation programs.
   (ii) Objective 2.2: Maintain and improve the productivity of agricultural lands and watersheds through plants and plant management technology.
   (iii) Objective 2.3: Increase the alternative uses and specialized uses of conservation plant releases to meet emerging needs.

(3) Strategic Goal 3: Provide equal access for all Americans to the PMP.
   (i) Objective 3.1: Deliver products and services fairly and equitably.
   (ii) Objective 3.2: Promote the products of the PMP through effective communications and program delivery.
   (iii) Objective 3.3: Increase the use of plant materials to address issues of human health, safety, culture, and aesthetics.
   (iv) Objective 3.4: Make effective use of Internet-based technology to provide customer-focused service.

539.22 Locations and Service Areas of Plant Materials Centers



whole or part on information provided by NRCS.

PART 613—PLANT MATERIALS CENTERS

Sec.
613.1 Purpose.
613.2 Policy and objectives.
613.3 NRCS responsibilities in plant materials.
613.4 Special production of plant materials.
613.5 PMCs.

AUTHORITY: 16 U.S.C. 590a–590f, 5908; 7 U.S.C. 1010–1011.

SOURCE: 73 FR 51351, Sept. 3, 2008, unless otherwise noted.

§ 613.1 Purpose.

This part provides NRCS policy on the operation of PMCs. The Centers have responsibilities for assembling, testing, releasing, and providing for the commercial production and use of plant materials and plant materials technology for programs of soil, water, and related resource conservation and development.

§ 613.2 Policy and objectives.

(a) It is NRCS policy to assemble, comparatively evaluate, release, and distribute for commercial increase new or improved plant materials and plant materials technology needed for broad programs of resource conservation and development for agriculture, wildlife, urban, recreation, and other land uses and environmental needs. It is the policy of NRCS to conduct plant materials work in cooperation with other agencies of the Department of Agriculture, such as the Agricultural Research Service, and with other Federal and State research agencies, including State agricultural experiment stations. The emphasis of the NRCS plant materials work is to find suitable plants to address conservation needs. In contrast, the emphasis of research agencies and organizations in plant development is to improve economically important crops. The NRCS program of testing and releasing new seed-propagated plant materials follows the guidelines in ''Statement of Responsibilities and Policies Relating to the Development, Release, and Multiplication of Publicly Developed Varieties of Seed-Propagated Crops,'' which was adopted in June 1972, by Land Grant Colleges and interested Federal agencies. NRCS releases improved conservation plant materials requiring vegetative multiplication in ways appropriate for particular States and particular species by working with experiment stations, crop improvement associations, and other State and Federal agencies.

(b) The objective of the plant materials activity is to select or develop special and improved plants and techniques for their successful establishment and maintenance to solve conservation problems and needs related to:

(1) Controlling soil erosion on all lands;

(2) Conserving water;

(3) Protecting upstream watersheds;

(4) Reducing sediment movement into waterways and reservoirs through the stabilization of critical sediment sources, such as surface mined lands, highway slopes, recreation sites, and urban and industrial development areas;

(5) Stabilizing disposal areas for liquid and solid wastes;

(6) Improving plant diversity and lengthening the grazing season on dryland pastures and rangelands;

(7) Managing brush on mountain slopes with fire-retarding plant cover to reduce the possibility of fires that threaten life and property, or result in serious sediment sources;

(8) Improving the effectiveness of windbreaks and shelterbelts for reducing airborne sediment, controlling snow drifting, and preventing crop damage from wind erosion;

(9) Protecting streambank, pond, and lake waterlines from erosion by scouring and wave action;

(10) Improving wildlife food and cover, including threatened and endangered and pollinator species;

(11) Selecting special purpose plants to meet specific needs for environment protection and enhancement;

(12) Selecting plants that tolerate air pollution agents and toxic soil chemicals;

(13) Selecting plants that mitigate odor, Particulate Matter (PM)–10, and PM–2.5;

(14) Testing plants for biofuels and other energy-related activities; and

(15) Evaluating plants and techniques to combat invasive plant species and for reestablishment of desirable species after eradication.

§ 613.3 NRCS responsibilities in plant materials.

NRCS operates or enters into agreements with State universities or other State organizations to operate PMCs. NRCS also cooperates, both formally and informally, with other Federal, State, county, and nonprofit agencies or organizations on the selection of plants and evaluation of plant technology to increase the capabilities of PMCs. NRCS employs specialists for testing and selecting plant materials for conservation uses and the development of plant materials technology. NRCS' responsibilities are to:

(a) Identify the resource conservation needs and cultural management methods for environmental protection and enhancement.

(b) Assemble and comparatively evaluate plant materials at PMCs and on sites where soil, climate, or other conditions differ significantly from those at the Centers.

(c) Make comparative field plantings for final testing of promising plants and techniques in cooperation with conservation districts and other interested cooperators.

(d) Release cooperatively improved conservation plants and maintain the breeder or foundation stocks in ways appropriate for particular State and plant species by working with experiment stations, crop improvement associations, and other State and Federal agencies.

(e) Produce limited amounts of foundation or foundation-quality seed and plants available for allocation to conservation districts, experiment stations, other Federal and State research agencies, State seed certifying organizations and directly to commercial growers (if other options do not exist) that will use the material to establish seed fields, seed orchards, or vegetative plantings for large-scale increase.

(f) Encourage and assist conservation districts, commercial seed producers, and commercial and State nurseries to produce needed plant materials for conservation uses.

(g) Encourage the use of improved plant materials and plant materials technology in resource conservation and environmental improvement programs.

§ 613.4 Special production of plant materials.

NRCS can produce plant materials in the quantity required to do a specific conservation job if this production will serve the public welfare and only if the plant materials are not available commercially. This function will be performed only until the plant materials are available commercially. Specific production of plant materials by NRCS requires the approval of the Chief.

§ 613.5 PMCs.

(a) The Norman A. Berg National PMC. The Norman A. Berg National PMC at Beltsville, Maryland, focuses on national initiatives and provides coordination for plant materials work across all 50 States. In addition, the center provides plants and plant technology to address resource concerns in the mid-Atlantic region.

(b) Other PMCs. There are 26 other PMCs. Each serves several major land resource areas. NRCS operates 24 of these Centers, and 2 by cooperating agencies, as follows:

(1) Operated by NRCS: Tucson, AZ, Booneville, AR, Lockeford, CA, Brooksville, FL, Americus, GA, Molokai, HI, Aberdeen, ID, Manhattan, KS, Galliano, LA, East Lansing, MI, Coffeeville, MS, Elsberry, MO, Bridger, MT, Fallon, NV, Cape May Courthouse, NJ, Los Lunas, NM, Big Flats, NY, Bismarck, ND, Corvallis, OR, Kingsville, TX, Knox City, TX, Nacogdoches, TX, Pullman, WA, and Alderson, WV.

(2) Operated by cooperating agencies with financial and technical assistance from NRCS: Meeker, CO—White River and Douglas Creek Soil Conservation Districts with partial funding from NRCS.

(3) Operated by cooperating agencies with technical assistance from NRCS: Palmer, AK—State of Alaska, Department of Natural Resources.

Part 540 - Operation and Management

Subpart A - Plant Materials Operations

540.0 Roles and Responsibilities

A. The following roles and responsibilities provide support for the Plant Materials Program (PMP). The majority of these roles are currently established and functioning as described. The roles described may or may not be valid depending on the structure which exists at the national, regional, or State level. Titles of positions and committees are generally the most accepted ones or the titles currently in use. Titles may be different but the responsibilities and functions of the position or committee are comparable.

B. Staff Positions - National Responsibilities

(1) Chief, NRCS - The Chief, with line and staff assistance, provides overall strategic planning and national direction for the agency, including plant science activities.

(2) Deputy Chief for Science and Technology - The Deputy Chief for Science and Technology provides overall strategic planning and national direction for national science and technology activities, including plant science activities.

(3) Director, Ecological Sciences Division - The Director of the Ecological Sciences Division provides management and leadership for the Division, including plant science activities.

(4) National Program Leader - Plant Materials - The National Program Leader – Plant Materials (NPL-PM) is a staff member of the Ecological Sciences Division. The NPL provides overall leadership for program integration and coordination of technology development and transfer in the PMP and other programs. Responsibilities include:

(i) Communicating with and providing information to agency administrators, national program leaders, legislative personnel, and other national level partners regarding program accomplishments and program needs;

(ii) Providing leadership and opportunities for discipline training;

(iii) Providing leadership in performance evaluation and accountability within the PMP;

(iv) Recommending budget allocations for Plant Material Centers (PMC);

(v) Communicating national PMP information, priorities, needs, and concerns to appropriate region and State levels;

(vi) Participating in national and regional strategic planning efforts;

(vii) Providing leadership and direction for information coordination; and

(viii) Encouraging, guiding, assessing, and assuring diversity and equity in program operations and delivery.

(5) National Plant Materials Information Coordinator - The Plant Materials (PM) Information Coordinator provides overall coordination for information management to the PMP. Responsibilities include:

(i) Serving as coordinator and facilitator in efforts to provide technology transfer of PM data to field offices;

(ii) Developing and maintaining a data management system for PM;

(iii) Serving as data steward for PM databases;

(iv) Serving as administrator of PM information on the Internet; and

(v) Developing and maintaining an information system for PM.

(6) National Plant Materials Center Manager - The National Plant Materials Center (NPMC) Manager is responsible for operation of the NPMC and its technical programs. Responsibilities include:

(i) Managing and administering the NPMC and the activities of a national scope as directed by the NPL;

(ii) Coordinating PM data management and Web site development and population;

(iii) Coordinating the collection and preservation of all PM publications and national PM information;

(iv) Collecting and preserving information on PM releases;

(v) Assisting with PMP promotional activities;

(vi) Providing release and germplasm processing assistance to the PMP;

(vii) Coordinating the export and import of plants with the Agricultural and Plant Health Inspections Service (APHIS); and

(viii) Those activities defined for the PMC Manager as described in Section 540.0(D)(5).

(7) National Technology Support Center (NTSC) Plant Materials Specialist – The NTSC PM Specialist serves as the lead contact and technical specialist for all PM-related technology nationally or in a region. Responsibilities include:

(i) Providing direct technical assistance and policy guidance to State Conservationists, their staffs, and the NTSC staff;

(ii) Serving as a liaison with the NPL and advising the NPL on key issues within their region;

(iii) Provide a technical review and scoring of new releases before the release gets approved, and a review of significant technical documents before they are finalized;

(iv) Initiating and coordinating PM work and technology transfer across State and regional boundaries; and

(v) Initiating and coordinating joint projects and work with other Federal and State agencies, groups, and organizations.

(8) NTSC Technology Coordinator - The Technology Coordinator (TC) is on the NTCS staff and will facilitate technology development for NRCS nationally and in each region. Responsibilities include:

(i) Being a primary contact person and liaison for NRCS Technical Support Centers, the NPL-PM, other agencies, and partners;

(ii) Serving as liaison with national program managers and technology committees;

(iii) Facilitating inter- and intra-region and national technology development;

(iv) Assisting with the identification of customer needs on State and regional levels, and the coordination of product development and transfer; and

(v) Serving as a member of the Regional Technology Workgroup.

C. Staff Positions - Regional Responsibilities

(1) Regional Conservationist - The Regional Conservationist (RC), assisted by the State Conservationists, provides overall administrative leadership, support, integration, and coordination of plant science activities within and between regions, national program leaders, and national and State partners. Responsibilities include:

(i) Providing leadership in the implementation of a regional organizational structure, which will allow key plant science resource needs and priorities to be met;

(ii) Ensuring PMP integration at State, regional, and national levels; and

(iii) Providing leadership in the evaluation and accountability of all program activities and accomplishments.

D. Staff Positions - State and Local Responsibilities

(1) State Conservationist - The State Conservationist (STC), assisted by the staff, provides overall administrative leadership, support, integration, and coordination of the plant science activities within and between States and with other local, State, and regional partners. Responsibilities include:

(i) Providing leadership in the development and implementation of a State organizational structure which will allow key plant science resource needs and priorities to be met;

(ii) Ensuring PMP integration at local, State, and regional levels;

(iii) Providing leadership in the evaluation and accountability of all program activities and accomplishments, and directing resources and staff as necessary to address priority needs with recommendations from the State program manager and State technical staff;

(iv) Overseeing the administration and operation of the PMC or Centers located in their State;

(v) Ensuring that the PM needs of all States within the PMC service area are met;

(vi) STCs both with and without PMCs will actively coordinate, organize, and participate in annual PMC advisory committee meetings;

(vii) Appointing the State Technology Contact;

(viii) Encourage field offices to be involved with PM activities through germplasm collection, test plantings, and demonstration plantings;

(ix) Delegate to PMC Managers the authority to manage discretionary spending within the PMC budget; and

(x) Provide a PM Specialist position (funded by CO-01 as part of the State resources staff) to support PM technology transfer activities within the PMC service area.

(2) State Resource Conservationist - As directed by the STC, the State Resource Conservationist (SRC), or equivalent position within the State, provides leadership of the State technical support staff. Responsibilities include:

(i) Ensuring coordination, technology development and transfer, support, integration, and coordination of plant science activities with other ecological sciences staff within the State;

(ii) SRCs both with and without PMCs will actively coordinate, organize, and participate in annual PMC technical committee meetings; and

(iii) Include the PM Specialist and PMC Manager in State Ecological Sciences/Resources staff meetings (for States with these positions).

(3) State Technology Contact - The State Technology Contact coordinates technology development within the State. Responsibilities include:

(i) Being the primary contact person and liaison for NTSC, other agencies, and partners;

(ii) Coordinating the identification of customer needs on State and regional levels, and the coordination of product development and transfer; and

(iii) Serving as liaison with the Regional Technology Coordinator and member of the Regional Technology Committee.

(4) Plant Materials Specialist - The PM Specialist is a member of the State technical support staff in each State served. The PM Specialist may also be referred to as a "Plant Resource Specialist" or "Plant Materials Program Specialist." A PM Specialist may serve multiple States and provide support for one to three PMCs. Responsibilities include:

(i) Providing leadership in the coordination of PM activities with the NPL, STC, PMC Advisory Committee, PMC Manager, NTSC PM Specialist, State Technology Contact, NTSCs, State Technology staff, NRCS field offices, conservation districts, and other local, State, and regional offices and partners;

(ii) Providing integration of critical PM information into other technical disciplines (e.g., agronomy, biology, cultural resources, forestry, and grazing) and conservation programs;

(iii) Integrating key PM and plant technologies into the Field Office Technical Guide for conservation planning and application activities;

(iv) Providing leadership in innovative plant technology to the field to meet emerging conservation issues;

(v) Providing leadership in promoting awareness of PM technology and outreach in PM activities to conservation partners, cooperators, and the public;

(vi) Maintaining working partnerships and coordination with agricultural experiment stations, the Agricultural Research Service (ARS), Plant Introduction Centers, Crop Improvement Associations, seed and plant growers and dealers, non-government organizations, etc.;

(vii) Developing the State Long Range Plan (LRP) for PM in States served, and integration of PMP objectives into the State business plan (Section 540.50); and

(viii) Provide coordination and oversight in the development of the PMC LRP and other PMC operational documents.

(5) Plant Materials Center Manager - The PMC Manager is a member of the State technical support staff in each State served. Responsibilities include:

(i) Managing and administration of the PMC including budget, procurement, personnel; management of the PMC facility and equipment; and development and management of reimbursable agreements;

(ii) Providing leadership in completing plant science technology needs assessment and development of the PMC LRP, PMC Business Plan, Workload Analysis, Study Plans, and other operational documents;

(iii) Providing leadership and coordination in the execution of the annual PMC Business Plan, including development of cooperative research projects with other agencies and partners;

(iv) Reporting of activities and accomplishments in appropriate databases and systems;

(v) Developing and transferring technology products for identified customers, such as State technical support staff, NRCS field offices, Tribal partners, other government agencies, land users, and universities;

(vi) Providing direct assistance and training to NRCS field offices, conservation districts, and partners on PM activities;

(vii) Ensuring that NRCS conservation plant germplasm is maintained and available to meet conservation needs; and

(viii) Utilizing the PMC for rapid response to emerging and critical vegetative needs.

(6) Area Conservationist - The Area Conservationist (AC), or equivalent position within the State, is responsible for providing overall administrative leadership, support, integration, and coordination of the plant science activities within and between areas, the State office, and with other local and State partners.

(7) District Conservationist - The District Conservationist (DC), or equivalent position within the State, is responsible for assisting Soil and Water Conservation Districts (SWCD) in carrying out plant science-related programs and activities. Field offices assist with PM activities which may include:

(i) Assessing local resource and conservation problems and needs in conjunction with the SWCD;

(ii) Promoting plant science technology and improved PM;

(iii) Initial seed and plant collecting for improved plant selection; and

(iv) Assisting with installation and evaluation of field plantings, conservation field trials, and demonstration plantings.

(8) Conservation Districts - Regional, State, area, and district conservationists are to keep conservation districts and other identified partners informed and actively involved with ongoing and proposed plant science-related programs, projects, and activities.

(9) Regional Technical Teams - These NRCS entities will provide technical guidance and support at State or regional levels as appropriate according to the developed organizational structure.

E. Committee Responsibilities

(1) National Plant Materials Advisory Committee

(i) The National PM Advisory Committee provides guidance to the National PMP. The principal duties of the National PM Advisory Committee are to:

- Review and provide input for strategic planning within the PMP;

- Discuss and act on issues which may have major impacts on the PMP;
- Identify concerns of national significance from the areas they represent;
- Recommend, review, and/or approve for consideration by the Chief, or other top level NRCS administrators, agreements or initiatives needed by PMP to achieve NRCS objectives; and
- Increase the awareness level and support of the PMP at all levels of NRCS.

(ii) Members of the committee may include:

- STCs appointed by the Deputy Chief for Science and Technology and Regional Conservationists;
- The Deputy Chief for Science and Technology or his/her representative;
- The NPL-PM;
- The National PM Information Coordinator and NTSC PM Specialist;
- Representatives from the National Association of Conservation Districts (NACD) or other national organizations;
- Representatives from other appropriate Federal agencies or NRCS offices as determined by the committee; and
- Representatives from private industry.

(iii) The committee will choose a chairperson or co-chairperson. Meetings will normally be rotated around the country to expose the committee to new resource concerns. Meeting frequency is 2-4 times per year or as determined by the committee.

(2) National Plant Materials Technical Committee

(i) The National PM Technical Committee provides input to the National PM Advisory process. The National PM Technical Committee is composed of representatives from all regions of the country. Responsibilities include:

- Providing overall technical leadership in the identification, integration, and prioritization of plant technology needs on a national scale;
- Identifying concerns and developing recommendations, which are submitted to the National PM Advisory Committee for review and approval; and
- Discussing and acting on issues which may have major impacts on the PMP.

(ii) Members may include:

- The NPL;
- Appropriate PMC Managers and technical staff, PM Specialists, and NTSC PM Specialists;
- Regional Technology Coordinators;
- The National PM Information Coordinator and NPMC Manager;
- Appropriate field and area personnel; and
- Advisors to the committee, which may include appropriate partners.

(iii) Meeting frequency is 1-3 times per year as determined by the NPL.

(3) Regional Plant Materials Advisory Committee

(i) The purpose of the committee is to provide leadership in the coordination, communication, support, and integration of plant science needs and/or developed technology within and between regions, the National PM

Advisory Committee, and other regional and national partners. The committee:

- Provides leadership in the integration of all PMP activities into one process for technology development;
- Reviews, approves, and arranges for the carrying out of projects and activities, and develops a regional LRP for PM; and
- Takes leadership in addressing identified priority resource needs and concerns and ensures the needed action is presented within the Regional Strategic Plan (annual or multi-year plan of work).

(ii) Members may include:

- STCs in the region;
- Regional Conservationist;
- NTSC PM Specialist; and
- Advisors to the committee, who may include the NPL-PM and other members as determined appropriate by the committee to serve as advisors.

(iii) Meetings will normally be chaired by the STC in the host State and rotate among States in the region. Meeting frequency will be annually or as determined by the committee.

(4) State Conservationist's Plant Materials Advisory Committee

(i) The purpose of the committee is to provide leadership in the coordination, communication, support, and integration of applied plant science technology within and between States within the service area, the Regional and National PM Advisory Committees, and other partners. The STC PM Advisory Committee:

- Provides leadership in the integration of all program activities into one process for technology development;
- Ensures that identified priority resource needs and actions are included in the State Strategic Plans;
- Reviews and approves the PMC LRP; and
- Reviews and approves PMC studies and activities to address the needs in the State and PMC LRP.

(ii) Members include:

- STCs in the PMC service area; and
- Advisors to the committee who may include the PM Specialist, PMC staff, NTSC PM Specialist, NPL-PM, and other Federal, State, and private members representing the various interests found within the service area of the PMC. These advisory members may or may not have a vote in the prioritization process.

(iii) Meetings will normally be chaired by the STC in the host State and rotate among States in the PMC service area. Meeting frequency will be annually.

(5) Regional Technology Workgroup

The Regional Technology Workgroup coordinates technical support needs and facilitates the development of technology for the region. Members of this workgroup

include the NTSC Technology Coordinator, State Technology Contacts (one per State), and NTSC representatives as assigned (advisory capacity).

(6) Plant Materials Technical Committee

(i) The PM Technical Committee provides input to the PM Advisory process. The PM Technical Committee may be on a State, multistate, or other regional/local level for a single PMC or multiple PMCs. Responsibilities include:

- Providing overall technical leadership in the identification, integration, and prioritization of plant technology needs;
- Developing recommendations for addressing needs and submitting information to the STC's PM Advisory Committee for review and approval; and
- Promoting the transfer of developed applied science technology.

(ii) Members may include:

- STCs or their representatives, such as the SRC;
- State and multistate technical staff;
- Appropriate PMC Managers and technical staff, PM Specialists, NTSC PM Specialist, and Regional Technology Coordinator;
- State Technical Contact;
- Representatives from Federal and State agencies;
- Appropriate field and area personnel; and
- Advisors to the committee, which may include appropriate partners.

(iii) Meeting frequency will be annually or as determined by the committee. PM Technical Committees typically meet prior to a STC's PM Advisory Committee meeting to discuss PM issues to be brought to the STCs.

(7) State Plant Materials Committee

(i) The State PM Committee is critical for the integration of PM activities into field office operations and the needs of the field office into the PM program. Each State will have a State PM Committee. Responsibilities include:

- Serving as a focal point for the identification and prioritization of key local and State plant issues, concerns, and product needs;
- Developing a State PM LRP which includes prioritized plant issues, concerns, and needs, along with proposed action items;
- Developing an annual State PM plan;
- Ensuring identified local and State plant science needs are presented to the appropriate decision makers; and
- Ensuring that the developed plant technology is disseminated to meet customer needs.

(ii) Members may include:

- The SRC, or equivalent;
- Appropriate NRCS State, area, and/or regional specialists;
- District and area personnel; and
- PM Specialist and PMC personnel, NRCS State technical specialists, and other partners as determined by the committee to serve as advisors. (The PM

Specialist or PMC Manager can chair or facilitate but should not direct the meetings.)

(iii) Meeting frequency will be determined by the committee. It may be necessary for a PM Specialist and/or PMC Manager to work closely with their SRC to initiate or keep the committee functioning.

(8) Standing or Ad Hoc Program Committees

Standing or ad hoc committees provide guidance or assistance to the NPL on specific issues. Standing or ad hoc committees can be formed and dissolved by the NPL, depending on the needs of the program. Examples include: strategic planning committee, PM information committee, Web site information committee, PM manual revision committee, etc.

540.1 Plant Materials Long Range Planning

A. General

(1) LRPs are developed to direct PM activities at the national, regional, State, or local levels. A LRP for PM will be developed and implemented to identify, prioritize, and integrate customer, resource, and program needs. The LRPs will help facilitate the development and transfer of plant technology to address priority concerns. The LRP is analogous to a strategic plan.
(2) National, regional, or State LRP should be of sufficient scope to serve as a basis for the development of the LRP for the servicing PMC(s), and provide direction for PM-related activities at the level (i.e., State, PMC service area, regional) for which the plan was developed.
(3) Regional and State LRPs will be filed as a supplement to the NPMM. Electronic copies will be sent to the NPL-PM and the NPMC.

B. Contents of a PM LRP

An example of a PM LRP is included in Section 540.51. The PM LRP should include the following items:

(i) Introduction

- Purpose (objectives) of the plan.
- Those involved with the development of the plan (listing of partners).
- Process/procedure used to identify customers and prioritize concerns/needs at appropriate level of development (i.e., State, PMC service area, regional, and national). The process or procedure should function within the scope of the organizational structure in place. This may be completed from a local, State(s), regional, and/or national level, as appropriate.

(ii) Description of concerns/needs - This section may include:

- A description of specific prioritized resource and non-resource related problems and needs. Resource problems and needs will be classified by NRCS Goals and Objectives (Section 539.20). Non-resource needs may include promotion of activities, training provided, and outreach efforts to minority and socially disadvantaged groups and other underserved clientele. The need must be specific enough to allow the development of action items by the servicing PMC(s).

- General discussion of current knowledge for each identified need (is current information available to solve the need?).
- Geographic location [include map(s) or Major Land Resource Areas (MLRAs), now Common Resource Areas (CRAs), as appropriate], ecological setting (land use, site description, soils, cause and effect information, etc.), and area of extent (approximate size of problem area in acres) of each identified need.
- Proposed action items identified to help solve the high priority resource and non-resource related needs. This may include information on field plantings and future seed collections needed to meet objectives.

(iii) Supporting Documentation, Attachments, and References

- Attachments may include a listing of State committee members, references used to prepare the LRP, and a summary of needs and actions which will be taken.

C. Development of the LRP

The responsibility for development of the LRP depends on the level at which the plan was developed. The PM Specialist(s) and PMC Manager(s) will take leadership in plan development for the applicable organization level. At the State level, the plant science or technical committee would be responsible. At the PMC service area level, the STC advisory or multistate technical committee would be responsible. At the regional level, the regional advisory committee would be responsible.

D. Review of the LRP

The LRP will be reviewed annually by the appropriate committee and approved by the advisory committee.

540.2 Operation and Administration of the Plant Materials Centers

A. General

(1) A PMC is a field unit operated by NRCS or by another agency or organization in cooperation with NRCS. It consists of the staff, land, buildings, equipment, and other items needed for the development and transfer of new plant science technology.
(2) Service areas of PMCs generally cover parts of States that have common land and climatic characteristics and are strategically located to serve multiple MLRAs, otherwise referred to as eco-regions. The location and service area of each PMC is shown in Section 539.22.

B. PMC Operations

PMC operations will follow established NRCS administrative policies and procedures. Administrative procedures are handled directly with the State office in the State where the PMC is located. Guidance for operations is provided in NRCS policy and guidelines, in the NPMM, in State supplements, and through specific instructions from appropriate administrative personnel.

(i) Administrative Activities

- Equipment and buildings - The PMC Manager is to review and update, as needed, the long range schedule of acquisition, replacement, or repair of equipment and buildings. The plan is reviewed by the STC responsible for

the operation of the Center. A copy of the revised schedule is to be sent to the NPL annually when requested. The schedule is to be used in requesting the allocation of funds to meet priority needs. Inventory of all NRCS owned buildings and structures is maintained in the USDA Corporate Property Automated Information System (CPAIS) database. PMC managers will work with their State office property management specialist to verify the accuracy of CPAIS information.

- Property utilization - Each PMC should show the need and use for all land managed by the PMC. The property utilization survey is a good tool for planning field space and justifying the land being used by the PMC.
- Filing - Correspondence, forms, and reference materials are filed according to the NRCS Directives System. Electronic files should be stored in electronic folders according to the NRCS Directives System and/or appropriate systems to meet the needs of the PMC. Electronic files should be shared over networks as appropriate and kept in common directories if possible. Retention of electronic files follows the same management as paper files. Electronic files should be backed up and/or archived when no longer needed on a daily basis.
- Inventory - Personal property inventories are completed, updated, and filed according to NRCS policy.
- Budget - PMC budgets are developed annually by the PMC Manager and State office in a manner to reflect the commitment of resources to PMC projects. PMC budget requests are initiated by the NPL and the information is required in May or June of each year. Budgets are to be reviewed and approved by the STC. Centers are responsible for fiscal management within the budget limitation and as delegated by the STC. The PMC is to use appropriate software or other methods to assist in budget management.
- Procurement - Procurement matters are to be conducted according to procedures in accordance with the Federal Acquisition Regulations and by guidelines established by the State office which provides administrative support to the PMC. Centers procure supplies to operate the PMC and conduct plant science studies. These supplies are often outside the norm for NRCS, due to the unique functions of PMCs, and can include other PM for standards of comparison, testing, and demonstration.
- Cooperative Agreements – PMCs enter into cooperative agreements, Memoranda of Understanding, and Memoranda of Agreement to augment and enhance PM activities and the PMC budget in their States, in accordance with NRCS administrative procedures. Such agreements may be for the lease of land or buildings to operate a PMC, for reimbursable projects with cooperators, and for agreements where services are rendered or exchanged.

(ii) Personnel

- Classification - Employees at a PMC may include a manager/team leader, assistant manager, technical specialists, field technicians, secretary/clerical, seasonal employees, and volunteers. These positions are typically classified as agronomist (GS-471), biologist (GS-401), range conservationist (GS-454), forester (GS-460), horticulturist (GS-437), natural resource specialist (GS-401), resource conservationist (GS-401), biological science technician (GS-404), secretary (GS-318 or administrative assistant), or soil conservationist (GS-457). Qualification standards are provided in the Qualification

Standards Handbook X-118, which is issued by the Office of Personnel Management. Positions are normally advertised as being interdisciplinary and applicants must meet one or more of the required series. Position Description and Knowledge, Skills, and Abilities evaluation factors for these positions are available from the NRCS State office Human Resources Manager. At a minimum, each Center should have a manager, an assistant manager or technical specialist, two field technicians, and a secretary/office assistant.

- Personnel procedures - Procedures (i.e., performance work plans, training plans, position descriptions, etc.) for PM employees follow guidelines found in NRCS policy documents.
- Employee Development - Employee development plans should be prepared for each employee at the PMC. These plans track employee development and establish training needs. Section 540.52 includes recommended training for positions at the PMC. Equal Employment Opportunity (EEO), Civil Rights, and computer security training are provided to each employee by the State office, in accordance with NRCS requirements.

(iii) Outreach Activities

- PM staff will look for opportunities to provide services and products to customers who are traditionally underserved. This includes working with limited resource and minority farmers, developing partnerships with minority and small-scale seed growers, and making important documents available in multiple languages. NRCS outreach policy can be found in General Manual (GM) Title 230, Part 406.
- The NRCS PMP is committed to assisting federally-recognized Tribes in a Government-to-Government relationship through consultative processes. Section 540.53 provides more details on working with tribes.

(iv) Communications and Marketing

- PM staff will look for opportunities to increase the awareness of the program and its products, such as releases, technical documents, field plantings, and training. The end result of such activities is to be able to provide more assistance and information to a wider range of customers. Staff should work with their State Public Affairs Specialist (PAS) and the PMP PAS on communications activities when needed.

(v) Preparing Reports and Information

- Each PMC will follow the guidelines outlined in Section 541.2 for the reporting of annual accomplishments and activities. Additional reports and information may be requested by the NPL and prepared on a periodic basis as outlined in Section 541.2(E).
- Each PMC will prepare administrative information, such as an annual budget (Section 540.2(B)(i)), planning tools such as the PMC LRP (Section 540.2(C)(1)), the Business Plan (Section 540.2(C)(2)), and the Workload Analysis (Section 540.2(C)(3)) to support the operation of the PMC.
- Many of the reports and planning required by PMCs are prepared on an annual basis on a recurring schedule. Section 540.54 provides a summary and schedule of the reports and information a PMC needs to prepare each year.

(vi) Safety and Health Policy

- The NRCS PMP is conducted in conformity with GM Title 360, Part 420 and all applicable Federal and State public health and pollution control statutes and regulations. PMC Managers need to be knowledgeable about those regulations that affect their operations. Federal statutes and regulations that may influence PMCs are discussed in Section 540.55, which includes a brief description of each. Additional guidelines on PMC safety can be found in the PMC Safety Manual.
- Each PMC must assign a Safety Officer/Coordinator to perform annual safety inspections as required by Federal and State regulations. Section 540.56 provides an outline for safety inspections at PMCs.

(vii) Prescribed Burning at PMCs

NRCS supports and encourages the use of prescribed burning within the context of Conservation Practice Prescribed Burning (Code 338), contained in the National Handbook of Conservation Practices. Prescribed burning is appropriate at PMCs where its application will assist in the development, evaluation, and production of conservation PM. At PMCs, burn plans as a management or study tool will be limited to no more than 10 acres per field. Employees at PMCs with the appropriate level of job approval authority and certification can conduct prescribed burns at PMCs for the development, evaluation, and production of conservation PM. The NRCS Prescribed Burning Policy is found in GM Title 190, Part 413. An example of a burn plan is found in Section 540.58.

(viii) Pest Management Policy for PMCs

PMCs will follow NRCS pest management policy as found in GM Title 190, Part 404. The highlights of this policy as it pertains to PMCs include:

- PMC staffs need to be certified and follow applicable State laws and regulations when applying pesticides at the PMC. Staff can apply pesticides off the PMC as long as it part of a PMC research study or planting which the landowner has agreed to and it is consistent with their certification issued by the State. PMC staff having a "Research and Demonstration" certification can test pesticides outside the label but these results cannot be reported and used for recommendations.
- PMCs can test pesticides and report on the results as long as the tests were within the limitations of the label. They can also report on what pesticides were used in a study or are used in an activity, such as glyphosate, for site preparation, as long as this is within the label.
- The reports generated by PMCs based on testing pesticides are considered as being based on reputable scientific research, provided they are peer-reviewed, and these reports are equivalent to reports from universities, Extension Services, or ARS. It is recommended that PMCs coordinate such studies and reports with others such as universities, Extension Services, or ARS.
- NRCS conservation planners can provide options on pesticide use based on reference materials from universities, Extension Services, ARS, and PMCs during the course of technical assistance to landowners.

C. PMC Planning

(1) PMC Long Range Plan

(i) The purpose of the PMC LRP is to identify, guide, and direct the operation toward solving high-priority resource problems identified throughout their service area. The PMC LRP is analogous to a Strategic Plan.

(ii) The PMC Manager is responsible for the preparation, review, and revision of the PMC LRP. The STC Advisory Committee reviews and approves the plan, and makes sure it is consistent with the needs and priorities identified in the State's PM LRP, NRCS National Objectives (Section 539.20) and/or PMP strategic objectives (Section 539.21). The PMC LRP should be reviewed annually and may require revision as State, regional, and national priorities change.

(iii) The PMC LRP will be filed as a supplement to the NPMM. An electronic copy of the PMC LRP will be sent to the NPL and to the NPMC for archiving.

(iv) An example of a PMC LRP is included in Section 540.51. The PMC LRP should include the following items:

- Introduction
  - Purpose (objectives) of the plan.
  - Those involved with the development of the plan.
  - A description of general significant characteristics of the area served by the PMC such as climates, soils, and land uses. It should not include detailed descriptions of MLRAs or other published data but should refer to the documents containing this information (i.e., State PM LRP).
  - A description of the process or procedure which was used to identify customers and prioritize identified needs.
- Description of concerns/needs - This section may include:
  - A comprehensive list and description of resource and non-resource related PM problems and needs. This list should identify and prioritize those problems and needs which will be addressed by the PMC. Resource problems and needs will be classified by NRCS Goals and Objectives (Section 539.20) and/or PMP strategic objectives (Section 539.21). Non-resource needs may include promotion of activities, training provided, and outreach efforts to socially disadvantaged groups and other underserved clientele.
  - General discussion of knowledge for each identified need, particularly if current information is available to solve the need.
  - Geographic location (include map(s) or MLRAs as appropriate), ecological setting (land use, site description, soils, cause and effect information, etc.), and area extent (approximate size of problem area in acres) of each identified need.
  - Proposed action items identified to help solve the high priority resource and non-resource related needs.
- Supporting documentation, attachments, and references
  - Supporting documentation and references may include maps and the State PM LRP being referenced.

- Attachments may be used to eliminate frequent revision of the entire LRP.
- Other attachments may include activities pertinent to the operation of the PMC such as specific project activities, informational and training activities, and long range schedule for maintaining and updating facilities and equipment.

(2) Business Plans

(i) The Business Plan (also known as a Plan of Operations) is a management tool used to direct the daily operation of the PMC. The Business Plan should be flexible to accommodate changes in operating plans or staffing levels. The Business Plan should be aligned to PMP, State office, and agency objectives and goals as much as possible.

(ii) The PMC Manager, along with assistance from the PMC staff and PM Specialist, is responsible for preparing the Business Plan. The Business Plan is to be prepared by October 1 on a fiscal year basis, unless otherwise approved by the STC Advisory Committee.

(iii) The Business Plan is to be reviewed and approved by the PMC Manager's supervisor. Copies should be sent to each STC Advisory Committee member.

(iv) Business Plans will be filed as a supplement to the NPMM at the PMC. An electronic copy of the PMC Business Plan will be sent to the NPL and to the appropriate NTSC PM Specialist.

(v) Major items used as references for development include the PMC Workload Analysis, the PMC LRP, PMC study plans, and long range schedule for updating and maintaining equipment and facilities. The Business Plan includes:

- All activities at the PMC, regardless of funding source;
- Action items by project and study plans;
- New and established plantings for seed and plant production;
- Planned technology development and transfer activities, including plant releases, written and oral information, and training (providing and receiving);
- Administrative and operational duties;
- Facility and equipment improvements, maintenance, and upgrades;
- Identification of activities which are funded by reimbursable or non-CO-46 funds;
- The staff member(s) responsible for identified action item and activity;
- When the action item or activity will begin and be completed; and
- Anticipated product from scheduled action or activity.

(vi) An example of a Business Plan is found in Section 540.59. Business Plans should be reviewed by the PMC staff each quarter of the year to ensure that scheduled items are being completed. It may be useful for PMCs to update a copy of their performance index (Section 541.2(A)) for the year as a tracking tool of PMC accomplishments. All progress and final reports from PMC studies and activities contained in the Business Plan will be summarized annually and presented in the PMC Annual Technical Report (Section 541.2(D)).

(3) Workload Analysis

(i) The PMC Manager is to develop an annual Workload Analysis for the PMC. The Workload Analysis will be prepared on a fiscal year basis and be completed by October 1 of each year. The Workload Analysis of a PMC operation is a valuable management tool needed to determine staffing requirements to accomplish the PMC LRP and Business Plan. The Workload Analysis can also be used to identify future program staffing needs and act as an aid for budget analysis and planning. The Workload Analysis should include all activities at the PMC and identify those activities which are funded by reimbursable or non-CO-46 funds. Section 540.60 can be used as a guide for constructing a Workload Analysis.

(ii) The Workload Analysis will be filed as a supplement to the NPMM at the PMC. An electronic copy of the PMC Workload Analysis will be sent to the NPL and to the appropriate NTSC PM Specialist.

(4) Conservation Plan

Each PMC is to have a current conservation plan prepared according to the NRCS National Planning Procedures Handbook. The conservation plan should include past, current, and future land use information. NRCS field office personnel are to assist in preparing and implementing the plan. If land or facilities are cooperatively used, the conservation plan is to be jointly prepared by all parties concerned. The conservation plan is to be updated every 10 years or sooner if major changes in PMC land use are made. The PMC Manager is to make maximum use of the conservation plan.

D. Expectations, Evaluation, and Review of a PMC Program

(1) Expectations

All PMCs are expected to follow policies and guidelines presented in the NPMM. Each PMC is expected to maintain a balanced program of technology and release development and transfer over a 3-6 year time frame. The Center should focus on action items in the LRP and items noted in the performance index.

(2) Goals

Goals for PMCs, such as new releases, technical documents, and hours of training, will be requested by and provided to the NPL on an annual basis.

(3) Evaluation of Performance

All PMCs will report progress towards performance goals on at least a quarterly basis as determined by the NPL. This reporting is done through the POMS database (Section 541.1) and through the NRCS Performance Results System (Section 541.3). Evaluation factors for performance goals will include those items noted on the PM performance index (Section 541.11). Specifically, some of the evaluation factors are:

- Technology product development and transfer completed by the PMC, such as written materials and presentations;
- Number of new releases during the fiscal year;
- Maintenance of seed and plants of released materials for distribution to commercial growers;
- Evaluation of PM;
- Number of field evaluation plantings;
- Training provided; and

- Contact and assistance provided to NRCS field offices, partners, and other individuals.

(4) Reviews

(i) Each PMC will undergo a comprehensive program evaluation every 5-7 years.

(ii) The NPL may initiate a Program Review for a PMC and PM Specialist. Other NRCS administrative levels may initiate an Oversight and Evaluation Review, a Leadership Review, an Operations Review, a Civil Rights review, or a Functional Review for a PMC, PM Specialist, or State PM program as specified in GM Title 340, Part 413, Subpart E.

(iii) Guidelines for PM Program Reviews

- Procedures for the review and the composition of the review committee will be determined at the time the review is initiated. The review committee may include the NPL, NTSC PM Specialist, and a member of the National PM Advisory Committee (typically a STC). The STC, SRC, PM Specialist, and PMC staff will be present for some or all of the review. It is the responsibility of the PMC Manager and PM Specialist to select 3 to 4 cooperators or partners to be available for interviews during the review.
- Section 540.61 provides guidelines and criteria for conducting a Program Evaluation or other type of review for a PM program. This guide may be used for reviewing a PMC, PM Specialist, or a State PMP. Other items beyond the guide may be covered in a review. Review follow-up will include a summary of findings, commendations, recommendations, and agreed-to items prepared by the review committee.

540.3 Operation and Administration of the National Plant Materials Center

A. Purpose

The NPMC, located at Beltsville, Maryland, has responsibility for providing specialized support to the National PMP and limited support to the Mid-Atlantic region as a field PMC.

B. Operation

(1) Operating Procedures - The NPMC will follow the same guidelines for operation and administration as those outlined for PMCs in Section 540.2.

(2) Personnel - Staffing procedures generally are the same as those for field PMCs discussed in Section 540.2, with the exception that national specialists may be located at the NPMC as needed by the program.

(3) Supervision - The STC of Maryland is responsible for administrative supervision of the NPMC and for providing technical input for regional activities at the NPMC. The NPL is responsible for providing technical supervision of the NPMC for national activities at the Center, and providing input to the STC of Maryland for the NPMC Manager's annual performance evaluation.

C. National Activities - The NPMC carries out or assists with activities of the National PMP. These activities include:

(1) Providing assistance to the NPL in carrying out activities of national scope as requested;

(2) Working closely with the NRCS Conservation Communications Office and National Headquarters (NHQ), ensure coordination of PMP information into the national delivery system, and providing assistance to the PM Information Program including: preparation of national PM newsletters, preparation and maintenance of national display and presentation items (such as slides and electronic images), and assisting other PMCs with desktop publishing and printing of written technology transfer products;

(3) Soliciting published information from PMCs and PM Specialists, providing long-term storage of paper and electronic documents at the NPMC, and preparing documents for inclusion on the PM Web site;

(4) Coordination of national PM germplasm efforts including: plant exchange outside of NRCS on a national and international basis, assisting PMCs with clearing improved plants for release, coordination with the ARS-National Plant Germplasm System, and coordination with the Plant Protection and Quarantine Office, APHIS, for import and export of plants;

(5) Maintaining the PM releases database and permanent release files to provide current information for reports, and the annual publication, "Improved Plant Materials Released by NRCS and Cooperators;" and

(6) Coordinate development and maintenance of PM databases, development of the PM Web site, assisting with national PM training, and coordination of activities with the NRCS National Plant Data Center.

D. Regional Activities - Provides PM support in the Mid-Atlantic region in areas of high priority. In carrying out regional activities, the NPMC will follow guidelines established for PMCs in Section 540.2.

Part 540 – Operation and Management

Subpart B – Product Development

540.10 General

Projects and studies are the foundation of plant science technology development in the Plant Materials Program (PMP). Projects are intended to address important NRCS conservation issues and are developed using goals identified in the USDA and NRCS Strategic Plan (Section 539.20) and in the PMP Strategic Plan (Section 539.21). Studies are established within projects to meet specific technology objectives and deliver relevant products. Studies, and the technology products from them, are divided into three general types according to how they are conducted. They include Plant Selection Studies (e.g., cultivar and other releases), Field-based Technology Studies (e.g., stand establishment or plant management), and Information-based Technology (e.g., summary of existing knowledge). Technology products should be based on goals identified in national project statements and relevant to NRCS field office needs. The typical process for Product Development is outlined in Section 540.63.

540.11 National Projects

A. General

Projects function to identify topics of work carried out by the PMP. They are national in scope and are used to address NRCS conservation needs. Projects are an umbrella for studies carried out by one or more PMCs. An appropriate project must be identified and associated with each PMC study before the PMC begins work on the study. Not all national projects pertain to each region of the country or the activities of each PMC.

B. Project Statements

Each national project is outlined by a national project statement. The project statement covers a broad topic area which addresses a conservation need. There are typically many studies which relate to each project. Projects help with the coordination of work, thus avoiding duplication of studies among PMCs. The content of a project statement is determined by the nature and magnitude of the problem, extent of prior work, and availability of information about the problem.

C. Development of a Project Statement

Projects and project statements are identified and developed on the national level, with input from the National Program Leader (NPL), PM Information Coordinator, National Technology Support Center (NTSC) PM Specialists, PM Specialists, and Plant Materials Center (PMC) Managers. Projects are broad in scope, and the majority of studies will fall under one or more national projects. If the study does not fall under a national project, then the PMC Manager, PM Specialists, or NTSC PM Specialists will contact the NPL to discuss adding a new national project or modifying an existing project. All national projects and project statements must be approved by the NPL.

D. Contents of a Project Statement

A complete sample project statement is found in Section 540.64. Each project statement will contain:

(1) Project Title - a brief title statement that best describes the project.

(2) Project Code - this will be a standardized identifier for the project. Project codes will be related to PMC study identification codes.

(3) Problem Statement - used to identify land use, resource concern, conservation practices affected, and the relative magnitude (e.g., extent and severity) of the problem. Generally, this will identify how the project will help solve the problem identified in the title and will include anticipated products.

(4) Project Classification - classification of the project based on SWAPA designation (soil, water, air, plants, and animals), conservation practice, etc., and on a lookup table in the Plant Materials Operation and Management System (POMS).

(5) Keywords - important words that may be used in a search of the database.

(6) Approval - all national project statements are approved by NPL.

E. Filing Project Statements

A list of national projects is included in Section 540.65. National project statements are also located in POMS (see Section 541.1) and will be found on the PMP Web site.

540.12 Studies

A. General

Studies are designed to guide the activities of a PMC or PM Specialist. They are prepared to address the needs identified in the State and PMC LRP, or by national initiatives or areas of emphasis. Studies may cover the activities of one or more PMCs or PM Specialists. Coordination required between PMCs and PM Specialist is the responsibility of the staffs involved and the NTSC PM Specialist. Plans will be prepared for all PM studies.

B. Study Plans

The study plan provides the details required to carry out the field, greenhouse, or laboratory work required to address the problem. Study plans will be prepared for field-based technology studies and plant selection Studies. Information-based technology may require development of a study plan. PMC Managers and/or PM Specialists develop study plans. Study plans are to be reported and developed in POMS (see Section 541.1), and may be modified as needed to achieve objectives.

C. Designating Study Plans

(1) Study plans are designated by an identification code used to track the study. The study plan number follows a defined format. This format is as follows: "MTPMC-P-0911" or "WY-F-0902," where:

(i) MT = PMC or State Abbreviation (ET = East Texas, etc.)

(ii) PMC or PMS = Plant Materials Center or Plant Materials Specialist

(iii) P, T or F = Type Code

(iv) 09 = year study was initiated

(v) 11 = Consecutive Number assigned by PMC or PM Specialist.

(2) Specific details and codes for assigning study numbers are found in Section 540.66.

(3) A study may have sub-studies, field plantings, or conservation field trials associated with it. In these cases, related studies may have their own study plan and study

number assigned. When this new study information is entered into the POMS database, the "main" study number will be recorded in the appropriate field to indicate related studies.

D. Development of the Study Plan

(1) The PMC or PM Specialist takes the leadership for developing study plans. Plans may include input from other staff members or disciplines. Study plans are reported in POMS (see Part 541.1). This will allow consolidation of information at the national level.

(2) Study plans will be reviewed by others for technical merit and to ensure the plan meets the need of the resource concern being addressed and a useful product is developed for the field. At a minimum, study plans will be reviewed by the PMC Manager, PM Specialist, appropriate State office technical specialists, the NTSC PM Specialist, or another technical specialist. Additional reviewers might include other PMCs having similar studies, State office specialists, field office staff, Agricultural Research Service (ARS) scientists, or university and Agricultural Experiment Station researchers.

E. Content of the Study Plan

A sample study plan is found in Section 540.67. Study plans have the following elements:

(i) Title - use a title specific to the study.

(ii) Study ID Code - follow guidelines in Section 540.12(C).

(iii) Basic Information - included in this is study leader, relevant project code(s), and study start and end dates.

(iv) Study status - status of study (i.e., on hold, active, inactive, completed.)

(v) Practice/Resources - select the Land Use(s), Vegetative Practice(s), Resource Concern(s), and National Objective(s) being addressed by the study.

(vi) Long Range Plans - identify concern(s) within the State and PMC LRPs that are addressed by this study.

(vii) Study objective - this is a brief text description that specifically identifies the objectives of the study.

(viii) Review of literature on prior research - a thorough review of all previous work, including current and previous activities on a study, is important at the time a study plan is prepared. The literature search is to be completed before the remainder of the study plan is started. Resources that may be used in a literature search are listed in Section 540.68.

(ix) Methods and materials - where, when, and how the work is to be done; featured materials, including standards; plot size and type; treatments to be used; data to be obtained; statistical procedures to be used; personnel who are to do the work; and an estimate of staff-day requirements. It is essential the technical and statistical validity of the methodology for each study be well developed before initiating the study.

(x) Species used - a list of species and cultivars/releases (if applicable) which are used in the study.

(xi) Keywords - important words that may be used in a search.

(xii) Cooperators - list of other PMCs, PM Specialists, State office technical specialists, agencies, or individuals that will be involved with the study.

(xiii) Study design - identifies the type of experimental design and describes the treatments to be evaluated by the study.

(xiv) Final evaluation - identifies Field Plantings (Section 540.14(F) and Conservation Field Trials (Section 540.14(G) which may be necessary to complete the evaluation process.

(xv) Technology transfer products - final products may include one or several formats. Section 540.69 lists types of technology transfer products.

(xvi) Approval - study plans and supplements are to be reviewed by others as indicated in Section 540.12(D)(2) to ensure technical adequacy. Signatures indicating review, concurrence, and acceptance will be included on the study plan prior to beginning a new study. The State Conservationist's PM Advisory Committee reviews the plan for administrative items such as adequacy of resources to carry out the work.

F. Filing Study Plans

Study plans are filed at the originating PMC. Information on studies is also pulled from the POMS database and posted to the PMP Web site to highlight PMC research activities. It is the responsibility of each PMC to update information in POMS as studies are added or completed.

G. Study Summaries

All progress, activities, and conclusions from ongoing and completed Field-based Technology studies, Plant Selection studies, and Information-based Technology will be summarized annually to be filed in the study folder and included in the PMC Annual Technical Report (Section 541.2(D)).

540.13 Technology Development and Transfer

The development and transfer of written and/or oral technology is an integral part of the PMP. Technology development and transfer is accomplished through the use of Field-based Technology or Information-based Technology studies. Field-based Technology studies evaluate plant management techniques used in conservation applications. Information-based Technology involves the consolidation of existing information into a usable format or transferring the results of Field-based Technology studies into a format the field can use. Examples of products that may result from Field-based and Information-based Technology studies are included in Section 540.69.

540.14 Field-based Technology Studies

A. General

Field-based Technology Studies are those activities which involve active studies at a PMC or are conducted by a PM Specialist. Examples of Field-based Technology Studies include the development of planting methods for streambank soil bioengineering, time of seeding studies for late season cover crops, and an evaluation of improved PM for use in windbreaks or air quality control studies. Study plans must be prepared as described in Section 540.12 for all Field-based Technology Studies, and be approved by the State Conservationist's PM Advisory Committee (or equivalent) prior to starting a study. A

basic outline for the process of Technology Development is found in Section 540.63. A Technology Development checklist, which may be used as a guide for Field-based Technology Studies, is found in Section 540.62.

B. Assembly of Materials for Field-based Technology Studies

(1) Materials for Field-based Technology Studies may include plant materials, chemicals, propagation supplies, nursery-type supplies, or other equipment necessary to complete the study objective. Standards for comparison are to be included in studies as appropriate.

(2) Required materials may come from any number of sources, depending on the type. The cost of materials should be considered in preparing the PMC budget. Plant materials may be obtained as described in Section 540.32(A)(2). The Internet may be a useful resource for locating difficult-to-find supplies.

C. Installing Field-based Technology Studies

Field-based Technology Studies will be installed and conducted according to the study plan.

D. Evaluation of Field-based Technology Studies

Evaluation is the process of recording and analyzing plant response to treatments under test conditions. The objective is to determine quantitatively and qualitatively how promising new cultural or management techniques may be better than the standards used. Most study evaluations are completed at the PMC and are called "on-center evaluations." The following should be considered when conducting evaluations:

(i) Performance is to be documented as required for the development of applied plant technologies using statistically acceptable methods and procedures that will ensure confidence in, and reliability of, the results.

(ii) True quantitative data, e.g., days to germination, plant height, weight of biomass produced, will be collected whenever possible. The use of relative rating systems, e.g., 1-9 scale, is discouraged.

(iii) Documentation is to be standardized for ease of recording and interpretation and to meet storage and retrieval requirements of automated data processing throughout the United States.

(iv) The data collected each year will be analyzed using Statistix 8 or a similar statistical package.

E. Off-center Evaluations

(1) Off-center evaluations are plantings and evaluations used by the PMC or sometimes the PM Specialist as part of a study to evaluate plant releases or technology off the Center. Typically they consist of plant selections, cultural or management studies established at locations that represent a land resource area, or a site having soil, climate, and other conditions not represented at the PMC. Although initial testing is sometimes conducted off the PMC, these sites generally are used for advanced testing.

(2) All off-center evaluations are to be coordinated by the PMC responsible for the State where the planting is made. The PMC is responsible for conducting evaluations or arranging for evaluations to be done by the PM Specialist, local field or conservation district office, or other partner.

(3) The State Conservationist is to be assured through a cooperative agreement, memoranda of understanding, or exchange of correspondence with the land owner that there is mutual agreement between land owners, NRCS, and/or the conservation district regarding use of, access to, and tenure of the planting. The level of documentation required may be dependent on other existing agreements or who the land owner is. If appropriate, any such arrangements will include an acknowledgment by the PMC to the landowners that the planting does not pose an environmental risk or threaten the health or well being of wild or domestic animals or ecosystems. The PMC Manager or PM Specialist will also determine if necessary funds, equipment, and manpower are available. Factors such as location, workload, and available facilities are to be considered in determining who is to have primary responsibility for each planting.

F. Field Plantings

(1) Field plantings are conducted as final evaluations in a study. The purpose of field plantings in Field-based Technology Studies is to assess the conservation potential of the new or developing technology under actual use conditions. Field plantings evaluate new plants or new plant technology under a variety of soil, climatic, and land uses. Study objectives will determine the need and location of field plantings. Field plantings generally are the responsibility of the PM Specialist and coordinated with the PMC Manager.

(2) The establishment of field plantings will be addressed in a LRP for field plantings. The purpose of the LRP is to provide an orderly evaluation process of field plantings for each specific conservation use for which the technology has potential application. Study objectives will provide guidance in the development of the LRP for field plantings. The LRP will address field planting numbers, location, establishment and management techniques, timing and duration of evaluations, standards for comparison, evaluation responsibility, and data collection and analysis. The size of the planting should be such that it permits normal use and management.

(3) The LRP will include the preparation of written products to adequately describe and convey new technology. These written products may include Plant Guides, Plant Fact Sheets, Technical Notes, or information brochures for the technology being evaluated in the field plantings. The written information is to include a description of the technology and how it will support appropriate conservation practice standards and specifications, potential uses, potential areas of adaptation, maintenance requirements, and/or detailed instructions on the procedures. See Section 540.16 for more information on preparing these and other types of written products.

(4) Additional field plantings (other than those specified in the LRP) may be requested at the local level by completing a planting plan (Form NRCS-ECS-9, Section 540.70) or other appropriate worksheet and submitting the request through the State Resource Conservationist (SRC) (or equivalent). All additional field planting requests will be considered by the SRC and PM Specialist/PMC Manager based upon the usefulness of the planting and availability of material.

(5) Each field planting will be identified by a study number according to the format described in Sections 540.12(C) and 540.66. All field plantings should use Type Code "F" to designate a field planting.

(6) A register of field plantings will be developed and maintained in the POMS database. Each planting will be classified as active, inactive, or closed. An active field planting

is one that is expected to provide additional trial information and for which periodic evaluations are to be continued. An inactive field planting will not require periodic evaluations. Because of their locations, demonstrational value, or for other reasons, records relating to these plantings will be maintained indefinitely in the study folder. Follow-up evaluations may be made as determined necessary. If a field planting has been destroyed or has no evaluation or demonstrational value, records pertaining to it are to be closed and the trial is considered closed.

(7) Form NRCS-ECS-14 (Section 540.71) may be used by the PMC or PM Specialist to document assistance provided through the field planting process. Form NRCS-ECS-600 (Section 540.72) may be used for documenting conditions at the time of planting.

G. Conservation Field Trials

(1) Conservation Field Trials (CFT) are identified in GM 450-403 as a field study designed to examine the adequacy or adaptability of a conservation practice, system, procedure, or material. It may also be used to introduce promising conservation practices or systems into areas where they are not now accepted as a solution to a local soil, water, or related resource problem or condition. These trials can be useful to transfer technology, update the local Technical Guide, or to demonstrate a need for formal research.

(2) The approach is usually interdisciplinary, involving multiple agencies. The PMP may use CFTs to develop or test new technology, evaluate releases, or promote PM products. These trials may be coordinated by the PM Specialist or by the PMC. They may involve a study or be established based on a local need.

(3) Each CFT will be identified by a study number, according to the format described in Sections 540.12(C) and 540.66. All field plantings, including CFTs, should use Type Code "F" to designate a field planting. Each CFT may be designated by a new and unique number, but may be linked back to a larger study or previous study through the POMS database.

H. Preparing Summaries

The data from every active study will be summarized each year and presented in the PMC Annual Technical Report (see Section 541.2(D)). When a study is completed, the data from all years will be summarized and analyzed. The results and conclusions will be reported in the PMC Annual Technical Report and other forms of written reports, including progress reports and Technical Notes.

I. Selection

(1) Selection is choosing the most desirable technique(s) from the study or the most desirable technique for a particular conservation use. Personnel responsible for conducting the evaluation are to select promising applied plant technologies based on observations and quantitative and qualitative data.

(2) Criteria for selection:

(i) The selected applied plant technology must be practical and economical for the intended conservation use.

(ii) If no standard is available, selection is to be based on the performance of the new technology in relation to the performance of the technologies being tested in the same group.

(iii) Selection criteria are to be documented in the study plan.

(iv) In selecting applied plant technologies for subsequent incorporation into technical guides, consideration is to be given to the practical use of the technology.

(v) Appropriate steps are to be taken during evaluations to determine that the new technology poses no hazards or threat to humans or the environment. See Section 540.33(A)(3) for details on environmental considerations.

540.15 Information-based Technology

A. General

Information-based Technology includes those activities which do not involve an active study at a PMC. The purpose of Information-based Technology development is to address priority technological voids independent of field work at PMCs. Information-based Technology development usually involves the consolidation of existing information into a usable format. A Technology development checklist, which may be used as a guide for Information-based Technology activities, is found in Section 540.62.

B. Sources of Information-based Technology

The type of Information-based Technology developed will depend on the nature of the need being addressed. Sources of information to develop Information-based Technology products may include:

(i) Existing material, either by a new summarization or reprinting existing material that still has application, but is in short supply;

(ii) Revision of older material based on recently developed technology;

(iii) New information/work that has been recently developed or is currently being developed;

(iv) "Personal" experience and knowledge on a specific subject;

(v) Providing training to NRCS and non-NRCS personnel; and/or

(vi) Addressing a new resource or species of concern.

C. Product Development

The product of Information-based Technology development may be written or oral and could take one of many forms. Types of technology products are found in Section 540.69. When developing an Information-based Technology product, an outline may be very beneficial to assist the PMC or PM Specialist. The outline may include:

(i) Title - A proposed title or working title for the activity.

(ii) Basic Information - Activity leader, cooperators, start and end dates, and timeline for development.

(iii) Need - Identify the specific need which is being met by undertaking this activity and the target audience.

(iv) Objective/Description - This is a brief description of the activity and the purpose it will serve.

(v) Literature Search - The current status of knowledge and products available should be assessed through a literature search. Resources for conducting a literature search are described in Section 540.68.

(vi) Materials - Identify what sources the information is to be acquired from.

(vii) Products - Identify the type of technology product (see Section 540.69) which will result from this activity and the intended distribution. Costs (i.e., printing and distribution) should be considered and funds allocated for product delivery.

(viii) Copyright - Copyrighted material needs proper clearances and permission if information or artwork is extracted from copyrighted sources; this should be considered during preparation.

(ix) Review and Approval - Cooperators and peers will review information for technical accuracy. NRCS policy will be followed for approval.

(x) Credit - Attention should be given to ensure that NRCS and the PMP are given credit for involvement with the product development.

(xi) Performance - Ensure products are captured under the appropriate performance goal and management system.

(xii) Report accomplishments in POMS.

540.16 Final Preparation of Field-based and Information-based Technology Products

A. Types of Technology Products

The products of Field-based and Information-based Technology development may be either written or oral, and the product can take one of many forms. Types of technology products are found in Section 540.69.

B. Preparing Technology Products

Product quality is of the utmost importance. The following items should be considered when preparing technology products:

(i) All products developed by the PMP must provide full and appropriate credit, particularly where multiple partners are involved with product development. A full citation for the document, especially for technical documents which might be referenced, should be included towards the end of the document so that it can be cited, and the originating authors and office are identified.

(ii) All written products must include the name of the PMC or PM Specialist office, authors and contact information, and the month and year issued.

(iii) All written products must include the USDA-NRCS logo. Proper Equal Employment Opportunity/Civil Rights statements should be included, according to USDA regulations for printed material.

(iv) Products must be scientifically sound, professionally presented, and must satisfy customer expectations.

(v) “Personal” information is acceptable, provided the source has recognized experience and knowledge on the subject.

(vi) The use of plant names in all PM publications will include both the full Latin binomial or trinomial and the common name the first time a plant is referred to in the abstract and text (see Section 542.2 on plant nomenclature). Plant names will conform to the PLANTS database and synonyms listed as needed.

(vii) When using measurements, the most appropriate measure, either English or metric, should be used. If metric is used, also include the English

measurement if appropriate. For example, plant height might be reported as "meters (feet)," while stem diameter might be reported as 3 mm with no English conversion.

(viii) Copyrighted material needs proper clearances/permission if information is extracted from copyrighted sources.

(ix) The State Public Affairs Specialist (PAS) should be involved in the final development of printed materials, even if the product will be printed through non-USDA sources.

(x) The format used should present material in an attractive way that can achieve a positive perception of the PMP and/or follows predetermined format guidelines. Format will be determined by the nature of the product developed. Technical Notes and Plant Fact Sheets/Plant Guides may have specific guidelines to follow.

- Technical Notes - A Technical Note is a document issued by a State office, regional office, or National Headquarters. A sample Technical Note is found in Section 540.75. Technical Notes are issued, distributed, and filed in accordance with the NRCS directives system, though the format of the Technical Note may vary with the content. Technical Notes are most useful for ensuring that important information is distributed and filed properly by the end user, most typically the NRCS field office. Many States have a set of Technical Notes for each discipline (e.g., PM, Biology, Agronomy, Range, etc.). While each State office may specify the distribution and filing of Technical Notes differently, there is a common method for the preparation and handling of PM Technical Notes. This method is summarized below.
    - Preparation: PM Technical Notes are typically written by a PM Specialist or PMC staff member. There are instances, though, when materials prepared by another author, e.g., cooperator or NRCS Field office staff, warrants issuing as a Technical Note. All written information which directly supports the Field Office Technical Guide (FOTG) or which may be of use to the field, should be considered for issuing as a Technical Note so that its importance to the field is conveyed and filed properly by the Field office. Technical Notes should receive a number (i.e., Technical Note #32) so that they can be referenced in an index or in other materials. All Technical Notes developed by PM staff should clearly identify the office(s) and/or author(s) so that recognition for the Technical Note is given to the PMP. The content of Technical Notes can vary considerably. It is up to the author(s) to determine the most appropriate format for the information they want to distribute. The only item that will be consistent is the cover letter with distribution and filing instructions.
    - Filing: Technical Notes are usually filed in a discipline handbook (e.g., the State Agronomy Handbook), with the FOTG, or in a 3-ring binder containing all State Technical Notes. The Technical Note should be filed by the receiving office according to the instructions in the distribution letter.

- Updating Technical Notes: Occasionally, it may be necessary to update the information found in Technical Notes. The updated Technical Note should retain the number of the old Technical Note. Instructions should be included in the distribution letter to discard the old Technical Note and insert the new one in its place.

- Plant Fact Sheets and Plant Guides - Plant Fact Sheets and Guides are a cooperative effort between the PMP and the National Plant Data Center, with input from other cooperating organizations. Coordination is provided by the NPMC. A sample Plant Fact Sheet is found in Section 540.76 and a sample Plant Guide in Section 540.77. Details on creating these documents can be found on the PM web site or SharePoint site. Plant Fact Sheets are one page (front and back) species overviews, and include color photos, a species description, and information on establishment, management, and improved materials. Plant Fact Sheets are intended for the landowner or layperson and should avoid the use of highly scientific terms or descriptions. Plant Guides contain more detailed information of everything on the Plant Fact Sheet plus information on propagation and production, cultural significance, and detailed descriptions of improved materials. They can be several pages long and must have references throughout the body of the Plant Guide, with a complete reference section at the end of the document. Plant Guides are intended for conservation professionals and are more scientific or technical. For examples of how to properly reference various types of technical documents (articles, books, and other manuscripts) refer to guidelines on the PM web site or SharePoint site. Before creating a new document for a species, be sure to check the PLANTS Web site (http://plants.usda.gov/java/factSheet) and contact the NPMC to see if a document already exists. Where new information can be provided to enhance a current fact sheet or guide, contact the NPMC.

(xi) For larger publications, such as major publications, books, and symposium proceedings, the authors may want to consider applying for a Library of Congress number. The NPMC should be contacted for assistance with this.

C. Review of Technology Products

(1) Development of technical information is an important component of the PMP, and PMC/PM Specialist scientists are encouraged to develop technical documents. To ensure technical documents are sound, high quality, and pertinent to the subject matter, a thorough peer review process will take place before being published.

(2) PMC staff and PM Specialists will follow NRCS policy for manuscript review, which can be found in GM Title 260, Public Information, Part 400, Public Information Policy, National Instruction 260-308.4. State offices follow this policy for manuscript review and clearance of in-service and outside publications, including Technical Notes, Standards and Specifications, professional papers published in scientific journals, symposia, periodicals, fact sheets, plant guides, video and audio scripts, etc. Reviewers of PMP-developed documents may consist of in-State reviewers and outside agency partners who are cooperators and/or familiar with the subject matter and technology.

(3) In addition, the appropriate NTSC PM Specialist will review all major documents. As a PMC/PM Specialist develops a technical document, they will submit the draft document to their NTSC PM Specialist. For more extensive or comprehensive documents, the NTSC PM Specialist may send to additional reviewers and will consolidate all feedback prior to returning comments to the originating PMC or PM Specialist.

(4) A review will be considered successful and complete after all the NTCS PM Specialist comments are adopted or addressed.

(5) Final copies of all major technical documents will be provided to the NTCS PM Specialist for their records, recorded in the POMS database, and an electronic copy sent to the PM Webmaster.

D. Distribution of Final Products

The type of product will determine the method and scope of distribution. The author has the responsibility to ensure that products are properly distributed to the customer in a timely and efficient manner. The author should work closely with their PAS for guidelines on final preparation, printing, and distribution of written products. The NPMC is an alternate source of information on printing and distribution. The cost of printing and distributing written materials should be considered.

E. Preservation and Archiving

An electronic file of all written products will be sent to the PM Webmaster for inclusion on the PMP Web site for filing in the program archives. Paper copies of documents will be forwarded to the NPMC only if an electronic copy is not available or the document was printed in a non-standard format. The NPMC will forward written materials to the National Agricultural Library. In addition, the PMC or PM Specialist should save written and electronic copies of all written products within their paper and electronic file systems.

F. Documentation

The PMC Manager and/or PM Specialist have the responsibility to record new documents on a quarterly basis in the POMS database and in the PRS, as applicable. All Field-based Technology Studies and Information-based Technology developed will be summarized annually in the PMC Annual Technical Report (see Section 541.2(D)).

540.17 Transferring and Marketing Technology Products

Marketing is extremely important in the delivery of products from the PMP. There are a number of ways to market technologies and products, including:

(1) Oral Communication - Oral communication is probably the most widely used method of marketing the PMP and PM products. Training, presentations, tours, and one-on-one contacts should all be looked upon as ways to improve the visibility of the PMP. Oral communication should be technically sound and presented in a professional manner.

(2) Printed Materials - Printed materials provide an in-hand copy of information to the customer. Printed materials are easy to access and share with others. It may be necessary to identify how the printed materials should be filed or used by the recipient. Consideration should be given to distribution of materials both within and outside of NRCS. The cost of printing materials may determine the extent to which

this method is used. Printed materials should clearly identify NRCS, the PMP, and the originating PMC or PM Specialist office.

(3) Electronic Media - Distribution of written products electronically through the Internet or on disk or CD is relatively inexpensive. Electronic media provides customers broader access to PM products. The NPMC should be contacted as needed for guidelines on the preparation of electronic media.

(4) Special Demonstration Plantings - Special plantings are designed to promote the use and/or acceptance of a plant release or developed technology. If special plantings are needed or desired, specific information such as number, location, purpose, amount of plant material needed, etc., should be addressed in the study plan or PMC Business Plan as applicable.

(5) Off-center evaluations - Off-center evaluations are an excellent way to market new technology or improved plants. More information on off-center evaluations is provided in Section 540.14(E).

(6) Conservation Field Trials - The PMP may use CFTs to develop new technology, evaluate releases, or promote PM products. Section 540.14(G) describes CFTs in more detail.

(7) Field Days or Tours – The PMP may use field days or tours to help market new products or increase awareness of the PMP and PMC activities.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

Part 540 – Operation and Management

Subpart C - Plant Selection

540.30 General

The collection, assembly, selection, and release of new plant varieties and/or germplasm are integral parts of the PMP. The selection and release of new plant germplasm is accomplished through the use of plant selection studies. Plant selection studies use observational and/or quantitative evaluations, along with plant breeding methods, to identify and/or select improved materials. In all cases, new conservation plants released by the PMP must have specific purposes and/or traits to address a specific natural resource issue or solve a particular conservation problem. Plant selection activities are based on study plans as described in Section 540.12. The typical process for plant selection is outlined in Section 540.63. A checklist, which may be used as a guide for tracking the progress of plant selection studies, is found in Section 540.78.

540.31 Coordination of Plant Selection and Release

The PMP relies on the cooperation, standards, and regulations of other State and Federal agencies during the development of plant releases.

(1) Agreement of Experiment Station Committee on Organization and Policy (ESCOP)

The ESCOP policy statement for developing and releasing improved plants was revised in November 1988 and reviewed by ARS and NRCS. The policy statement contains responsibilities and guidelines for the development, release, and multiplication of publicly developed germplasm and varieties of seed-propagated crops. A copy of the ESCOP policy statement is provided in Section 540.79. The PMP follows these guidelines in the testing and release of seed-propagated plant materials. NRCS also develops many releases cooperatively with State Agricultural Experiment Stations and other agencies.

(2) Federal Seed Act

Broad guidelines for the production of crops, such as isolation distances, seed testing, purity, and germination requirements are established by the Federal Seed Act and monitored by USDA's Agricultural Marketing Service (AMS). The PMP follows the guidelines of the Federal Seed Act for the species it produces. Note that not all species selected by the PMP are included in the Federal Seed Act. The National Plant Materials Center (NPMC) will retain copies of Federal Seed Act and AMS regulations.

(3) Association of Official Seed Certifying Agencies (AOSCA)

AOSCA develops the basic requirements for certified production of many crops in the United States, Canada, and several other countries. AOSCA also defines the various classes of releases, requirements for each class of release, and labeling requirements. These standards are found in the **Certification Handbook** published by AOSCA and in the Federal Seed Act. The NPMC will retain reference copies of these documents. The PMP follows these guidelines for release types and certification. State certification standards are individually established within these guidelines. Each PMC should maintain manuals of the seed certification standard.

(4) State Seed Certification Agencies

The PMP cooperates with the State Seed Certification Agency, Crop Improvement Association, or other official State agencies in establishing standards for new crops and meeting State and Federal requirements in the production and handling of cultivar and pre-varietal germplasm seed classes with respect to: source of seed stocks, genetic purity, isolation requirements, roguing other crop or weed contaminants, field inspection, seed cleaning, and seed quality, purity, and germination. Though the internal organization of seed certifying agencies may differ from State to State, all regulations must comply with AOSCA and Federal Seed Act genetic requirements and standards.

540.32 Assembly and Accessioning

A. Assembly of Plants for Potential Release

(1) General

Plant materials are assembled from domestic and foreign sources for studies. Preference is given to finding a conservation solution using native plant species, whenever possible, based on the intended use of the release. "Native" for the PMP is a plant species that occurs naturally within North America, including the United States, Mexico, Canada, Puerto Rico, the U.S. Virgin Islands, and the Hawaiian Islands in a particular region, State, ecosystem, and habitat without direct or indirect human actions. Germplasm assemblies are planned to satisfy a specific objective(s) indicated in a study plan.

(2) Sources of Material - The following sources may be utilized when assembling plants for release:

(i) Seed and Plant Collections - Collections should be made from the area encompassed by the identified problems and/or objectives outlined in the study plan. Where the identified problem encompasses more than one PMC service area, PMCs should coordinate plant collection efforts. Plant and seed collections may be coordinated with field offices and cooperators.

- The number of collections will depend on the purpose of the study. Vegetative samples require higher sample numbers than seed collections to capture the diversity of sampling population. With seed, be sure to collect on enough dates to avoid selection against either early or late maturing genotypes. In most cases, collections should be made from 25 or more sites (populations) and from 30-100 different plants at each site. It is important to ensure that a representative sample of the population has been collected and that there is sufficient data to substantiate decisions on the recommended selections. In addition to the sampling size, understanding the breeding system, seed dispersal, successional stage, and isolation requirements are all important when it comes to collections and how they are handled. Determining genetic adaptability, ploidy level, and outbreeding depression all need to be considered before a release is made.
- Appropriate approvals should be obtained as needed when working with non-PM staff. Collection information should be recorded on Form NRCS-ECS-580 (Plant Collection Information, Section

540.80) or Forms NRCS-ECS-580-a or NRCS-ECS-580-c (seed collection envelopes). Electronic copies of NRCS-ECS-580 are available on the PM Web site and seed collection envelopes can be ordered from the NRCS LandCare Web site (http://landcare.sc.egov.usda.gov/).

(ii) National Plant Germplasm System (NPGS) - The NPGS, operated by ARS, is an excellent source of both domestic and foreign collected materials. The NPGS includes collections maintained at ARS Plant Introduction (PI) stations and the ARS National Seed Storage Laboratory (NSSL). Information on plant collections may be accessed through the Germplasm Resources Information Network (GRIN) database via the Internet. Materials in the NPGS may be obtained though the GRIN database and/or by contacting an ARS PI station and/or the NSSL directly. The NPMC will assist PMCs with obtaining these materials if necessary.

(iii) Foreign Sources - Plant materials may be obtained from foreign sources, as necessary, to solve a specific conservation problem. The NPMC will assist with locating sources of plant materials and coordinating the import process. For the NPMC to complete this effectively, PMCs must provide them with ample lead time to bring the assembly together to meet the PMC study plan timetable. This may require 1-2 years, depending on the source of foreign germplasm. In all circumstances, the PMC Manager should discuss foreign germplasm needs with the NPMC Manager to determine the most feasible method of obtaining materials and the timeframe needed to complete the acquisition.

(iv) Other Sources - Other State and Federal agencies frequently supply materials for specific evaluation purposes and as standards for comparison. Commercial seed dealers and nurserymen, privately endowed foundations, or district seed-increase growers are sources of many released varieties and new strains. PMCs should work directly with these sources to obtain these seed or plants. Plant materials may be purchased from commercial sources as needed for standards of comparison, testing, and demonstrations.

(3) Size of Assemblies

An assembly should ideally contain a representative sampling of populations from throughout the range of a native species or the area the release is intended to be used in. An assembly of introduced species should contain as large a number of accessions as is available in this country. There may be instances where additional field collections from foreign sources may be required in order to have an adequate assembly. All released varieties with known adaptation should be included in evaluations for comparison.

B. Assigning Accession Numbers

(1) An accession is plant material (plant, seed, or vegetative part) collected and assigned a number to maintain its identity during evaluation, increase, and storage. NRCS accession numbers are also known as 9-million numbers (i.e., 9012345). Blocks of accession numbers are requested from the NPMC. The 9-million number assigned to an accession is to be used in referring to that accession throughout the evaluation process. Other numbers, such as individual PMC control numbers, are not permitted. Old PMC control numbers which are still being used should be replaced with 9-million numbers.

(2) PMCs will assign NRCS accession numbers to:

(i) New collections from native or foreign sources;

(ii) Unnamed non-varietal materials obtained from commercial sources;

(iii) Accessions which are combined (i.e., composited) during the plant selection process; or

(iv) One or more plants which are selected from an original accession during the plant selection process.

(3) PMCs **shall not** assign NRCS accession numbers to:

(i) Accessions received from another PMC, which already have an NRCS accession number;

(ii) Materials which already have a PI number; or

(iii) Named materials received from commercial sources. These materials will be assigned an accession by the NPMC to avoid assigning two different numbers to the same material. The NPMC should be contacted to obtain accession numbers for these materials.

(4) Use the NRCS accession number (9-million) as the primary number for an accession. The only exception is when the accession was received with a PI number assigned. The 9-million number will be used within the POMS database for tracking purposes. The 9-million number and the PI number, along with any other numbers assigned, will be included on release notices and other documents as appropriate. Accession numbers and accessioning records will be tracked through POMS according to procedures found in Section 541.1 of the NPMM.

540.33 Evaluation and Summary

A. Evaluating Plant Assemblies

(1) General

The purpose of a plant assembly is to observe the characteristics and comparative performance of numerous collections so that promising plant(s) can be selected for release.

(2) Documentation of Performance

(i) Plant performance will be documented as required for the release of the plant using statistically acceptable methods and procedures that will ensure confidence in and reliability of the results. Such techniques may require multiple plantings and plantings that are conducted at off-center locations. Standards for comparison should be included if available. The interdisciplinary approach is important and should be utilized in preparing plans for evaluations. All evaluations will be documented according to the study plan.

(ii) True quantitative data will be collected whenever possible. The use of relative rating systems, e.g. 1-9 scale, is discouraged. Criteria which are often used for plant evaluations include:

- speed of germination;
- rate of growth;
- mature height;

- flowering date;
- flower color;
- seed maturity date;
- seed shatter/dispersal or seed retention;
- drought tolerance;
- insect and disease problems; and
- overwintering survival

(3) Environmental Considerations

(i) The PMP, by means of a categorical exclusion found within the Code of Federal Regulations (CFR), does not routinely need to prepare a formal Environmental Assessment (EA) and/or Environmental Impact Statement (EIS) for new plant releases (7 CFR 650.6). However, under this CFR, an Environmental Evaluation (EE) is necessary to "identify extraordinary circumstances that might lead to significant individual or cumulative impacts. Actions that have potential or significant impacts on the human environment are not categorically excluded." The EE, conducted by the PMP, will be documented in the worksheet found in Section 540.83. The EE process determines if the new release will pose significant adverse effects on the environment. The EE is also the first step in determining if an EA and/or an EIS will be needed according to National Environmental Policy Act (NEPA) regulations.

(ii) All plant releases, whether a native or introduced species, will undergo an EE process supported by appropriate documentation. Native species are preferred for use in NRCS conservation practices and programs whenever possible and should be considered first when evaluating potential solutions to conservation problems. Introduced species may continue to be evaluated by PMCs, provided they do not pose a threat to the environment or agricultural systems, are determined not to be invasive, and there is a significant conservation need which may not be solved using native plants. Use the worksheet in Section 540.83 to conduct and document the EE for PMP releases. Plants will not be released until evidence or conclusions can be provided that a plant will not pose a significant adverse impact to the environment. These impacts include risks related to displacing natural plant communities (i.e., native plants or threatened/endangered plants), negatively altering natural processes in the environment (i.e., frequency of fire), decreasing the value of domestic animal and wildlife habitats, and altering the value of current land use (i.e., such as for agriculture or forestry).

(iii) The PMC will document during initial, advanced, and field planting evaluations whether the plant has characteristics which may pose a significant adverse impact to the environment. The PMC should test the plant under a variety of conditions, especially if there is little known about the species or if the plant is suspected of having undesirable characteristics. A review of the literature, initial and advanced evaluations at the PMC, field planting evaluation data, and herbage toxicity determination (if applicable) should all be used to determine undesirable characteristics which may contribute to a plant having a significant adverse impact on the environment. PMCs should be familiar with the criteria found in Section 540.83 far in advance of completing the worksheet so that they can adequately answer the questions found in it.

(iv) If it is found that the plant, while under evaluation in on-center plantings, off-center plantings, or field plantings, has undesirable characteristics or the potential for significant adverse impacts on the environment, then the PMC should carefully evaluate the proper course of action to take. If it is clear that the plant poses a significant threat, is difficult to control, and has low potential for conservation use, then the plants will be removed from the testing program, destroyed, and the findings recorded in the PMC Annual Technical Report.

(v) Careful consideration should be given to pursuing the release of a plant that has undesirable characteristics but may have potential for meeting an urgent or priority conservation need. Contact the National Program Leader (NPL) and discuss all information available about the plant to determine if the release should be pursued or if the study should be terminated. If environmental impacts are not considered until the final stages of the release and it is determined, based on completion of the EE worksheet (Section 540.83), that it is not clearly OK to make the release, the NPL should be contacted immediately. The NPL will assist the PMC in determining whether to pursue the release or if the release process should be terminated under these circumstances. If the decision is to continue evaluating a plant for release or to continue with releasing a plant which could have significant adverse effects on the environment based on the EE worksheet, then it will be necessary to consult with NRCS experts to determine if an EA and/or EIS are needed. This involves preparing and publishing a formal Notice of Intent, inviting comments from other Federal and State agencies and the public, and preparing an EA and/or EIS. The NPL must be contacted for assistance with these procedures. Note that most NRCS releases will not reach this stage of NEPA compliance. Only those releases that are determined to have potential significant adverse effects on the environment, and have considerable merit for release and conservation, should be considered for having a full EA and/or EIS conducted prior to release.

(vi) If the EE worksheet determines that is it OK to make the release based on no significant adverse effect on the environment, include a summary of findings based on the documentation in the EE in the formal release notice (see Section 540.34(F)). The summary will clearly indicate that the proposed release does not have undesirable characteristics and is not known to have significant adverse impacts on the environment. In addition, the summary must include (if applicable) any known or foreseeable negative impacts the release will have on the environment (no matter how minor), limitations of the release based on the geographic area of intended use (i.e., if the plant is aggressive in a part of the United States outside its area of intended use), and methods for management and control of the release should it become a problem.

(vii) If the primary releasing agency is not a PMC, then NRCS will not participate in the cooperative release until an EE has been performed. Release notices will not be approved by the Ecological Sciences Division if they do not have a summary of environmental considerations in the release notice and an EE worksheet included with the release documentation.

(viii) The EE (Section 540.83), EA, and/or EIS (if required) must be included with the release documentation and a copy sent to the NPMC for archiving.

(4) Determining Regions of Adaptation

(i) Regions of adaptation for potential releases are best determined before the release is made. Determining the region of adaptation for a potential release is more important for cultivars and long-term evaluated (i.e., tested class) pre-varietal releases because of the additional information needed to document performance.

(ii) Regional adaptation plantings are usually conducted at PMCs in the area of intended use. There may be cases where the potential plant release is tested at off-center evaluation sites by other PMCs and PM Specialists within their service areas.

(iii) It is recommended that adaptation and performance of potential selected, tested, and cultivar releases be determined as soon as adequate seed or vegetative stock is available. Source-identified releases are often not used beyond a limited area so the full area of adaptation may not be necessary. Determining area of adaptation and performance allows PMCs and PM Specialists the opportunity to evaluate the new plant release and determine if additional plantings are needed in the service area. It also provides general information to potential growers of the plant in regions beyond the releasing PMC. Incorporating the selection into NRCS specifications and recommendations will be according to NRCS policy regardless of performance at the evaluating PMC. If the plant shows the potential to become invasive or has other undesirable characteristics in certain areas, it should be included in the release notice, release brochure, and other documentation about the adaptation of the release.

(iv) Region of adaptation is determined using Observation Nursery Plantings at other PMCs, Inter-Center Strain Trials, Off-center Evaluations, Field Plantings, or a combination of the four methods. The results of such evaluations may be incorporated into the release notice, planting guides, and other information about the release.

(v) The region of adaptation for NRCS releases is typically not equivalent to the region where the species occurs or is native. The species range distribution/description (i.e., species maps from the PLANTS Database) should not be used in place of the intended area of adaptation or the known area of adaptation unless the plant release has been tested throughout the range of the species.

(5) Observational Plantings

(i) Observational plantings are conducted to determine the potential area of adaptation of an accession(s) selected from initial evaluation or advanced evaluation plantings. These plantings are also recommended for determining the potential area of adaptation and future use of pre-varietal releases beyond the originating PMC service area. Generally, observational plantings consist of non-replicated, single row or plots planted at other PMCs in the region of potential use with a standard of comparison, if one is available. Plants are evaluated for their adaptation and performance over a given number of years (e.g., 3 to 10 years) depending on the type of plant material and objective of the planting. For assistance in conducting observational plantings, contact the NTSC PM Specialist in your region.

(ii) All naturalized or introduced plants selected for potential release will be evaluated in an observational planting at multiple PMCs to determine if the

plant has aggressive or invasive properties under controlled conditions outside of the releasing PMC service area.

(6) Inter-Center Strain Trials

(i) Inter-Center Strain Trials (ICST) are similar to observational plantings in that area of adaptation and performance of accession(s), cultivars, or pre-varietal releases are measured over multiple locations, which generally include PMCs, and years. ICSTs are used to minimize the number of potential plant releases with similar characteristics by identifying ones that are adapted to and perform well over a broad geographical region. Additionally, ICSTs are used to refine and strengthen NRCS technical guide standards by including plant selections that have proven performance.

(ii) Entries are planted in replicated plots using an experimental design to collect performance data on various plant parameters. A standard of comparison is generally included in the ICST, if one of more is available. Plants are evaluated for adaptation and performance over multiple years (e.g., 3 to 10 years) depending on the type of plant material and objective of the planting. Experimental design and data collection criteria will be determined by the originating PMC and PM Specialist in consultation with the NTSC PM Specialist.

(iii) All naturalized or introduced plants selected for potential release will be evaluated in ICSTs at multiple PMCs outside of the releasing PMC service area to determine if the plant has aggressive or invasive properties under managed conditions.

(iv) The PMC Manager and/or PM Specialist should work through the NTSC PM Specialist to contact other PMCs in their area to discuss field space requirements and evaluation data to be collected before the materials are sent to the receiving PMC. Each PMC is responsible for maintaining and evaluating materials received from another PMC. Plots may be maintained on a rotational basis, where new plots may be added as needed and old plots removed after evaluations are completed.

(7) Off-center Evaluations

(i) Typically off-center evaluations consist of replicated plot or row plantings of plant accessions for a potential release. These plantings should be established at locations that represent a land resource area or a site having soil, climate, and other conditions not represented at the PMC. Although initial testing is sometimes conducted off the center, these sites generally are used for advanced evaluations. Plant materials used in initial off-center evaluation sites will be limited to local native ecotypes or be under highly controlled conditions to prevent unwanted spread of the tested materials. Evaluation of potential releases, following a positive rating on a locally-conducted EE worksheet, can be conducted at locations away from the PMC.

(ii) Off-center evaluations generally are the responsibility of the PMC Manager and coordinated with the PM Specialist. See Section 540.14(E) for more information on responsibilities and approvals necessary for conducting off-center evaluations.

(8) Field Plantings

Field plantings may be conducted as the final evaluations in a study. The purpose of field plantings is to assess the conservation potential of new or unproven plant materials under actual use conditions. Field plantings are evaluated in comparison with standard varieties under a variety of soil, climatic, and land uses. Field plantings also provide an opportunity for testing of released plant materials for new uses or in new areas where adaptation is not known. Field plantings are especially important with pre-varietal releases to allow further demonstration of adaptation, determine additional conservation uses not identified prior to release, and will assist field office personnel to become familiar with the release and its potential uses. Study objectives will determine the need and location of field plantings. Field plantings generally are the responsibility of the PM Specialist and are coordinated with PMC Manager(s). Complete details for planning, designing, implementing, and evaluating field plantings are found in Section 540.14(F).

B. Managing and Analyzing Evaluation Data

Managing and analyzing evaluation data are important steps in the development of new releases. The objective is to determine quantitatively and qualitatively how potential releases may be better than the standards used. The following should be considered when conducting evaluations:

(i) Performance is to be documented as required for the development of new releases using statistically acceptable methods and procedures that will ensure confidence in, and reliability of, the results.

(ii) Standardized documentation is necessary for ease of recording and interpretation and to meet storage and retrieval requirements of automated data processing throughout the United States.

(iii) The data collected each year will be analyzed using Statistix 8 or a similar statistical package.

C. Preparing Summaries

The data from every active study will be summarized each year and presented in the PMC Annual Technical Report (see Section 541.2(D)). When a study is completed, the data from all years will be summarized and analyzed. The results and conclusions will be reported in the PMC Annual Technical Report, other forms of technology transfer media, Technical Notes, refereed papers, etc.

D. Making Plant Selections

(1) General

A plant selection is made by choosing the accession(s) from the assembly or the most desirable individual plants in an accession which have the best characteristic(s) for a particular conservation use. Determination of promising plants should be based on observations and quantitative/qualitative data.

(2) Criteria for Selection

(i) The selected accession must be superior to the standard plant in one or more characteristics for the intended conservation use. If no standard is available, the decision should be based on superior performance of the accession in relation to the performance of the other accessions being tested in the same group.

(ii) The desirable plant characteristics for a potential release and the criteria for selection should be documented in the study plan. General criteria which

should be considered in the final selection process include, but are not limited to:

- Methods of propagation
- Mode of pollination (crossing, selfing, apomixis)
- Seed/vegetative production
- Yield potential
- Areas of adaptation or anticipated area of use
- Potential weediness or invasiveness and control methods
- Toxic qualities to animals or humans
- Establishment, management, and care requirements
- Market potential
- Acceptance by land managers.

(iii) Under certain circumstances, it may be beneficial to blend accessions in developing an outstanding cultivar or pre-varietal release. Justification for combining accessions must be well documented before proceeding.

(3) Documentation of Selection

(i) Selection criteria should be documented in the release notice, the release brochure, and entered into the release module of POMS. Reports may include documentation to support moving a release to advanced evaluation or summary information for preparing a release notice. Section 540.84 provides an example of Documentation of a Plant Accession Selected for Advanced Testing. This document will accompany planting instructions of plant materials that are sent to other PMCs for observational plantings (see Section 540.33 (A) (5)). The factors found in this exhibit include information which may indicate the adaptation and performance of a plant accession. The final selection documentation for new plant releases is the release notice (see Section 540.34(G)(1)).

(ii) During the course of evaluation, PMCs will collect data to populate the "Conservation Plant Characteristics" worksheet for inclusion in the PLANTS database. This worksheet includes data specific for a species or release related to morphology, physiology, growth, reproduction, and use. Information is used in NRCS plant information databases.

(4) Disposition of Non-Selected Materials

(i) Materials which are not selected for advanced evaluation or release may still be valuable germplasm. If seed or plants of a vegetative collection from the original collection site is still available and are believed to be viable, then the PMC should make an effort to determine if the material is needed in the ARS NPGS. The PMC should contact the NPMC and follow the guidelines outlined in Section 540.74(J) to submit materials to the NPGS. The PMC should include all evaluation data for that accession with the seed.

(ii) Inclusion of non-selected materials in the NPGS:

- Allows other researchers, including other PMCs, to use the germplasm for other studies;
- Reduces duplication of efforts if future collections are made of the same species in the same location; and
- Provides performance and characteristics information for the accession if evaluation data was submitted to the NPGS.

(iii) Even seed from native collections which have been in storage for long periods of time, or may have questionable viability, may be of use to the ARS National Center for Genetic Resources Preservation for DNA analysis. This seed may be used for DNA analysis for comparing past to current populations. Contact the National Center for Genetic Resources Preservation or the NPMC to find out what information is needed to submit seed samples for this purpose.

540.34 Release Procedures

A. Determining the Type of Release

(1) NRCS recognizes five release types. "Cultivar," "Tested," "Selected," and "Source Identified" releases can be made available to commercial growers following release. "Germplasm" releases are intended for additional research, selection, or development but not for commercial production. A summary of the following text is included in Section 540.85.

(2) Release types are further defined by one of two development methods recognized by NRCS, based on AOSCA guidelines: those which undergo genetic manipulation and those which undergo no genetic manipulation (natural). An entire population, accession, or ecotype may be selected in comparison with other populations under the "natural" development track. When a selection for a specific trait within a population is made, or when distinct populations are bulked, or individuals are crossed, the resulting population is then considered "genetically manipulated." Genetic manipulation can also involve inducement of mutation or biotechnology methods. If there is no genetic manipulation involved in making the release, and protocols have been established to minimize involuntary "non-purposeful" selection, the release may be eligible for a natural designation on the seed tag. All release types are eligible for both the genetic manipulation and natural tracks except for Source Identified releases, which are only eligible for the natural track. Section 540.86 presents the release types and development tracks as found in AOSCA guidelines.

(3) The decision as to which release type should be developed is dependent on conservation need, market demand and availability, source of original plant materials, and plants already available to do the job. Plants released as Selected or Tested releases may undergo continued selection and evaluation and be released later as a cultivar. How a release is typified should be based on criteria in the following descriptions:

B. Types of Releases

(1) Cultivar

(i) The international term "cultivar" denotes an assemblage of cultivated plants that is clearly distinguished by any characters (morphological, physiological, cytological, chemical, or others), is uniform in these characteristics, and retains its distinguishing characters when reproduced (sexually or asexually). The terms "cultivar" and "variety" are often used interchangeably. The term "variety" is accepted by AOSCA, however, this term also refers to a botanical classification (a variety of a species). Because of this confusion, the PMP will use only the term "cultivar" when referring to cultivar releases.

(ii) Cultivars may or may not have purposeful genetic manipulation. Examples of genetic manipulation include any type of crossing within species, wide

hybridization, recurrent selection, or biotechnology gene transfer. Cultivar releases follow the ESCOP policy statement. This release method is expected to be used when there is a high priority need identified over a broad area, a limited number of commercially adapted materials available for that area, and suitable performance testing has been conducted. Range of adaptation, conservation value, and usefulness can be shown over the expected broad geographic and ecological area. There should also be a projected demand for the cultivar.

(iii) Cultivar releases use original site data, species literature searches, multiple testing sites, replications, and data collected over a period of several years (typically 7-11+ years depending on the species or type of plant) that statistically validates superior traits. Testing includes initial, advanced, and final evaluations plantings. Field plantings are used to validate performance, superior traits, area of adaptation, and conservation values.

(iv) Classes of seed for cultivar releases are defined by AOSCA; each generation through which a cultivar is multiplied is indicated by a class name, i.e., breeder, foundation, registered, and certified. The number of generations through which a cultivar can be increased is limited to a maximum of four by agreement between NRCS and the certifying agency. Number of generations allowed varies by species and is designed to minimize inadvertent "non-purposeful" selection; for some species this may mean generations are limited to fewer than four. The length of time a production field may be maintained for any one of the generations also varies by species, and the certifying agency should be consulted if it is unclear how long a field may remain in production.

(2) Tested

(i) Tested releases are the progeny of plants whose parentage has been tested and has proven genetic superiority or possesses distinctive traits for which the heritability is stable, as defined by the certifying agency. The seed or plants must be produced so as to assure genetic purity and identity. Such production could occur in either rigidly controlled, isolated natural stands or individual plants, or in seed/plant production fields or orchards.

(ii) Purposeful genetic manipulation may or may not be conducted; if no purposeful manipulation is conducted, the plant material may be eligible for a "natural" designation on a certification label. Plantings and evaluations have been conducted that support, address, and validate performance for identified needs. This release method is expected to be used when there is a high priority identified need, there are a low number of commercially adapted materials available for this need, and performance testing is needed.

(iii) Tested releases use original site data, species literature searches, and multiple testing sites, replications, and data collected over a several year (typically 3-6 years) period that statistically validates superior traits. Traits of interest must be shown to be heritable in succeeding generations. Some data must be replicated. Standards are used for comparisons. Initial and advanced evaluation plantings are normal. Field plantings can be a part of testing. Tested releases differ from cultivars in that the complete area of adaptation for tested releases may not be known. Cultivars are intensively evaluated for a longer period of time over a wider selection of sites and their range of adaptation has been fully documented.

(iv) The same generation class names accepted by AOSCA for cultivars cannot be used for pre-varietal releases. Instead, AOSCA defines each generation through which a pre-varietal release is multiplied by a generation number (i.e., G0, G1, G2, etc.) for generation zero, generation one, generation two, etc. Generation numbers are similar to the seed class generations defined for cultivars: G0 is equivalent to breeder, G1 is equivalent to foundation, G2 is equivalent to registered, and G3 is equivalent to certified. Generations for tested releases are limited to a maximum of four by agreement between NRCS and certifying agency. Length of stand in a production cycle for any one of the generations varies by species.

(3) Selected

(i) Selected releases are phenotypically selected plants of untested parentage that have promise but no proof of genetic superiority or distinctive traits. The propagating material of this release class should be produced with methods that ensure genetic purity and identity from either natural stands or seed production areas or seed/plant production fields or orchards.

(ii) Genetic manipulation may or may not be conducted on the selected material; if no purposeful manipulation is conducted, the plant material may be eligible for a "natural" designation on a certification label. The selected release type can involve establishment of crossing blocks and selection of materials from the progeny of a crossing block. This release method is expected to be used when an identified high priority need exists; there is a lack of or low availability of commercial, adapted materials for this identified need; and/or the commercially available sources are not adapted and have no performance documentation to meet the identified need.

(iii) Selected releases use original site data, species literature search, and initial evaluation plantings to support releases. **Data may or may not be replicated.** Comparisons are made to other accessions or cultivars for 1-2 years and shows the selected material is better than others in some way that will meet client needs. Limited advanced evaluation planting data can be used to further support the release. Initial evaluation plantings normally would be completed on a typical site representative of the conservation need.

(iv) Generations are limited to a maximum of four by agreement of NRCS and the certifying agency (see information under tested releases).

(4) Source Identified

(i) Source identified releases within the PMP should usually be used only under special circumstances, for example, where use of local ecotypes are necessary. Selected or tested categories of pre-varietal releases are normally more appropriate release types and preferred for NRCS releases.

(ii) Source identified releases are seed, seedlings, or other propagating materials collected from natural stands, seed production areas, seed fields, or orchards where no selection or testing of the parent population has been made. No planned genetic manipulation is conducted, that is, all source identified releases are defined as "natural" track germplasm. The source identified release should be regarded as comparable to an ecotype. Protocols should be established to minimize involuntary non-purposeful selection in initial assembly or production blocks. Any deliberate selection made from assemblies would make the release ineligible for the "natural" designation.

(iii) The original collection site will be known, and any off-site production will be designated on the tag. This release method is expected to be used only when:

- There is a high priority and urgent need for identified plant materials;
- There is a lack of commercially available and adapted materials for this identified need;
- There is high potential for immediate use in the identified need area; and
- A local population source exists.

(iv) Details of original population or individuals, soil-site characteristics, climate, and other physiographic data must be documented. Source identified releases use original site data and species literature review for basic documentation. Every seed harvest made from a natural stand is designated G0 and unlimited generations are allowed by AOSCA.

(v) Source identified releases can be initiated by anyone. In many cases, NRCS may not be involved beyond providing technical assistance. Public agencies, private individuals, and companies may decide to secure locally adapted ecotypes for restoring indigenous plant communities on disturbed sites. On request, NRCS can provide technical assistance relative to species selection, seed phenology, collection, conditioning, storage, asexual and sexual propagation, site preparation, and seeding techniques. Interested parties will be advised of the pre-varietal release process and referred to the State seed/plant certification agency. Clients will be encouraged to utilize the State certification agencies to verify origin and ensure genetic integrity of harvested seed or plants. NRCS will not be party to source identified releases initiated by private and other public agencies where the State or PMC long range plan does not show the activity as a high priority need.

(5) Germplasm

(i) A germplasm release refers to basic genetic plant material possessing one or more potentially desirable characteristics that may be of value in plant breeding, the release of which is in the best interests of USDA and a State or Federal agency research program. A germplasm release consists of basic genetic materials and should generally be provided to all plant breeders who request it, but it should not be moved into commercial use without further evaluation and development.

(ii) Most germplasm releases by NRCS will involve materials that have undergone preliminary genetic manipulation. Most often a germplasm release will result from a reduced priority for the need that initiated the evaluation, or is plant material that is considered valuable but does not meet an NRCS priority, or has some limitation that NRCS does not wish to overcome.

(iii) Documentation will include original site data, species literature search, and initial and advanced evaluation data replicated at multiple sites over a several year (typically 6+) period. There will be enough data to support the materials as having potential for additional research.

C. Plant Identification

(1) All plants demonstrating potential for advanced evaluations and release are to be positively identified as to genus, species, and subspecies or variety, as appropriate. Potential releases which cannot be identified to a species or may contain a mix of more than one species or hybrids cannot be released.

(2) If positive identification cannot be made by PMC staff, a pressed plant specimen should be submitted to an appropriate college, university, or other authority. Plant specimens should be prepared in the manner described in Section 542.3. After positive identification is made, the PMC originally submitting the specimen will ensure that all records and documentation on the material are correct. In addition, any PMCs or other offices which have received this material should be notified of the name change.

(3) Each request submitted to a college, university, or other authority for identification should contain the following:

(i) A voucher plant specimen properly labeled, along with additional information that would help the taxonomist to work through the keys and make the identification and a specimen label. The voucher plant specimen should be prepared following the guidelines in Section 542.4.

(ii) Detailed documentation and evaluation data to help identify the plant, such as plant height, leaf characteristics, flowering and seed maturity dates, and flower color.

(iii) Where and when the specimen was collected (geographic location, soil type, associated vegetation, etc.).

(iv) One seed packet containing approximately 100-200 seeds. The seed packet should be attached to the voucher specimen.

(v) Anticipated genus and/or species name of the sample.

(vi) NRCS Accession Number or PI Number, if assigned.

D. Naming Plant Releases

(1) General

(i) All types of plant materials releases are named at the time of release, and appropriate publicity and credit are given to cooperators and the originating source of the materials. The selected names should be acceptable to the agencies and organizations cooperating in the release. Release names are used to identify improved materials which are being released to the public and in commerce.

(ii) Distinction should be made between cultivar names and pre-varietal release names so that pre-varietal releases are not later confused as a cultivar name in commerce. Names of all classes of release are to be selected according to guidelines provided in the International Code of Nomenclature for Cultivated Plants (see Section 542.2), the provisions of the ESCOP Policy Statement (Section 540.79), and current AOSCA guidelines. Release names for all types of releases are limited to a maximum of 10 syllables and 30 characters, including spaces.

(2) Selecting and Using Cultivar Release Names

(i) Selection of cultivar names is at the discretion of the releasing agency, providing the cultivar name follows the formulation rules of the International Code of Nomenclature for Cultivated Plants. Often, the collection location

or a term which describes the attributes of the release is used as the cultivar name.

(ii) The following rules will be used when formulating cultivar names according to the International Code of Nomenclature for Cultivated Plants:

- Cultivar names must be a word or words in the modern English language. Latin words, or words which may be considered Latin, may not be used unless they are the classical name of an ancient Roman person or place.
- Cultivar names may not be repeated within a genus, species, or denomination class. A denomination class is a grouping of similar genera. For example, the same cultivar name may not be applied to a species of both *Festuca* and *Lolium*. (Note: the NPMC has lists of denomination classes which are checked when clearing names for new cultivar releases.)
- Cultivar names must consist of no more than 10 syllables and no more than 30 letters or characters, excluding spaces and demarcation marks. [Note: the PMP limits the length to 30 characters, including spaces because of database restrictions.]
- Cultivar names may not consist solely of common descriptive words (i.e., 'Large' or 'Variegated') in a modern language unless the descriptive word is used with a non-descriptive word (e.g., 'Velvet Cream'), or unless the word is a recognized name of a color (i.e., 'Indigo' or 'Majestic Red').
- Cultivar names may not contain the following words: variety, var., cross hybrid, grex, group, maintenance, mutant, seedling, selection, sport, strain, improved, and transformed.
- Cultivar names may not contain punctuation marks except for the apostrophe ('), the comma (,), a single exclamation mark (!), the hyphen (-), and the period (.).
- When used with the common name, the release name should be written as 'Cave-In-Rock' switchgrass. When used with the scientific name, the release name would be written as *Panicum virgatum* 'Cave-In-Rock'. Single quotes are used around the cultivar name.

(3) Selecting and Using Pre-Varietal Release Names

(i) The naming guideline accepted by AOSCA in January 1998 specifies a 2-part name to be used for all pre-varietal releases (i.e., source-identified, selected, and tested releases).

(ii) When naming a pre-varietal release, the first part of the name or **descriptor term**, can be any combination of words, letters, or numbers the releasing PMC feels is appropriate. The second part of the name is the **fixed term** "Germplasm," which denotes that the material is **not** a cultivar. The two terms used together are written as Beltsville Germplasm (for example). The first letter of each word is capitalized. Quotes are **not** used around the pre-release name as they are with cultivars.

(iii) When used with the common name, the release name should be written as Beltsville Germplasm little bluestem. When used with the scientific name, the release name should be written as *Schizachyrium scoparium* Beltsville Germplasm. On release notices and other information, the release can be

described as Beltsville Germplasm, Beltsville Germplasm little bluestem, or *Schizachyrium scoparium* Beltsville Germplasm.

(4) Selecting and Using Germplasm Release Names

As with other pre-varietal material, germplasm type releases are given a 2-part name similar to the AOSCA guidelines, the second part of which is the fixed term "Germplasm" to denote that the material is not a cultivar. It is standard practice, however, to use a designation in the first part of the name to indicate that the release differs from other pre-varietal release types. Germplasm material is generally given a designation based on its genetic make-up, any features useful for further exploitation, or accession identifier. For example, a germplasm release of little bluestem with four chromosome sets and collected in North Dakota might be named *Schizachyrium scoparium* ND4X Germplasm or ND4X Germplasm little bluestem. A meaningful sequence of letters and/or numbers should be selected by the releasing PMC with the understanding that the germplasm release may be used for future development by other researchers.

(5) Name Clearance

(i) The name of all releases, regardless of release type, must be cleared through the NPMC. The following information should be included when submitting a request for name clearance to the NPMC:

- Requesting PMC/ PM Specialist name and contact;
- Plant scientific name and plant common name;
- PLANTS plant symbol (required);
- NRCS Accession Number and/or assigned PI Number (required);
- Type of Plant (grass, grass-like, legume, forb, or woody);
- Anticipated class of release (cultivar, tested, selected, source identified, or germplasm);
- List up to 3 proposed release names in order of preference;
- Anticipated release date (month/year); and
- Attach Advanced Evaluation Documentation for the release.

(ii) The NPMC will check to make sure that cultivar names are formulated according to the rules of the *International Code of Nomenclature for Cultivated Plants*, and that pre-varietal release names are formulated according to current ESCOP and AOSCA guidelines. The NPMC will check for potential name conflicts with ARS-NPGS-GRIN, the USDA Plant Variety Protection Office, the U.S. Plant Patent Office-Trademarks Division, and the appropriate registrar or office for the genus in question. The extent to which the NPMC checks for conflicting names depends on the type of plant, the genus or species, and type of release being made. Once name clearance has been confirmed for the selected name(s), a letter will be sent from the NPMC to the releasing PMC indicating that the name has been cleared for use. If the requesting PMC has submitted several options for the release name, names should be ranked in priority order. The NPMC will confirm the first available highest ranking name as the new release name in the letter sent back to the requesting PMC.

(6) Name Registration and Publication of the Plant Release Notice

(i) Registration or publication of the plant release notice is required for all release types. Registering release names and publication of the plant release notice with the proper office, registrar, or publication gains recognition for

the release and discourages others from using the same release name for a different accession of the same species. All applicable plant release notices of native species, regardless of plant type, will be submitted to the *Native Plants Journal (NPJ)* for publication. In addition to publication in the NPJ, cultivars of agronomic importance will be registered in *The Journal of Plant Registrations* (for agronomic crops, grasses, and legumes). *HortScience* (for vegetable, flower, fruit, and nut varieties), *American Nurseryman* (for woody ornamentals), and *Rangeland Ecology & Management* or *Rangelands* (for releases for rangeland application) may be used for publication of release notices. The NPMC can help obtain the proper application forms and registrar contacts if needed.

(ii) The requesting PMC should complete the release name registration forms provided by the registrar, as necessary, and send copies to both the registrar and the NPMC. The NPMC will update all name information in the NPGS-GRIN record for the release as needed.

(iii) The primary PMC for the release pays any costs required for name registration. This should be incorporated into the PMC budget as needed.

(iv) PMCs will receive credit for such name registrations as part of their release package and as a new document.

E. Assigning Plant Introduction (PI) Numbers

(1) General

PI numbers are assigned through the NPGS. They are used to introduce the germplasm to the public and make it available for other scientists. It is ARS policy that once a PI number is assigned to an accession, the accession must be maintained in perpetuity at a NPGS maintenance site. Assignment of PI numbers is concurrent with submitting germplasm for storage to the NPGS. The NPGS reserves the right to not accept germplasm; in which case, a PI number would not be assigned. Section 540.34(I) discusses the protocol for submitting germplasm to NPGS.

(2) When to Apply for a PI Number

Application for a PI number should be made when a PMC is within one year of finalizing a new release. When Plant Variety Protection (PVP) is being considered, PI numbers should **not** be applied for. Releases which have been assigned a PI number for over one year are considered public domain and are no longer eligible for PVP (see Section 540.35(D)).

(3) Applying for a PI Number

(i) PI numbers may be requested once the release name has been cleared through the NPMC, and all other items have been completed according to the checklist for Plant Selection Studies (Section 540.76). This ensures that the release name and other pertinent information will be entered into the NPGS system when the PI number is assigned, and reduce paperwork after the PI number has been assigned. Seed or vegetative material must be available to be sent to NPGS at the time a PI number is requested.

(ii) Follow the guidelines below when submitting requests to the NPMC. The NPMC will determine the appropriate NPGS Curator for the species being released and make initial contact with the Curator. The NPMC will find out what documentation the Curator needs and send a response to the requesting

PMC. The requesting PMC should then forward the appropriate materials directly to the Curator. Send copies of all correspondence between the PMC and the Curator to the NPMC. The information required varies with each Curator and species, but typically includes:

- Requesting PMC/ PM Specialist name;
- Date;
- Person requesting and phone number;
- Plant Scientific Name;
- Plant Common Name;
- PLANTS plant symbol;
- NRCS Accession Number and/or other numbers assigned to this release;
- Type of Plant (grass, grass-like, legume, forb, or woody);
- Anticipated class of release (cultivar, tested, selected, source identified, or germplasm);
- Anticipated release date (month/year);
- Release and/or advanced testing documentation which clearly shows the superior or distinguishing characteristics of the accession being released and the intended uses of the release;
- Historical documentation, including original collection site and collector's name; and
- Seed or vegetative materials must be sent with the information package. Seed may include a specified amount or volume. Vegetative material may include unrooted cuttings, rooted cuttings, or whole plants.

(iii) Once a PI number has been assigned, all relevant information on the release is entered into the NPGS-GRIN and confirmation is sent to the requesting PMC. In some cases, a temporary PI station number may be assigned. The NPMC will check the GRIN database to ensure that the information for the release is correct and will follow up with the GRIN database management unit to make any corrections, if necessary.

(4) Using PI Numbers

PI numbers should be included, along with the 9-million number, on all release documentation, submission of plant materials to the NPGS, and on correspondence with NPGS and others who are familiar with PI numbers. Using both the PI number and 9-million number will help prevent double-assigning of PI numbers by the NPGS. Once assigned, enter the PI number in the POMS database in both the Accession and Releases modules. For PM, the 9-million number remains the primary accession identifier so that studies and evaluations for a release are consistent (see Section 540.32(B)).

F. Releasing Agencies

(1) Involving other agencies in NRCS releases is an important part of the testing and marketing of new plant releases. Conservation plant releases may be made in conjunction with other Federal, State, and local agencies, universities, and non-profit organizations. Releases cannot be made with privately owned commercial growers or nurseries.

(2) Other agencies involved in the release should be included as signers on the official release notice and as co-authors on any technical papers or marketing materials involving the release, as appropriate.

(3) Where NRCS is the secondary releasing agency, the PMC will follow the procedures of the primary releasing agency. However, the PMC will complete an EE plus submit the new plant release package and evaluation worksheet to the NTSC PM Specialist as outlined in 540.34(G).

G. Preparing the Release Package

(1) Plant Material Availability

The amount of seed or stock needed for commercial increase purposes is to be determined by NRCS and the cooperating agencies, and is to be on inventory prior to the release of the plant material. There should be sufficient quantities of foundation quality seed and plants so that distribution can be made to interested commercial growers after the release is final. This is a critical part of making sure the new release is available for large scale increase and use in conservation plantings.

(2) Preparing Release Notices

(i) The notice of release describes the plant and its unique characteristics, its use and area of adaptation, and how and by whom the breeder, foundation, generation one, or other classes of materials are to be maintained. The notice is to specify when and where seed or plants will be available and when the release is expected to be commercially available. In addition, the notice must contain a summary of environmental considerations based on the EE worksheet (Section 540.83) which has been completed for the release. The summary must show that the proposed release does not have undesirable characteristics or significant adverse impacts on the environment. Also it **must** include, if applicable, any known or foreseeable impacts the release will have on the environment, no matter how minor; limitations of the release based on the geographic area of intended use (i.e., if the plant is aggressive in a part of the United States outside its area of intended use); and methods of management and control of the release, should it become a problem. **Release notices will not be approved by the Ecological Sciences Division if they do not have a summary of environmental considerations.** If it is determined in the EE that the release has potentially significant adverse effects on the environment, the PMC should contact the NPL prior to completing the release notice and routing for signatures (see Section 540.33(A)(3)) to determine if an EA and/or EIS is needed for the release.

(ii) The PMC Manager and/or the PM Specialist will prepare the release documentation. The notice is to be reviewed by cooperating agencies and organizations. The notice of release generally is prepared after the certification requirements have been determined. (See Section 540.34(J).) **A release is not considered official until final review and signatures by all participating agencies have been completed.** Section 540.88 is a general outline for all release types. Sections 540.89, 540.90, 540.91, 540.92, and 540.93 are typical release notices for cultivar, tested, selected, source identified, and germplasm releases, respectively.

(3) Prior to routing a new conservation plant release notice the PMC, along with the PM Specialist, will prepare a release package. The release package contains an assembly

of the materials needed to support the new conservation plant release. A full release package contains the following:

(i) The complete notice of release (Section 540.34(G)(3));

(ii) A copy of the name clearance letter received from the NPMC (Section 540.34(D)(5));

(iii) Indication of how the plant material was botanically identified and a copy of correspondence, as appropriate, relating to positive botanical identification of the proposed release if done by an outside partner or entity (Section 540.34(C));

(iv) The completed EE (Sections 540.34(A)(3) and 540.83);

(v) Completed "New Plant Release Package and Evaluation Worksheet" (Section 540.87);

(vi) Completed, or ready for publication, release brochure (Section 540.90);

(vii) New or updated Plant Fact Sheet (Section 540.76) or Plant Guide (Section 540.77);

(viii) Completed Conservation Plant Characteristics worksheet for the release to be submitted to PLANTS (540.33(D)(3)(ii);

(ix) Draft press release or marketing plan (Section 540.34(H)); and

(x) A completed or ready for publication release registration abstract or article, appropriate for the level of release (for example, a source identified release may not be registered), for the *Native Plants Journal*, *Journal of Plant Registrations*, *HortScience*, *American Nurseryman*, or other appropriate venue (Section 540.34(D)(6)).

(4) The procedure for routing a release package through the approval process involves the following:

(i) The PMC submits the entire release package to the NTSC PM Specialist for their region.

(ii) The NTSC PM Specialist review focuses on the following:

- Is the documentation packet complete as per the NPMM?
- Is the documentation professional in appearance and easily understood?
- Is testing analyzed and summarized in a manner appropriate with the release type as per the NPMM?
- Do summarized results support the proposed uses and the geographic area of recommended use?
- Does the release notice clearly state why this material is superior or different than previous releases and/or other plants of the same species currently available?

(iii) The NTSC PM Specialist consolidates any comments and returns the release package to the PMC within 3 weeks of original receipt. The NTSC PM Specialist either returns a completed evaluation with a point score or provides recommendations to the PMC on revisions. A review will be considered successful and complete after all Plant Materials Release Committee comments are adopted and/or addressed via re-submittal of the package. A successful review will result in a PMC receiving a score between 3–15 (15 total available) points under the release component in the PM

performance index as shown in Section 540.87. The NTSC PM Specialist will document the points earned by the release component in the exhibit and provide a copy of the points awarded to the NPMC, the NPL, and the originating PMC.

(iv) The PMC either proceeds to obtain signatures on the release notice or revises the release package and resends it back to the NTSC PM Specialist. When the NTSC PM Specialist review is final, the release notice is routed for signatures

(v) The release notice is signed by the appropriate personnel of the area served by the PMC and the proposed plant release. All releases where NRCS is involved will be signed by each State Conservationist within the primary releasing PMC service area, or by the chair of the State Conservationists' Plant Materials Advisory Committee where agreed upon. When the area of recommended use of the released plant exceeds the primary PMC service area, additional State Conservationist signatures may be desirable and should be determined by the primary releasing PMC advisory committee. All cooperating agencies must sign the release notice as well. Final signature will be at NHQ; the release notice is sent to the NPL to obtain the signature of the "Director, ESD." The NPL will then forward the release notices back to the originating PMC or office. All NRCS releases, regardless of release type, must be sent to the NPL to obtain the final signature of the Director of ESD. The notice of release and EE is routed for signatures in the following order: State Conservationists, other cooperating agencies, and then to the NPL. This routing may differ when NRCS is a secondary releasing agency.

(vi) The complete release package, as indicated in 540.43 (G), must be sent by the PMC to the NPL as well, preferably with the final release notice to be signed by NHQ. The NPL returns the signed notice of release and EE back to the originating PMC and sends a copy to the NPMC. The NPMC will maintain a file on each plant release in the PMP.

(vii) The PMC sends a copy of the complete release package with a signed release notice to all cooperating agencies.

(viii) Electronic copies of the new or updated plant fact sheet, plant guide, and Conservation Plant Characteristics worksheet will be sent to the National Plant Data Center for incorporation into PLANTS.

(ix) The release notice, new or significantly revised plant fact sheet and plant guide, release registration notice, and release brochure will be entered into the POMS database and electronic files sent to the PM Webmaster.

(x) Name registrations will be submitted to the appropriate journal for publication.

H. Marketing New Plant Releases

(1) It is essential to publicize new releases to improve visibility and gain acceptance for use of a new release. A marketing plan should be developed with the plant release study plan. Publicity of a new release may include plantings, such as Field Plantings (see Section 540.33(A)(8)), Special Demonstration Plantings (see Section 540.17(D)) and Conservation Field Trials (see Section 540.17(F)), and written materials, such as release brochures (see Section 540.94), revision of plant fact sheets (see Section 540.76) or plant guides (see Section 540.77), and news releases. A release brochure, or similar document, should be prepared for each release. Release brochures should

describe the characteristics of a species and/or release(s) and describe the adaptation, uses, establishment, and maintenance of the plant. Additional information on seed production, establishment, and management for the release should be included in plant guides (see Section 540.77) or other written documents. New releases should also be included into FOTG standards, specifications, and job sheets as appropriate for specific conservation practices. The PMC Manager and the PM Specialist are to prepare plans and materials for promoting the new release.

(2) Assistance from the State Public Affairs Specialist (PAS) should be sought in preparing public information materials. Public information materials are to include a statement when plant materials will be commercially available. Popular type news releases and publications may be delayed following a plant release until such time as the material is commercially available. Additional publicity can be obtained through bulletins, release brochures, Web sites, local articles, journals or periodicals, Soil and Water Conservation Districts, and commercial growers. NRCS guidelines on preparing and providing information to the public and news media may be obtained from the State PAS.

I. Preservation of Plant Germplasm

(1) General

(i) Plant germplasm preservation is accomplished mainly in cooperation with the NPGS. Plant germplasm within NRCS includes initial collections (accessions) and conservation plant releases. Germplasm at any stage of plant selection, i.e., initial collections and assemblies through final plant releases, should be considered for long-term preservation. Preservation of initial collections/accessions will reduce duplicated efforts in making field collections or assembling collections of plant materials and make the collections available for future research by NRCS and others.

(ii) Preservation of all NRCS conservation releases is required. All new plant releases must be submitted for preservation no later than 90 days after being released. This ensures that the released materials are backed up at another location in case of a disaster at the PMC.

(2) Role of the NPMC

The NPMC will serve as the clearinghouse for all information on germplasm preservation of NRCS releases. The NPMC will periodically inventory NPGS records to determine what materials need to be submitted or resubmitted to maintain viable seed or vegetative materials at the NPGS sites. The NPMC will work with individual PMCs to identify germplasm preservation needs and assess the most appropriate method of preservation. In addition, for any materials which cannot be preserved within the NPGS, the NPMC will serve as a back-up site or will find another appropriate site to maintain the germplasm.

(3) Submission of materials to the NPGS

(i) There are two methods of preserving germplasm in the NPGS: through the PI Stations and through the National Center for Genetic Resources Preservation (NCGRP, formerly the National Seed Storage Laboratory). The PI Stations are the first source for preservation. Materials not accepted by the PI Stations can be submitted to the NCGRP.

(ii) PMCs interested in preserving germplasm should first contact the NPMC. Seed or plants should not be sent to the NPMC. The NPMC will contact the

appropriate NPGS Curator and determine if the Curator is interested in receiving the material. If the NPGS Curator would like to include the material in the active collection at a PI Station, he/she will indicate the plant form (seed, plants, or vegetative propagules) and amount to be sent. The NPMC will forward all information to the requesting PMC. The PMC will then forward materials directly to the Curator and provide a copy of all correspondence to the NPMC. Germplasm accepted by the NPGS Curator will be assigned a PI number or PI Station identifier, and information about each accession will be entered in the GRIN database. The NPGS will maintain adequate quantities of seed to make the material available to other interested scientists.

(iii) The Curator may recommend in some cases that seeds be maintained at the NCGRP rather than at a PI Station. The NPMC will contact the NCGRP to determine if they are interested in preserving the germplasm. If the germplasm is accepted by the NCGRP, the NPMC will contact the requesting PMC with materials needed by the Curator. In all cases, the requesting PMC will be required to complete a Seed Storage Application Form (Section 540.95). This form indicates the amount of seed which is required by NCGRP. The PMC will then forward materials directly to the NCGRP in Fort Collins, Colorado, and provide a copy of all correspondence to the NPMC.

(4) Submission of botanical specimens

In addition to preservation as live material or seeds, all materials released through the PMP should be represented in a herbarium with a mounted botanical specimen. Botanical specimens should be prepared according to the guidelines found in Section 542.3. It is particularly important that a standard type specimen be prepared for all cultivar releases. A type specimen contains the typical and/or unique features of a particular cultivar, and may be used to differentiate between similar cultivar materials in legal cases where PVP is an issue. Generally, the National Arboretum will maintain the type specimen sample for each cultivar. In addition, if there is a registrar for the genus, a herbarium specimen should also be sent to the registrar. The releasing PMC will maintain a record of where the type specimen is stored and notify the NPMC of that location. It is not necessary to identify a specimen as a standard for pre-varietal materials. Herbarium specimens of all releases should be sent to the NPMC, and they will then be forwarded to the National Arboretum for long-term storage.

J. Certification Standards for Seed and Plants

(1) General

Certification of seed and/or plants provides the end-user an assurance that the material being purchased or received is, in fact, the material they think it is. Certified seed or plants are sold or distributed under minimum standards which have been established by AOSCA and the State seed certification agency (or similar agency). Certification classes of cultivars include breeder, foundation, registered, and certified generations. Certification generations of pre-varietal releases include G0, G1, G2, etc., for the number of generations from the original population. The G0 is equivalent to the breeder, the G1 to the foundation, and so on. Refer to Section 540.85 for limitations of generations for each release type. All releases may not need to be distributed under the certification program. Examples might include vegetative

releases where no certification program exists or seed producing releases distributed in very limited amounts.

(2) Guidelines for Certification

(i) Plants or seed intended for certification by the State seed certification agency (or similar agency) need to be produced according to standards established by the agencies cooperating in the release and the certifying agencies. The PMC Manager, the PM Specialist, and cooperating agencies, such as experiment stations and crop improvement associations, need to prepare specific certification guidelines for plants where certification standards have not been established. Guidelines for established species or releases may be found in the Certification Handbook prepared by AOSCA.

(ii) In releasing new plant materials, NRCS is guided by State and Federal regulations and the ESCOP policy statement (Section 540.79). Insofar as possible, materials are released in cooperation with or with concurrence of cooperating agencies. The data required to document a cooperative release will be identified and agreed upon with cooperators. It may vary by type of release. Detailed study plans will outline evaluation factors, methods of data collection and analysis, and identify potential cooperators and evaluation factors. A thorough summarization of performance and data will be made well in advance of the anticipated release date to ensure that the information is available or that appropriate steps can be taken to obtain it.

(iii) Procedures for certification vary depending on the type of release being certified. NRCS recognizes cultivar, tested, selected, source identified, and germplasm release types. These release types are defined and discussed in Sections 540.24(A) and 540.85.

540.35 Protecting PMC Releases

A. General

(1) Title 37 CFR 501.6, which pertains to ownership of inventions made by Government employees, generally provides that the Government is entitled to ownership of any invention directly related to the official duties of the inventor. New plant releases and/or technologies developed by PMCs for conservation use represent new inventions. As the owner, the Government is entitled to apply for protection.

(2) The principal reasons for seeking statutory protection of a new plant cultivar are to safeguard the cultivar name, to provide a basis for granting exclusive production rights to one or more growers, and to protect the integrity of the released germplasm by limiting generations or production cycles. Without legal protection, there can be no licensing of production rights. Patents for Plants, Utility Patents, and the Plant Variety Protection Act (PVPA) are methods that can be used to seek statutory protection. The PVPA is applicable for use when seeking protection of PMC releases.

B. Patents for Plants

Patents for Plants (35 USC 161, Amendment 1954, 68 Statute 1190) are administrated by the U.S. Patent and Trademark office, Department of Commerce. It allows "Whoever invents or discovers and asexually reproduces any distinct and new variety of plant, including cultivated spores, mutants, hybrids, and newly found seedlings, other than a

tuber propagated plant or a plant found in an uncultivated state…" to obtain a patent. The key words here are "asexually reproduced" and "other than…found in an uncultivated state ..." The latter is interpreted to mean that plants cannot be merely selected from an uncultivated state (wild) and patented, but must undergo some genetic change or selection. Because most, if not all, asexually propagated releases by NRCS represent a selection from an uncultivated state, procedures for seeking plant patents are not covered in this policy. If a plant that is to be released is asexually propagated and has been genetically altered, the State Conservationist's Plant Materials Advisory Committee of the PMC developing the plant release should explore with the NPL the desirability of seeking a plant patent.

C. Utility Patents

Utility patents (35 USC 101) are also administrated by the U.S. Patent and Trademark Office. It allows "Whoever invents or discovers any new and useful...manufacture, or composition of matter, or any new and useful improvement thereof" to obtain a utility patent, provided that the invention meets several criteria set forth in the law. Plant materials may fall into the category of "manufacture" or "composition of matter." Utility patents are more difficult to obtain than the other forms of protection, and require that the "hand of man" (e.g., by cross-breeding) be involved in making the invention. The mere discovery of a new plant growing in the ground does not qualify it for such protection. In addition, not only must the cultivar be novel, it also must be "non-obvious" to one of ordinary skill in the art. This type of protection is more than twice as expensive as PVPA and is better than PVPA only if one wishes to protect, for example, a newly bred characteristic in a genus, as opposed to protecting a specific cultivar. The application of utility patents does not apply to PMC work and will not be used.

D. Plant Variety Protection Act

(1) PVP is a process by which plants can receive legal protections similar to patents. The PVPA (7 USC 2321 et seq.) was enacted December 1970 and provides legal protection, much like a patent, to developers of new releases or varieties of plants that reproduce sexually. The Act, administered by AMS, covers seeds, transplants, or plants of all seed-reproduced plants except first-generation hybrids of any kind. A PVPA certificate is awarded to any owner of a cultivar after an examination shows it clearly differs by one or more identifiable morphological, physiological, or other characteristic from all varieties that are publicly known. If any variation occurs, it must be describable, predictable, and commercially acceptable. When sexually reproduced, or reconstituted, the cultivar remains unchanged as to its essential and distinctive characteristics with a reasonable degree of reliability. A description of characteristics, genealogy, and breeding procedure are required. After a PVPA certificate is issued, protection lasts for 18 years. The owner of a U.S. protected cultivar has exclusive rights to multiply and market the seed of that cultivar or grant these rights to others (cooperating agencies, universities).

(2) PVP only applies to cultivar releases. When combined with exclusive licensing, PVP helps ensure that critically needed conservation plants of limited demand will remain available for consumer use.

(3) Seeking PVP

(i) Well in advance of the anticipated release date, the State Conservationist's Plant Materials Advisory Committee for the releasing PMC will evaluate whether PVP should be sought for the release. If there is potential for seeking protection of a release under the provision of the PVPA, the

releasing PMC should contact the NPL and NPMC for additional guidance and guidelines.

(ii) The releasing PMC should not submit a seed sample to NPGS or apply for a PI number until within one year of the planned date of seeking the protection. This is because PVPA considers any accession that has been assigned a PI number for more than one year prior to the application date to be in the public domain, and not eligible for PVP.

(iii) If the decision is made to seek PVP, the releasing PMC will:

- Contact the NPMC for application forms and other documents necessary for applying for PVP.
- Prepare the release notice. The release notice will state that protection will be sought under the PVPA. The release notice will also state that the use and reproduction of the cultivar for plant breeding or other bona fide research shall not constitute an infringement of the certificate, as provided by Section 114 of the PVPA.
- Obtain the concurrence of other cooperators in the release.
- Determine that adequate interest is available to warrant its commercialization.
- Develop an abstract documenting the rationale and intent of seeking PVP.
- Prepare a 2,500 viable seed sample to be included with the application.
- Complete all applications for PVP.

(iv) NRCS, under the direction of the NPL, with assistance from the releasing PMC, will:

- Verify availability of funds required to seek PVPA.
- Obtain the certificate of protection (approximately $3,000).
- Develop a list of potential licensees interested in producing the new cultivar that represents an equal opportunity for all interested parties to become a licensee.

(v) The releasing PMC should provide the information identified above to the NPL, who will serve as the NRCS PVP Liaison with ARS, AMS, and the Office of General Council (OGC). The NPL will advise AMS, OGC, and the ARS-Office of Technology Transfer (OTT) of the intent to seek PVP, and that the PVP documentation will be forthcoming.

(vi) Following NPL review and agreement of the content with the releasing PMC, the application will be filed with the AMS PVP Office in Beltsville, Maryland. If licensing of exclusive production rights to a commercial grower will be pursued, the prepared release notice is to be reviewed by ARS-OTT.

(vii) The releasing PMC can finalize and execute the release notice prior to or following completion of the PVP application, providing it contains the provision identified in this section, though it is generally advised to wait until the AMS PVP Office has received the PVP application.

(4) Exclusive Production Rights

(i) With few exceptions, NRCS-developed plant releases have been released on a nonexclusive (public) basis. However, there are compelling reasons to seek PVP and grant exclusive production rights to growers when:

- NRCS-developed plant releases are likely to fail in the market place when released on a nonexclusive (public) basis;
- Adequate supplies of seed or plant materials are not likely to be produced or marketed on a continuing basis under nonexclusive production and distribution;
- Exclusive licensing to one grower or limited licensing to several growers is a reasonable and necessary incentive to encourage the investment of capital and to protect, produce, and distribute adequate seed or plant material on a continuing basis;
- The specialized market for the release will not be satisfied without proprietary protection; or
- Special production techniques, production areas, or marketing techniques are required.

(ii) The licensing agreement with the commercial producer for exclusive production rights should include a provision that the commercial producer must grow and market a specified amount of seed within a certain time period or the exclusive production rights will be revoked. This ensures that releases achieve their market potential.

(iii) When the release notice has been executed, the NPL will advise ARS-OTT. ARS-OTT will:

- Provide oversight to NRCS in the licensing process.
- Coordinate the publishing of a notice in the Federal Register of NRCS' intent to exclusively license material.
- Negotiate fair licensing terms and conditions with anticipated licensees, considering both the interest of the Government in promoting commercialization of Federal research results and the need to provide a proper reward to the inventor.
- Ask each applicant to complete a license application and a detailed marketing and development plan.
- Administer licenses of PVP plants made by NRCS.
- Collect payments as required by licenses on NRCS PVP plant releases, retain funds sufficient to cover administrative costs associated with licensing and technology transfer activities, and distribute the remaining funds to the NRCS license coordinating office.
- Monitor licenses to ensure annual progress reports and fees due are received, maintain patent and license records, and keep NRCS agency personnel advised of activities.

(5) Licensing and License Income

(i) The Federal Technology Transfer Act (FTTA) of 1986 (15 U.S.C. 3710) authorizes income from inventions to be used to pay awards to the inventors and expenses associated with acquiring and administration of patent activities, and to share the balance with the agency. However, collection of license income (royalties) is not required under the PVPA.

(ii) ARS-OTT has been delegated authority by the Secretary of Agriculture to administer the License Program in USDA. The following NRCS guidelines are permissible under ARS authority and guidelines:

- License income due to NRCS will be distributed in compliance with FTTA.
- Inventors employed by NRCS shall collectively receive the first $2,000 of license revenue each year and 25 percent of remaining income received by NRCS from each licensed invention up to a maximum of $150,000 per inventor per year.

(iii) After license income has been paid to the inventors, the NRCS licensing coordinator will ensure any remedial funds are used for technology transfer activities within the PMP.

(iv) The manager of the NPMC serves as the licensing coordinator and will oversee disbursement of royalties to the inventors.

540.36 Management of Plant Releases

A. Increase of Plant Releases

(1) General

An adequate supply of commercially available plant materials (seed or plants) of an active release is vital to the success of NRCS conservation programs. PMCs are responsible for maintaining breeder seed and plant stocks. PMCs will also develop plans for the production of foundation or pre-varietal materials to ensure that high quality seed and plant stocks are available to commercial growers for large-scale increase.

(2) Seed and plant quality

(i) PMCs may choose to distribute seed and plants directly or through a certification process. The decision to release a product through a seed certifying agency should be made in cooperation with the PMC, PM Specialist, and the certifying agency. Cultivars and pre-varietal releases sold commercially as certified seed require distribution under a certification protocol. PMCs should always follow accepted practices for genetic purity; isolation requirements; crop or weed contaminants; field inspection; seed cleaning; and seed quality, purity, germination, etc.

(ii) NRCS cooperates with the State seed certification agency, or equivalent State agency, in establishing standards and meeting State and national requirements in the production and handling of recognized seed classes (for cultivars: Breeder, Foundation, Registered, and Certified; for pre-varietal releases: G0, G1, G2, and G3) with respect to: source of seed stocks; genetic purity; isolation requirements; roguing other crop or weed contaminants; field inspection; seed cleaning; and seed quality, purity, and germination.

(iii) The basic requirements for certified production of many crops are found in the Certification Handbook, published by AOSCA ,and supported by the Federal Seed Act. State certification standards are individually established within these guidelines and pertain to the following items:

- Isolation requirements - The minimum standards for isolation of Foundation and pre-varietal seed established by AOSCA are to be

used as a basic guide for seed-producing crops. These standards may be supplemented by standards or other requirements imposed by the State seed certifying agency or crop improvement association.

- Location and size - A location is to be selected where optimum care and isolation can be provided. Examination of prior field use is necessary to determine any conflict with the release to be grown. The size of increase plantings vary according to species, amount of seed or clonal material available, and planned evaluations.
- Establishment and cultural and management practices are to be applied that provide optimum production of quality seed or other propagules.
- Harvesting, cleaning, and storage - Harvesting, cleaning, and storage are to be accomplished by the most practical method to maximize yield, purity, and viability of seed or plants. Improved technology for harvesting, cleaning, or storage methods should be reported as new technology development (see Section 540.15).
- Inventory - An inventory of plants and seed produced and plants and seed on hand are to be maintained as described in Section 540.36(B). This inventory should be adjusted to assure seed is available for commercial growers, research requests, and technology development.

(3) Procedures for Increase

(i) Initial increase is the production of small quantities of seed or other propagules of potentially useful plants. These materials are usually selected on the basis of initial or advanced evaluation identifying them for further testing or for exchange with other PMCs or cooperating State and Federal agencies.

(ii) Field-scale Increase

- Field-scale increase is the reproduction of plant materials to be included in field plantings or for use by other PMCs or cooperating State and Federal agencies. Sufficient quantity of seed should be produced to meet the needs of field plantings, conservation field trials, or demonstration plantings.
- Field-scale increase plantings should be established according to the standards used in producing Foundation-quality seed or plants.

(iii) Breeder Increase

- The production of Breeder seed or plants of PMC releases is an essential part of the overall function and program of a PMC. This production is necessary because it represents the genetic basis of a release from which all subsequent seed is produced.
- It is the responsibility of the PMC to maintain Breeder or early generation pre-varietal production or seed stocks for releases where NRCS is the primary plant breeder. In some cases, the PMC may have the primary responsibility to produce Breeder

materials for another agency when agreed between the releasing agencies.

- PMCs will continue to maintain Breeder production for the releases for which they are responsible until the release is discontinued. See Part 540.36 B(7) for discontinuing a plant release. A PMC may suspend production of foundation/pre-varietal generations indefinitely without discontinuing the release; small amounts of Breeder seed would be required to be available.
- Guidelines for maintaining Breeder seed increase fields are provided by the State seed certification agency (or similar agency) based on AOSCA and Federal Seed Act regulations. If such guidelines are not available at the time of release, they will be developed with the State seed certification agency and incorporated into the release notice. Special guidelines unique to a release should also be incorporated into the release notice.
- Breeder seed can be made available by the PMC, at no charge, to establish up to 5 acres (or more under special circumstances) for commercial growers to produce their own foundation seed. Where not prohibited, the grower may work with NRCS and the State seed certification agency to have this production block serve as foundation seed for subsequent production of certified seed.

(iv) Foundation and Pre-Varietal Generation Increase

- PMCs will develop plans to ensure the limited production of Foundation and pre-varietal (G0, G1, and/or G2) seed and plant stocks where NRCS is the primary agency and, in some cases, where a cooperative release has occurred. This production is necessary to ensure that high quality seed and plants are available to private growers for establishing commercial scale production. Due to various constraints, including staff and facility resources, the annual production of specific releases, length of time a plant release is maintained in production, and the amount of seed distributed, should be carefully evaluated and adjusted as needed. Adjustments and suspensions of production should be determined and documented in advisory committee minutes. Consider the following when evaluating foundation seed plans:
  - Work with universities, soil conservation districts, crop improvement associations, private growers, or other appropriate entities to develop alternatives to PMC production of foundation/early generation pre-varietal seed to supply commercial growers. This could include:
    - "Exclusive Release" procedures
    - Developing agreements where others produce Foundation/pre-varietal seed (outsourcing agreement example under development).
  - Suspend production of Foundation/pre-varietal release:
    - When an improved cultivar/pre-varietal release of that species is made within the same geographic region of recommended use.

- When demand for the release is consistently low.
- After 10 years following plant release using pre-varietal release procedures.
- When evidence of genetic drift has occurred. For older releases where original Breeder or G0 pre-varietal stock is not available, studies should be conducted to evaluate potential genetic drift and handled as appropriate.

o Limit allocation of Foundation seed/pre-varietal releases, through established agreements with the State seed certifying agencies, to amounts sufficient to establish 10-40 acres and encourage commercial growers to use first harvests to plant larger acreages as desired.

- Guidelines for maintaining Foundation/pre-varietal seed increase fields are provided by the State seed certification agency (or similar agency) based on AOSCA and Federal Seed Act regulations. If such guidelines are not available at the time of release, they will be developed with the State seed certification agency and incorporated into the release notice. Special guidelines unique to a release should also be incorporated into the release notice.

(4) Encouraging Commercial Increase of Releases

(i) The purpose of commercial increase is to make released plant materials available for conservation uses. Arrangements for commercial increase are to be formulated during the release process. The PM Specialist and/or PMC Manager, assisted by the State plant materials committee, has leadership for developing the commercial increase of released plants to ensure that adequate supplies are available.

(ii) Released plant materials are typically provided to growers through Crop Improvement Associations, Foundation Seed Programs, or State seed certification agencies. Agreements with these entities should outline how Foundation/pre-varietal seed and plants should be distributed, how producers will be selected, how pricing will be determined and how funds will be available to the PMC to support future foundation seed production.

(iii) Individual commercial producers can acquire (from NRCS or those named above) foundation or early generation pre-varietal plant materials to establish production fields for the purpose of growing large quantities of seed and plants. The production of these materials is then sold to commercial retail sources or directly to the public for the establishment of conservation plantings.

(iv) Requests for plant materials to be used for commercial increase are to be submitted by letter or formal application to the appropriate PM Specialist or PMC, or to the entity responsible for Foundation/pre-varietal seed distribution. Seed and plant requirements and allocations for commercial increase are to be determined annually.

B. Inventory, Allocation, Exchange, and Distribution

(1) General

All classes of seed and plants produced at PMCs, obtained through exchange or purchased with Federal funds, are Government property. The POMS database is to

be used to maintain inventory and track distribution of herbaceous and woody seeds and plants. The PMC will account for all seed and plants produced at the PMC or purchased by the PMC.

(2) Inventorying Plant Materials

(i) Inventories are the responsibility of the PMC Manager. The PMC Manager is responsible for tracking inventory information in the POMS database. A physical inventory of seed and plants is to be taken each year. The inventory record includes species, accession number or cultivar name, and current germination and purity records. Inventories for all PMC-produced seed and seed purchased for redistribution must be maintained. The PMC Manager may establish an independent procedure for maintaining an inventory of small lots of seed (i.e., packets) or planting stock.

(ii) Inventories should be made available to the PM Specialist. These inventories and information on estimated production serve as a basis for allocating plant materials.

(3) Determining Needs for Plant Materials

(i) Determining the needs for plant materials to be produced or purchased, and the availability of materials in inventory, requires good communication between the PMC Manager and the PM Specialist. Plant materials needs are based on:

- Studies and activities conducted by the PMC;
- Requirements for off-center evaluations;
- Seed increase at the PMC;
- Field plantings, Conservation Field Trials, and demonstration plantings;
- Materials needed for distribution to commercial producers;
- Requests from other PMCs; or
- Requests from cooperating agencies and partners.

(ii) The seed or plant needs of the PMC or cooperating agencies are to be determined annually at formal or informal meetings or through correspondence between the PM Specialist or PMC Manager and the cooperating agencies. The need for foundation seed or plant increase can be determined based on previous requirements, anticipated commercial need for the seed or plant, and availability of producers.

(iii) The PM Specialist and the PMC Manager are to prepare a summary of seed and plant needs for a 5-year period and update and extend it annually. The PM Specialist /PMC will send copies of the summary to the State Conservationist's Plant Materials Advisory Committee responsible for the PMC where production is being anticipated. The 5-year estimates are to be agreed upon, revised, extended annually, and incorporated into the PMC's LRP for seed and plant production. If PM Specialists serve more than one PMC, they will coordinate plant materials needs and production among the PMCs in their service area.

(4) Allocation of PMC Produced Materials

(i) Requests for plant materials from a PMC are filled on the basis of available plant materials. Request for plant materials generally are submitted to the PM Specialist responsible for the service area of the PMC. The originator of the request is to be notified by the PM Specialist /PMC if the request cannot be filled. Requests received by PMCs and PM Specialists directly from individuals

or organizations outside their service areas are to be coordinated through the PM Specialist serving the area from which the request originated. This procedure ensures that the appropriate PM Specialist is kept informed concerning such requests and permits the PM Specialist to keep abreast of the results of studies in the service area pertaining to NRCS plant materials.

(ii) Requests for foundation quality plant materials to be used for commercial increase should be directed to the PM Specialist. The PM Specialist will determine if the seed will be allocated from the PMC supply, or if the request should be forwarded to another agency, such as a Crop Improvement Association or district seed program, for allocation.

(iii) Foreign requests for seed or plants may be received by a PMC or PM Specialist. The NPMC will assist in arranging for shipping to the foreign country (refer to Section 540.37(B) for procedures). If the NPMC is contacted by a foreign entity for plant material, the NPMC will contact the appropriate PMCs directly to find out if seed or plants are available from the PMC. The quantity of each species shipped to foreign countries is usually limited to amounts necessary for research activities.

(iv) Requests for seed shipments are usually initiated by the PM Specialist using Form NRCS-ECS-001 (Request for Plant Materials Allocation and Distribution, Section 540.97) or by a letter containing the same information. Form NRCS-ECS-9 (Planting Plan for Field, Special, and Increase Plantings, see Section 540.71) may also be used to initiate a seed request for a planting associated with an NRCS field office, or may be attached to NRCS-ECS-001 for additional documentation. Requests may be forwarded through a PM Specialist to the appropriate PMC or directly to the PMC if applicable. Information from NRCS-ECS-001 may also be used to determine future seed or plant production needs as described in Section 540.36(B)(3). The PMC retains Forms NRCS-ECS-001, NRCS-ECS-9, or other documentation and files them with Form NRCS-ECS-596 (Distribution and Delivery Record).

(5) Exchange of Plant Materials

Within the framework of its priorities and study plans, a PMC can request amounts of seed or propagules directly from another PMC. If the source of an accession is known, the PMC Manager may request small quantities of seed or plants directly from the PMC Managers in other service areas within the region. The NTSC PM Specialists are responsible for coordinating requests for large quantities of plant materials among regions if needed.

(6) Distribution of Plant Materials

(i) Domestic plant material shipments from PMCs will be in accordance with all Federal and State laws relative to noxious weeds, quarantine of plants, and nursery certification. Attention should be given to State restrictions on noxious weeds and any restriction on the shipment of certain species of plants to certain States (quarantine restrictions). Often a Nursery Inspection Certificate is required for the shipment of plants over State lines. The State department of agriculture usually regulates such restrictions and issues inspection certificates.

(ii) All foreign plant material shipments are subject to guidelines established by USDA‘s Animal and Plant Health Inspection Service (APHIS). The NPMC should be contacted regarding restrictions on all foreign seed shipments. Refer to Section 540.37(B).

(iii) A properly executed Form NRCS-ECS-596, Distribution and Delivery Record (Section 540.98) will accompany each shipment of plant materials. Form NRCS-ECS-596 is generated electronically from within the POMS database. The POMS distribution record is populated on the basis of the information on Form NRCS-ECS-001, NRCS-ECS-9, or a request letter. Accession numbers (both NRCS 9-million number and PI number, as applicable), scientific, cultivar or release name, and common names identify items shipped. Seeds are identified by lot number, year produced, and results of purity and germination tests. Plants are identified by age and type of the material. Form NRCS-ECS-596 is processed as follows:

- Two copies are sent with the shipment or under separate cover, where one copy is signed by the recipient and returned to the PMC and the other copy retained for the recipient's file.
- One copy with attached Form NRCS-ECS-001 will remain in the PMC's file until the signed receipt copy is returned, at which time it can be replaced.

(7) Procedures for Discontinuation of a Release

(i) When it is determined appropriate by the State Conservationist's Plant Materials Advisory Committee that an NRCS conservation plant release is no longer needed, NRCS will formally discontinue maintenance of Breeder and Foundation seed of the PMC plant release and discontinue supporting and recommending the plant for conservation use.

(ii) The PMC Plant Materials Technical Committee (or equivalent) will review current PMC releases and make recommendations to the State Conservationist's Plant Materials Advisory Committee on need and desirability to discontinue a prior plant release. This request shall be done in writing using the "Request to Discontinue Production of a Plant Materials Release" worksheet to guide and document their recommendations (Section 540.99). Releases may be discontinued for the following reasons:

- No or Limited Foundation Seed or Plant Requests - If no requests have been received in the last 5-10 years, consideration should be given to discontinuing the release. As part of the consideration process, the PMC Plant Materials Technical Committee should evaluate and document if another plant or source of plant material is available to address natural resource issue(s) for which the release was made. Where requests are few, seed and/or plant production should be commensurate with requests. For releases of native species where demand is being met from wildland collections, as is the case with many shrubs and trees, consideration should be given to maintaining the release name and type, but identifying the original collection site area as the source of Breeder or G0 seed for the named type material. Ability to utilize this latter process would require good collection site information, clear site definition, access to the site, and no intentional genetic manipulation or bulking of multiple source materials of the release.
- No Commercial Production - If no commercial production of a release has occurred in the last 5 years, consideration should be given to discontinuing the release. If the release is recent,

determine and document if adequate promotion of the material has occurred.

- Replaced by Better Releases - When 2 or more releases are available for a species and both are recommended for the same purpose in the same geographic area or eco-region, consideration should be given to discontinue one or more of the releases. Extensive comparative trials, using Field Plantings and ICSTs, over a 5-10 year period should be used to determine and document relative performance. NRCS should promote the most appropriate plant to solve a conservation problem.
- Considered Invasive and Potentially Harmful to the Environment - All plant materials releases are evaluated for their potential to harm the environment prior to release. If a new scientific study indicates a potential problem with an NRCS release, consideration should be given to discontinuing the release.

(iii) The review for discontinuing a release should occur (at a minimum) when a PMC LRP is revised and updated. Any recommendation to discontinue a release should include documented consultation with all who cooperated in the original release and with distribution agencies, such as crop improvement associations. Documentation should note their agreement to discontinue the release. If NRCS was a secondary releasing agency, discussions should take place with the primary agency to consider jointly discontinuing the release. If the primary releasing agency does not wish to discontinue the plant release, NRCS should proceed with documentation and the worksheet in order to disassociate the agency from the plant release. This is especially important when the species may be considered invasive.

(iv) Documentation (the worksheet in Section 540.99 along with an EE or other appropriate paperwork) for discontinuing a plant release is sent to the NPL for final approval.

(v) Upon final approval, the PMC is strongly encouraged to send a notice to NRCS and all partner offices using the release informing them of the discontinuation. Additionally, all reference of the discontinued release should be removed from the FOTG, Web sites, and publications as they are updated.

540.37 Import and Export of Plant Germplasm

A. General

Import and export rules differ according to the types of plant material (e.g., seeds, cuttings, live plants) and foreign countries involved. All transport of germplasm should be coordinated through the NPMC, which has ready access to APHIS personnel and information on required import/export documents.

B. Exporting Germplasm to Foreign Countries

(1) Researchers in foreign countries may request plant materials from the PMP. Requests may be received by any PM Specialist or PMC. The PM Specialist or PMC should first contact the NPMC to determine what restrictions there are on shipping the requested germplasm and provide the following information:

(i) The form of the germplasm to be shipped (seed or plants – Note: the restrictions for the import of plants into foreign countries are typically different than those for seed);

(ii) Scientific and common names of the species to be exported;

(iii) Origin of seed to be exported (State and country where it was produced);

(iv) Country of destination; and

(v) Amount of seed to be shipped.

(2) The NPMC will check with APHIS as to any import restrictions for the species going into the destination country. If there are import restrictions, the recipient of the seed in the foreign country may need to obtain an import permit from their plant quarantine office. This import permit should be sent directly to the NPMC. The import permit may require additional declarations that the distributing PMC must meet before shipping seed. All PMCs should use extreme caution in exporting plant materials that may have invasive tendencies or that may have harmful effects on the environment of a foreign country. Guidelines for invasiveness and environmental considerations may be found in Sections 540.33(A)(3) and 540.83.

(3) A phytosanitary certificate from APHIS may be required for foreign shipment; if one is needed, the NPMC will notify the PMC to send the seed to the NPMC. A completed D&D form should be included. The NPMC will obtain the phytosanitary certificate from APHIS and ship the material to the foreign recipient.

(4) There may be situations where the seed being exported does not need a phytosanitary certificate. In these cases, the NPMC will inform the PMC that the seed may be shipped directly from the PMC to the recipient.

C. Importing Germplasm from Foreign Countries

(1) A PMC wishing to import plant material from a foreign country should contact the NPMC before attempting to obtain material. The PMC will need to provide the following information to the NPMC so import permit requirements can be determined:

(i) The form in which the germplasm is to be shipped (seed or plants);

(ii) Scientific and common names of the species to be imported;

(iii)Origin of seed to be imported (country or locality it was collected or produced);

(iv)How the material will be used (e.g., research);

(v) Any known restrictions on the use of the material because of intellectual property rights; and

(vi) Amount of material to be shipped.

(2) The NPMC will check with NPGS-GRIN to determine if the material is already available in the United States from a public or private germplasm collection. If it is not available domestically, the NPMC will consult with the APHIS-Permit Unit to determine the entry requirements for introducing the species from a foreign country. The NPMC will obtain an import permit and other required documentation from the APHIS-Permit Unit for the requesting PMC if there are import restrictions.

(3) All PMCs should use extreme caution when importing plant materials that may have invasive tendencies or have harmful effects on the environment. Species which are known to be invasive in the United States **will not**, under any circumstances, be imported into country. For those species which are new to the United States, an

extensive evaluation of potential spread and invasiveness must be conducted on the PMC prior to moving the material off the PMC. Guidelines for assessing invasiveness and environmental considerations may be found in Sections 540.33(A) and 540.83.

(4) **Shipment of plant materials into the United States:** The requesting PMC should send an import permit (if required) to the foreign plant source for inclusion with the seed shipment to the United States. Packages sent to the United States must also include identification of the materials, country of origin, the sender (name and address), and the intended recipient. Some shipments may also require a phytosanitary certificate issued by the exporting country.

(5) **Hand-carrying plant materials into the United States:** Because of the potential costs involved in hand-carrying germplasm into the United States, APHIS recommends that travelers consider mailing plants from foreign countries whenever possible. If travelers know what material will be brought back into the country, the NPMC can obtain any required permits prior to an overseas trip. If a port of entry is not equipped to inspect the imported material, it is the importer's responsibility to pay for shipment of the material to the appropriate inspection station.

(6) For material that must be quarantined prior to release into the United States, the NPMC will work with APHIS and the requesting PMC on a case-by-case basis.

540.50 Example of State Plant Materials Long Range Plan

STATE PLANT MATERIALS LONG RANGE PLAN

2005-2010

I. Introduction

The mission of the Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The purpose of the Plant Materials Program is to: 1) assemble, test, and release plant materials for conservation use, 2) determine techniques for successful use and management of conservation species, 3) facilitate the commercial increase of conservation species, 4) provide for the timely development and transfer of effective state-of-the-art applied science technology to solve conservation problems, and 5) promote the use of plant science technology to meet the goals and objectives of the NRCS Strategic Plan.

The state Plant Materials LRP identifies and prioritizes customer, resource, and program needs. The LRP presents proposed action items to address identified needs.

II. Long Range Plan Development

This LRP was developed in accordance with the revised National Plant Materials Manual, Part 540.1. This plan is intended to be used as a guide for directing plant materials activities within the state. This plan will be used along with the respective plans of the other states within the service area to develop the Plant Materials Center LRP. This plan may also serve as a reference to develop specific action items which will be incorporated into the state's annual Business Plan.

The listing of identified customer, resource, and program needs were developed by the State Plant Materials Committee. The Plant Materials Committee is comprised of both NRCS employees and non-NRCS partners who have an interest in plant materials work. See Appendix A for a listing of committee members. Along with the input provided by the committee members, additional references were used to help identify and prioritize problems and needs. These are listed in Appendix B. Needs were categorized by the NRCS Goals and Objectives as listed in the National Plant Materials Manual, See exhibit in Section 539.20 (NRCS Goals and Objectives).

III. NRCS Objectives, Needs, Recommended Actions

A summary of problems, needs, and recommended actions are provided in Table 1. Details are provided in the following text.

NRCS Objective: High Quality, Productive Soils

(1) Degradation in the quality of intensively used soils has occurred through the production of an abundant food supply. The primary areas of concern are located within MLRA's 76 and 106 and cover approximately 1,347,000 acres. The soils in these areas are typically deep, moderately well drained and are gently sloping to steeply sloping. The soils have been formed from loess and glacial till. Increasing soil condition and soil carbon can be improved by minimum tillage and cover crops. Information on these practices is found in the FOTG. In 2003, 60 percent of cropland was farmed under systems that maintained or increased soil condition or soil carbon. Adequate plant materials and technology are currently available to carry out appropriate practices necessary to address the problem. The need exists to transfer current plant materials and technology information to identified customers.

Recommended Action: Summarize existing information on suitable plant materials and accompanying technology needed in implementing the appropriate conservation practice. Transfer this information to identified customers.

Priority Ranking: High

NRCS Objective: Clean and Abundant Water

(1) Degradation of water quality has occurred through excessive sedimentation from unstable streambanks and shorelines. The areas of concern are along stream corridors and reservoirs located through the state in all MLRA's. Current and past agricultural practices have resulted in the loss of riparian vegetation necessary to stabilize the stream course resulting in unstable conditions and excessive sedimentation. It has been estimated that 85 percent of the riparian areas within Kansas are in need of improvement. Creation of reservoirs with accompanying drastic changes in water level has resulted in shorelines exposed to severe erosion. Information pertaining to the stabilization of streambanks and shorelines are found in the FOTG and the Engineering Field Handbook Chapter 16, Streambank and Shoreline Protection. The need exists to identify locally available plant materials that may be used in carrying out those practices as outlined in the above references. In addition, establishment techniques for the identified species need to be investigated.

Recommended Action: Locally available and suitable plant materials for use in streambank and shoreline protection need to be identified and evaluated. Establishment techniques need to be determined for the identified plant materials.

Priority Ranking: Medium

(2) Degradation of water quality has occurred through nonpoint source contaminants from untreated and unconfined waste materials. Animal waste from feedlots has been identified as a major contributor to both surface and groundwater water quality problems, particularly nitrogen, throughout the state. Plants may play a major role in removing excess nutrients in agricultural waste filter systems, constructed wetlands, and in waste disposal areas. Conservation practices such as riparian forest buffers, contour buffer strips, field borders, and filter strips may remove not only sediment, but also organic matter, various pesticides and nutrients such as nitrogen and phosphorous. Adequate plant materials and technology are currently available to carryout appropriate conservation practices

necessary to address the problem. The need exists to transfer current plant materials and technology information to identified customers.
Recommended Action: Summarize existing information on suitable plant materials and technology needed to implement the appropriate conservation practices necessary to address the identified need, and transfer this information to the identified customer.
Priority Ranking: High

(3) Degradation of water quality has occurred through point source contaminants and excessive soil erosion from saline, alkaline, and other mineralized soils. The majority of affected sites have resulted from past oil field activity. The affected sites are characterized by high soil salinity levels, excessive soil erosion, little soil structure or tilth, and lack of vegetation. While the majority of affected sites are less than 5 acres in size, collectively it is estimated that 100,000 affected acres exist statewide. The State Department of Health and Environment has identified these type sites as contributors to the non-point problem within the state. The need exists to identify plant materials and establishment techniques which will provide for the revegetation of these affected sites.
Recommended Action: Identify plant materials and establishment techniques that will provide for the revegetation of these affected sites.
Priority Ranking: Medium

(4) Drought conditions have required irrigation to lands to maintain plant cover. This added water use is impacting stream and aquifer levels in the western part of the state. Adequate plant materials and technology are not currently available to carry out appropriate conservation practices necessary to address the problem. The need exists to collect, test, and release materials to satisfy this need.
Recommended Action: Collect, test, and release seed to provide drought tolerant plants.
Priority Ranking: High

NRCS Objective: Healthy Plant and Animal Communities

(1) Grassland: There is a lack of productive adaptive cool season perennial grasses that provide quality livestock forage as well as providing for erosion control within MLRA's 72, 73, 77, 78, and 79. Cool season perennial grass species are needed to extend the grazing season. The use of cool season grasses will allow grazing deferment of the native range and subsequent improvement of range health. Approximately 44 percent of the rangeland or 6, 900,000 acres are in poor or fair ecological condition. The need exists to provide adaptive and productive cool season perennial grass species and establishment and maintenance information. Currently the FOTG lists only two cool season grass species that are approved for use in the above MLRA's. There are numerous cool season perennial grass species currently available that may address the need. However, adaptability and performance for many of these species have not been evaluated for the listed MLRA's.
Recommended Action: Evaluate and select cool season perennial grass species for adaptability, forage quality and quantity with respect to livestock grazing with MLRA's 72, 73, 77, 78, and 79.
Ranking Priority: High

(2) Wildlife Habitat: Lack of diversity exists within rangeland seedings in terms of adapted native forbs, legumes, and shrubs. With the increased public interest in native species, federal program requirements for the use of native forbs, legumes, and shrubs (Conservation Reserve Program (CRP), Wildlife Habitat Incentive Program (WHIP), Environmental Quality Incentives Program (EQIP), Wetlands Reserve Program (WRP), and state and federal native species highway revegetation requirements, the demand for these adapted native forbs, legumes, and shrubs has greatly exceeded the supply. The need exists to provide additional sources of native forbs, legumes, and shrubs and the necessary information for propagation, establishment, and maintenance.

Recommended Action: Identify, collect, and evaluate suitable native forbs, legumes, and shrubs. Investigate propagation techniques, establishment methods, and maintenance requirements,

Priority Ranking: Medium

(3) Wetlands: The creation, enhancement, and restoration of wetlands have gained much interest in light of legislation regarding wetlands and recent federal programs aimed at promoting wetlands conservation. There is a general lack of both plant materials and technology necessary for wetland enhancement, restoration, and creation to meet both regulatory and NRCS program requirements. The need exists to provide wetland species and accompanying technology regarding establishment and survival for those wetland species.

Recommended Action: Identify and select locally adapted wetland species for potential use in wetland restoration, enhancement and creation. Evaluate those selected plants in terms of propagation techniques, establishment methods, and maintenance requirements.

Priority Ranking: High

NRCS Objective: Healthy Air Quality

(1) Odors, particles, and greenhouse gas emissions generated through agricultural activities such as the use of nitrogen fertilizers and on-farm fuels, as well as animal waste management, degrade air quality. As urbanization encroaches on agricultural lands, communities at the rural/urban interface are becoming more sensitive to these issues.

Recommended Action: Identify and implement low-cost opportunities to reduce odor-laden particles, and greenhouse emissions from agricultural sources.

Priority Ranking: Medium

NRCS Objective: An Adequate Energy Supply

(1) The recent increases in energy prices faced by producers throughout the country emphasize the need to find new ways to improve the energy efficiency of U.S. agriculture. In the future, the challenge will be to improve energy efficiency in ways that maintain the productive capacity of the land while benefiting the environment. Development of more efficient machinery and selection of new plant varieties can improve energy efficiency. While bio-energy and bio-products can help replace fossil fuels, the challenge is to overcome the barriers to economic feasibility and ensure that the production of energy raw materials is environmentally beneficial at the farm level. There are opportunities to increase

the use of conservation plants and plant residues in the conversion to various forms of energy and bio-products.

Recommended Action: Collaborate with external agencies to develop bio-energy technology and determine the feasibility of using existing conservation plants for biofuels.

Priority Ranking: Medium

NRCS Objective: A Diverse and Well-Served Customer Base

(1) An important part of the NRCS Strategic Management Plan is addressing the civil rights issue. As part of this plan, the Plant Materials Program needs to be reviewed on a regular basis to determine if any systematic barriers exist that may result in disparate treatment of minority or small scale and limited resource groups. These groups should be identified and steps taken to assure that no barrier exists and to determine what steps need to be taken to reach these groups to ensure they are aware of the services provided by the Program.

Recommended Action: Develop a Native American Limited Resource Farmer outreach strategy that will promote awareness and utilization of the Plant Materials Program for the purpose of addressing identified cultural resource needs.

Ranking Priority: High

(2) Many NRCS employees hired since 1985 have had limited exposure to the Plant Materials Program. Their understanding of the program and the services available is severely limited, especially in those states that do not have a Plant Materials Center. This lack of understanding hinders the effectiveness of the program in meeting employee, resource, and program needs. The need exists to provide awareness training to NRCS and other non NRCS partners regarding the purpose and function of the Program.

Recommended Action: Develop an outreach training effort to provide awareness training of the Plant Materials Program to NRCS employees and non NRCS partners.

Ranking Priority: High

Appendix A. Listing of State Committee Members

- State NRCS Resource Conservationist
- State NRCS Range Management Specialist
- State NRCS Biologist
- State NRCS Agronomist
- State NRCS Forester
- District Conservationist
- Soil Conservationist
- Soil Conservation Technician
- Area Conservationist Team Leader
- State Wildlife and Parks Representative
- State Foundation Seed Organization Representative
- State Highway Department Representative
- Nature Conservancy Representative

- USDA ARS Representative
- USF&W Representative
- USDA-FS Representative
- Commercial Seed Industry Representative
- State Native Plant Organization Representative
- State Forestry Service Representative
- Plant Materials Specialist (Advisor)
- Plant Materials Center Manager (Advisor)

Appendix B. Listing of References

- USDA-NRCS Strategic Plan
- State Natural Resources Inventory Data (NRI) 1992
- EQIP Priority Area Resource Inventory Data
- State Soil Surveys
- GLCI State Summary Data for Range Health Report
- State Nonpoint Source Inventory and Assessment Report
- State NRCS Field Office Technical Guide
- State Watershed Study Report for Riparian Health

Table 1 Summary of Needs and Action Taken					
				Action Planned	
Problem	**Plant Materials Needs**	**Ranking Priority**	**Evaluate Existing Technology**	**Transfer Existing Technology**	**Develop New Technology**
NRCS Objective: High Quality, Productive Soils					
Degradation of soil quality due to sedimentation and non-point source contaminants from cropland	Summarize and transfer existing plant materials and technology information	High	x	x	
NRCS Objective: Clean and Abundant Water					
Degradation of water quality due to sedimentation from unstable streambanks and shoreline erosion	Identify and evaluate locally adapted plant materials for use in streambank and shoreline protection (investigate). Develop establishment techniques for the selected material	Medium			x
Degradation of water quality due to nonpoint source contaminants from nitrogen and phosphorus runoff	Summarize and transfer existing plant materials and technology information	High	x	x	
Degradation of water quality due to point source contaminants and sedimentation from saline, alkaline, and other mineralized sites	Identify and evaluate locally adapted plant materials and establishment techniques for the reclamation of the affected sites	Medium			

Table 1 Summary of Needs and Action Taken					
				Action Planned	
Problem	**Plant Materials Needs**	**Ranking Priority**	**Evaluate Existing Technology**	**Transfer Existing Technology**	**Develop New Technology**
Degradation of water quantity due to increased irrigation from drought	Identify and evaluate locally adapted plant materials and establishment techniques for drought tolerant plants	High			x
NRCS Objective: Healthy Plant and Animal Communities					
Lack of adapted and productive cool season perennial grasses for extending the grazing period	Investigate and evaluate existing cool season grass species for adaptability and performance	High	x		x
Lack of locally adapted native forbs, legumes, and shrubs for use in range and wildlife plantings and information pertaining to the propagation, establishment, and maintenance of those species	Identify and evaluate locally adapted native forbs, legumes, and shrubs and investigate propagation, establishment, and maintenance requirements for those species	Medium			x
Lack of locally adapted wetland species and propagation, establishment, and maintenance information for use in restoring enhancing, or creating wetlands	Identify and select locally adapted wetland species for use in wetland restoration, enhancement or creation of wetlands. Propagation, establishment, and maintenance information is needed for these species	High			x

Table 1 Summary of Needs and Action Taken					
				Action Planned	
Problem	**Plant Materials Needs**	**Ranking Priority**	**Evaluate Existing Technology**	**Transfer Existing Technology**	**Develop New Technology**
NRCS Objective: Healthy Air Quality					
Lack of low cost options to reduce odor laden particles	Identify and select locally adapted species to serve as windbreaks or buffers to collect dust particles	High			x
NRCS Objective: Adequate Energy Supply					
Lack of knowledge of conservation plants and plant residues in the conversion to various forms of energy and bio-products	Collaborate with other agencies and identify and evaluate new species to use as biofuel	Med	x	x	x
NRCS Objective: A Diverse and well served Customer Base					
Potential for disparate treatment of minority or small scale and limited resource groups	Develop an outreach strategy to minority groups to promote awareness of the program and identify needs which may be addressed by the program.	High		x	
Lack of understanding of the program by NRCS and non NRCS partners	Develop outreach training efforts to provide awareness of the program to NRCS and non NRCS partners	High		x	

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.51 Example of a PMC Long Range Plan

PLANT MATERIALS CENTER LONG RANGE PLAN

I. Introduction

The mission of the Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The purpose of the Plant Materials Program is to carry out specialized activities in resource conservation, as part of the overall program of the Natural Resources Conservation Service (NRCS). It is the responsibility of the Plant Materials Center (PMC) to: 1) assemble, test, and release plant materials for conservation use, 2) determine techniques for the successful use and management of conservation species, 3) facilitate the commercial increase of conservation species, 4) provide for the development and transfer of state-of-the-art applied science technology.

The PMC Long Range Plan (LRP) identifies, guides, and directs PMC operation toward solving high-priority resource problems identified in the state(s) Plant Materials LRP. Plant Materials Centers may be directed by one or more state LRPs depending on the number of states served by the Center. The PMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan.

II. Long Range Plan Development

This LRP is in accordance with the revised National Plant Materials Manual, Part 540.2(C)(1). This plan is to act as a guide for directing Plant Materials Center activities within the state(s) served. The PM Technical Committee(s) is responsible for identifying customers, resources, and program needs. The PM Technical Committee consists of representatives from NRCS and other federal and state agencies, private industry, and universities. Advisory members may have an interest due to financial contributions made to the Center.

Needs are categorized by the NRCS Goals and Objectives as listed in the revised National Plant Materials Manual, See exhibit in Section 539.20 (NRCS Goals and Objectives) and Plant Materials Strategic Plan.

The PM Technical Committee and/or State Plant Materials Committee recommends studies needed at the Center to meet identified concerns. Specific study areas and special concerns are defined by the PM Technical Committee and reviewed by the State Conservationist Advisory Committee. Projects budgeted are incorporated into the Center's Plan of Operation Annual Business Plan.

General Description of the Service Area

Climate - USDA Plant Hardiness Zones 4, 5, 6 are within the area serviced. The climate is continental, changes rapidly with altitude, and is characterized by wet winters and dry summers. Summers have cool nights and warm days. Precipitation occurs mostly as winter snow or rain and spring rain, varying from less than 5 inches to over 30 inches annually.

Major Land Resource Areas – All or portions of 13 Major Land Resource Areas (MLRAs) and five states (Idaho, Nevada, Oregon, Utah, and Wyoming) are included in the Service Area. MLRAs include the following:

B - Northwestern Wheat and Range Region

B10 Upper Snake River Lava Plains and Hills (Idaho)*
B10A Big and Little Wood River Footslopes and Plains (Idaho)
B11 Snake River Plains (Idaho and Oregon)*
B11A Central Snake River Plains (Idaho)
B11B Upper Snake River Plains (Idaho)
B12 Lost River Valleys and Mountains (Idaho)
B13 Eastern Idaho Plateaus (Idaho and Utah)

D - Western Range and Irrigated Region

D23 Malheur High Plateau (Oregon and Nevada)*
D25 Owyhee High Plateau (Nevada, Idaho, Oregon, Utah)*
D28A Great Salt Lake Area (Idaho, Utah, Nevada)*

E - Rocky Mountain Range and Forest Region

E43B Central Idaho Rocky Mountains (Idaho, Utah, and Wyoming)*
E43C West Central Idaho Rocky Mountains (Idaho)*
E47 Wasatch and Uinta Mountains (Idaho, Utah and Wyoming)*

*** Indicates overlap with other PMC's area of responsibility**

A detailed description of MLRAs, land use, and climate may be found in the reference "Land Resource regions and Major Land Resource Areas of The United States," Agricultural Handbook 296.

III. NRCS Objectives, Needs, Recommended Actions

The priority plant material needs of the Plant Materials Center fall into four goals according to the PM Technical Committee:

NRCS Mission Goal: High Quality, Productive Soils

NRCS Mission Goal: Clean and Abundant Water

NRCS Mission Goal: Healthy Plant and Animal Communities

NRCS Mission Goal: Clean Air

The plant material needs of the PMC Service Area fall into nine major priorities and are in accordance with the national program objectives. The highest priorities include: plant releases and seed and plant production; rangeland in poor ecological condition; riparian and wetland degradation; clean air; equipment, facilities and personnel. Based upon current funding and personnel levels, the PMC is not able to assign specific actions to categories identified as medium and low priority needs.

These needs are listed with the intention that they may be addressed as actions are taken to meet the needs of the high priority categories and as additional funds become available. Written materials may be developed to assist with the medium and low priority needs identified.

A. Plant Releases, Seed and Plant Production
Priority Ranking: High

A major responsibility of the PMC is the maintenance of Breeder seed and production of foundation quality seed of the plant releases from the Center. Foundation seed is made available to the University Agricultural Experiment Station, Crop Improvement Associations, other Plant Materials Centers and cooperating agencies. Allocation and exchange or other written agreements distributing seed will be documented. Foundation seed of recent releases may be provided to soil conservation districts for Registered or Certified seed production under the District Seed Increase Program. Seed for field plantings is also made available to cooperators through soil and water conservation districts in order to determine proper uses, adaptation, proper technology, and to promote and demonstrate the values of recent releases.

Actions

1. Maintain Breeder and Foundation seed of released materials
2. Maintain genetic superiority and characteristics of released materials
3. Release new plant materials
4. Develop techniques for facilitation of commercial production

B. Rangeland in Poor Ecological Condition
Priority Ranking: High

Problems

Large areas of rangeland are in unsatisfactory condition and are producing well below potential. Many sites are infested with cheatgrass, medusahead rye, and other weeds. These areas provide poor diversity of vegetation for wildlife, generally have poor cover, and commonly erode at excessive rates. Wildfires consume large acreages each year because of their flash fuel characteristics. Reseeding large areas is costly with current methods and available plant materials. Threatened and endangered species are destroyed, weeds are allowed to invade, water quality is degraded due to erosion, and watershed values are adversely affected. Critical wildlife winter habitat is affected.

Needs

- Native plants and establishment techniques
- Facilitate commercial seed production of native plants
- Strategies for invasive weed management including chemical control, integrated pest management, revegetation strategies
- Greenstrips to reduce wildfire hazard
- Establishment of woody shrubs from seed
- Development of native forbs to improve vegetation diversity for wildlife

Actions

1. Develop native, performance-tested rangeland grasses, forbs, and shrubs
2. Develop Integrated Pest Management strategies for invasive plants such as cheatgrass, medusahead rye, yellow starthistle, rush skeletonweed, etc.
3. Continue cooperative relationships with other plant development and land management agencies
4. Equipment and technology development for plant establishment on rangelands

C. Riparian and Wetland Degradation
Priority Ranking: High

Problems

Concentrated runoff water causes gully, perennial and intermittent stream erosion. Floods cause streambank and gully erosion on cropland, rangeland, pastureland, and meadows. Desirable streamside vegetation is degraded, and it is difficult to prepare a seedbed and protect such sites during establishment. Created wetlands can help improve water quality. There is a lack of commercially available seed or plants for riparian and wetland areas.

Needs

- Riparian and wetland species and restoration techniques
- Riparian and wetland habitat management
- Streambank stabilization with trees and shrubs
- Urban development stormwater collection
- Low growing, aggressive, stiff, sod-forming species for concentrated flow erosion
- Filter and buffer strips

Actions

1. Identify native riparian-wetland plants with high potential for use in restoring plant communities
2. Develop bioengineering techniques for establishment and management of trees, shrubs, grasses, and grass-like plants for degraded and intermittent riparian zones
3. Design criteria and adapted plant and management techniques for constructed wetland
   systems to treat non-point source pollution
4. Continue cooperative relationships with other plant development and land management agencies

D. Clean Air (Agroforestry)
Priority Ranking: High

Problems

Many tree and shrub species have been tested and their effectiveness is known for agroforestry applications. Design criteria and management for windbreaks is also known. Researchers know the beneficial effects of windbreaks on crop quality, and quantity and water use efficiency. The beneficial effects of windbreaks to reduce windborne soils and snow are also well understood. There is a continuing problem with air quality and how windbreaks can be used to mitigate odors and sediment. This information also needs to be transferred to land users.

Needs

- Develop design criteria for using windbreaks to mitigate odors and sediment from livestock and poultry operations
- Communicate benefits of agroforestry to landowners
- Demonstration/installation of agroforestry practices
- Information on species for buffer strips including windbreaks and field borders

Actions

1. Develop design strategy and install sample field windbreaks to test placement for odor mitigation
2. Develop list of species that work best in mitigating odor and wind carried particles
3. Maintain PMC windbreak plots for display and training purposes
4. Maintain testing of poplar species for plantation applications
5. Maintain testing activities off-center
6. Demonstrate installation of agroforestry practices
7. Continue cooperative relationships with research and extension people involved in agroforestry

E. Wildlife Habitat
Priority Ranking: - High

Problems

Food and cover for wildlife have been seriously reduced or eliminated in many areas by intensive farming practices, poor rangeland condition, wildfire, reduced winter forage, overgrazing, extensive development of transportation corridors, and more intensive management of forests.

Needs

- Information on adapted species and cultural methods for establishment
- Native forbs for rangeland areas
- Enhance areas with interseeding technology and burning
- Reduce loss of critical habitat to urbanization
- Establishment of woody shrubs from seed
- Information on buffer strips, including windbreaks and greenstrips
- Information on pest management

Actions

Develop list of plants and management techniques that address species of concern.

F. Equipment, Facilities and Personnel
Priority Ranking: High

Problems

In order for the PMC to function effectively and efficiently, equipment and facilities must be maintained and upgraded as new technology becomes available. Farm machinery, greenhouse and research equipment, as well as computer hardware, software and buildings, must be maintained and upgraded. Funding for improvements can be difficult to obtain. Because of rapidly changing technology, PMC personnel must continually learn new skills to be effective in developing and transferring new plant science technology.

Needs

- Continue equipment and facility upgrades
- Training opportunities for PMC personnel

Actions

1. Continue cooperative working relationship with Soil Conservation District, University, and Department of Fish and Game
2. Maintain facilities and equipment
3. Review needs and make purchases as funds allow
4. Obtain training to keep employees informed and educated in new technology
5. Promote funding

G. Categories Identified as Medium or Low Priority

Based on current funding and personnel levels, the PMC is not able to assign specific actions to needs categories identified as medium and low priority. They are listed with the intention that they may be addressed as actions are undertaken to meet high priority needs. While PMC plant development work will not generally be performed for medium or low priority needs, occasional written materials may be developed to assist with them.

1. Low Quality Pastureland
Priority Ranking: Medium

Problems

Pastureland is producing below potential on sites with poor soils and soil situations including low fertility, poor drainage, high sodic or saline conditions, and stony or excessively drained conditions. Improper grazing management, species selection, irrigation, and fertility practices commonly result in lower productivity and loss of more desirable species.

Needs

- Plant materials best suited to intensive grazing on irrigated pastures
- Plant materials for saline soils
- Pasture renovation including no-till
- Pasture and hayland management practices (grazing, fertilization, irrigation)

2. Sheet and Rill Erosion on Cropland
Priority Ranking: Medium

Problem

High intensity rains, rain-on-snow, spring thaw, and runoff cause erosion of open cropland fields. The season of greatest erosion is during spring and with summer thunderstorms. Low residue crops, downslope farming, and highly erodible soils contribute to the erosion problem. There is lack of available information on the application of some practices. Information is needed on the affects of practices on water quality.

Needs

- Economically viable alternative crops to create improved rotations
- Information on cover and green manure crops
- Information on buffer practices including windbreaks, field borders, filter strips, riparian buffers, and grassed waterways

3. Wind Erosion on Cropland
Priority Ranking: Medium

Problems

High winds cause erosion of open fields, usually in the spring. Low residue crops and highly erodible soils contribute to the problem. There is a lack of information for landowners on the value of windbreaks and cover crops.

Needs

- Information on cover and green manure crops
- Information on buffer strips including windbreaks and field borders

4. Critical Area Treatment
Priority Ranking: Medium

Problems

Large areas of land are disturbed or damaged each year. Many acres are disturbed by practices such as highway, dam, dike, or pond construction and by urban development and mining. Other land is affected by natural events such as landslips, floods, etc. The soils are commonly a composite of rock and mixed soil material or denuded by wind and water erosion. These areas may be very droughty with low water holding capacities, are generally infertile, and may have high levels of calcium, sodium, or other minerals that make establishing vegetation difficult. Seedbed preparation may be very difficult.

Needs

- Information on critical area planting and seeding techniques and species
- Information on bioengineering practices for disturbed land
- Information on chemical and fertilizer soil amendments
- Information on special stabilization techniques to allow establishment of vegetation such as fiber mats, mulches, etc.

5. Irrigation Induced Erosion on Cropland
Priority Ranking: Low

Problems

Thousands of acres of irrigated cropland have excessive erosion caused by poor irrigation systems and irrigation water management. Irrigation-induced erosion is most common on surface irrigated fields, but some sprinkler irrigation systems cause problems as well.

Needs

- Information on filter strips
- Information on PAM
- Information on irrigation systems and irrigation water management

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.52 Recommended Training for Plant Materials (PM) Staff

The following lists have been adapted from the NRCS training guidelines and are recommendations for staff training/proficiency in the PMP. Training may be received through the NRCS National Employee Development Center (NEDC), through State office or interagency sponsored courses, through PM sponsored courses, or through non-government sources as approved through proper procedures.

(1) PMC Manager and PM Specialists

- Principles of Management and Supervision
- EEO for Supervisors and Managers (USDA Grad School)
- Effective Facilitation
- Basic Computer Skills and Applications
- Experimental Design and Statistical Analysis
- Plant Materials - Field and Laboratory Techniques
- Soil Bioengineering
- Biology of Tree and Shrub Species
- Agrostology: Biology of Cool-Season Grasses and Biology of Warm-Season Grasses
- Biology of Legume Species
- Biosystematics, Genetics, and Plant Breeding
- Field Office Operations
- Pasture Ecology (NEDC)
- Plant Materials Operations and Management System (POMS) Training
- Plant Ecology
- Plant-Herbivore Interactions (NEDC)
- Rangeland Ecology (NEDC)
- Wetland Restoration (NEDC)
- Also includes all training identified for Assistant PMC Managers and Biological Science Technicians

(2) Assistant PMC Manager/other specialized positions such as Agronomists and Horticulturists

- Research Report Writing
- Basic Computer Skills and Applications
- Effective Presentation and Instruction
- Experimental Design and Statistical Analysis
- Plant Materials - Field and Laboratory Techniques
- Plant Physiology
- Soil Bioengineering (NEDC)
- Biology of Tree and Shrub Species
- Agrostology: Biology of Cool-Season Grasses
- Agrostology: Biology of Warm-Season Grasses
- Biology of Legume Species
- Biosystematics, Genetics and Plant Breeding Concepts
- Pasture Ecology (NEDC)
- POMS Training
- Plant Ecology

- Plant-Herbivore Interactions (NEDC)
- Rangeland Ecology (NEDC)
- Wetland Restoration (NEDC)
- The above list also includes training identified for Biological Science Technicians

(3) Biological Science Technician

- Introduction to NRCS Computer Operations
- Introduction to Civil Rights Modules 1& 2
- How to use NRCS Directives
- Introduction to NRCS
- Orientation for New Employees
- Partnership Roles and Responsibilities
- Effective Interpersonal Skills
- Farm Management and Agronomy Principles for PMC Biological Science Technicians
- Road Map to Problem Solving Workshop
- POMS Training

(4) Secretary/Program Assistant/Office Automation Clerk

- Introduction to NRCS Computer Operations
- Introduction to Civil Rights Modules 1& 2
- How to use NRCS Directives
- Introduction to NRCS
- Orientation for New Employees
- Partnership Roles and Responsibilities
- Effective Interpersonal Skills
- Managing for Excellence
- Office Management (USDA Grad School)
- The Professional Office Manager (MCI)
- Roadmap to Problem Solving Workshop
- POMS Training

540.53 Working with Native Americans-American Indians and Alaska Natives

A. PURPOSE

The purpose of this section is to improve and enhance Plant Materials Program (PMP) assistance to federally-recognized American Indian and Alaska Natives. Guidance provided in this section will assist the PMP in providing assistance to Tribes in meeting their goal of self-determination and self-sufficiency. It will also establish uniform procedures for delivery of quality assistance to Tribes in addressing their individual Tribal needs. This section provides background information, roles and responsibilities, policy, and exhibits for assisting American Indian and Alaskan Native Tribes.

B. BACKGROUND

The basis for the Government-to-Government relationship between the United States and American Indian and Alaska Natives can be found in the Constitution, treaties, and other laws involving Indian and Native Tribes, including case law.

(i) Public Law 74-46, 49 Stat. 163, 16 U.S.C. 590-a-f, April 27, 1935.

(ii) Public Law 101-624, the 1990 Food Agriculture Commerce and Trade Act (Farm Bill), Section 2501(g).

(iii) USDA Department Regulation 1020-6, Indian Policy, October 16, 1992.

(iv) Executive Order, Consultation and Coordination with Indian Tribal Governments, May 14, 1998.

(v) Executive Order, Tribal Colleges and Universities, October 21, 1996.

(vi) Civil Rights at the United States Department of Agriculture, Report by the Civil Rights Action Team.

(vii) NRCS, Action Plan - Oversight and Evaluation Review of American Indian Program Delivery, 1997.

C. RESPONSIBILITIES

(1) The PMP is committed to assisting federally-recognized tribes in a Government-to-Government relationship through consultative processes.

(2) The Federal Government has "Trust Responsibilities" to American Indian and Alaska Natives. NRCS, as an agency of USDA, has trust responsibilities. The PMP and each of the PMCs have trust responsibilities.

(3) The Plant Materials (PM) Specialist and PMC Manager are to ensure that all activities within the PMP adhere to the NRCS policy. NRCS has established policy on delivery of technical assistance to Tribes through Tribal Liaisons and/or Tribal Contacts. Operating outside of the National Plant Materials Manual and NRCS-established policy causes inconsistency, confusion, and Tribal expectations that may or may not be able to be met through the PMP. The PMP will coordinate with the Tribal Liaisons and/or Tribal Contacts in providing assistance to Tribes. It is important that the PM Specialist and PMC Manager work closely with the Tribal Liaisons and/or Tribal Contacts to ensure their clear and accurate understanding of

the PMP and NRCS policy. For additional information see General Manual Title 410, Part 405.

540.54 Reports and Information Required from PMCs Each Year

The following table summarizes the reports and information which PMCs are required to prepare annually and is intended as a guide for PMCs. The dates indicated are approximates and may change from year-to-year. Refer to the indicated NPMM part and page numbers for details on the specific item.

Item	Date Due	Section
Plant Materials Progress Report of Activities	January 15	541.4(A)
PMC Annual Technical Report	May 1	541.4(B)
Budget Information	May-July	540.2(B)(i)
PMC Business Plan	October 1	540.2(C)(2)
Workload Analysis	October 1	540.2(C)(3)
POMS Exports for the first, second, and third quarters of the fiscal year	last business day of the quarter	541.1(C)
POMS Export for the fourth quarter of the fiscal year (final export of the fiscal year)	second Friday in September	541.1(C)

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.55 Safety and Health Legislation and Regulations Pertinent to PMC Operations

The following statutes and laws require Federal agency compliance to the same extent as non-government entities. In addition, State regulations or requirements established pursuant to the statutes must also be complied with. PMCs should take into consideration these statutes while operating the PMC facility.

(1) Federal Insecticide, Fungicide, and Rodenticide Act

(i) The Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC 136-136y, as amended, regulates the production, distribution, commerce, sale, and use of pesticides in the United States.

(ii) Importance to PMCs: PMCs often use pesticides. All pesticides used by PMCs must be registered and their use must be in conformity with the label. In addition, PMCs must follow all State guidelines for the application, handling, storage, and disposal of pesticides. This usually includes having a certified pesticide applicator at the PMC.

(2) Comprehensive Environmental Response, Compensation, and Liability Act

(i) The Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund Act"), 42 U.S.C. 9601-9657, was enacted on December 11, 1980, to address problems posed by uncontrolled hazardous waste sites, means by which responses can be made to releases of hazardous substances into the environment, identification of potential Hazardous Waste Sites (HWS), preliminary assessment of potential sites, appropriate remedial action if problems are confirmed when there has been a release of a hazardous substance into the environment, emergency responses by the Environmental Protection Agency (EPA) or a capable responsible party, and identification of sites where hazardous substances may be or are located as a result of abandonment or uncontrolled or inadequately controlled use. EPA maintains a list of potentially HWS locations and a system for tracking progress of obligations, allocations, and expenditures for all remedial projects at the National Priority List (NPL) sites.

(ii) Importance to PMCs: Currently, there are no HWS' identified on PMCs. If there is a release of a reportable quantity of a hazardous substance into the environment, the PMC Manager must notify the National Response Center. Liability for cost of cleanup of the hazardous materials may be attached to the PMC or State where the PMC resides if determined after EPA investigation. Hazardous chemicals should be purchased and stored in small enough quantities so if a spill occurred, the agency would not have to report it to EPA. Hazardous chemicals should also only be purchased for immediate or near future use and not stored long term.

(3) Resource Conservation and Recovery Act

(i) The Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901-6991, was enacted in 1976 to regulate the management of hazardous waste and improve waste disposal practices. Subsequent regulations have established reporting, record keeping, performance and operating standards for generators, transporters, and facilities that treat, store, or dispose of hazardous waste. The RCRA requires that anyone owning or operating a facility where hazardous waste is treated, stored, or

disposed of must obtain a permit from EPA or the State, if a State has an authorized Hazardous Waste Management program.

(ii) Importance to PMCs: Hazardous waste is generally not stored at PMCs. PMCs planning to store hazardous waste must obtain more information pertaining to this law prior to storage of such materials. A permit is not necessary for the use, storage, and disposal of gas and oil. Disposal of waste materials should meet EPA and State requirements**.**

(4) Safe Drinking Water Act

(i) The Safe Drinking Water Act, U.S.C. 300f-300j-10, was passed on December 16, 1974. The purpose of the Act is to ensure that potable water systems serving the public meet minimum national standards. The Act authorizes EPA to establish standards for protecting public water systems from harmful contaminants. It requires that Federal agencies which own or operate public drinking water systems comply with these standards. The Safe Drinking Water Amendments of 1977 require, among other items, that Federal agencies comply with all State and local requirements, processes, and sanctions, in addition to Federal requirements.

(ii) Importance to PMCs: PMCs should make sure that their drinking water is safe for consumption, and have the water tested on a regular basis for lead, chemicals, and bacteria if there is a question about suitability of the drinking water for consumption. Lead contamination may be a problem in facilities with lead pipes, typically found in older buildings.

(5) Clean Water Statutes

(i) The Federal Water Pollution Control Act Amendments of 1972 were enacted to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The Act establishes goals for the eventual elimination of discharge of pollutants into receiving waters; a prohibition of discharge of toxic pollutants in toxic amounts; and area-wide waste treatment management planning to ensure adequate controls of sources of pollutants. The Act also sets standards and minimum requirements for the control and abatement of water pollution.

(ii) The Clean Water Act of 1977, 33 U.S.C. 1251-1376, was passed November 16, 1977. Among other items, it requires that Federal agencies comply with all State and local regulations, standards, and processes, in addition to Federal requirements. It also directs Federal agencies to consider alternative methods of wastewater treatment, utilizing recycling and reuse and land treatment processes and techniques.

(iii) Importance to PMCs: PMCs should ensure that any wastewater generated by the PMC, including sewage and irrigation run-off, is properly treated before being discharged. Chemicals should be disposed of in an approved manner by neutralizing or applying wash water from pesticide mixing, according to the label. If the wastewater is hazardous enough, it could come under EPA or State guidelines for disposal.

(6) Toxic Substances Control Act

(i) The Toxic Substances Control Act (TSCA), 15 U.S.C. 2601-2629, was enacted on October 11, 1976. It provides for the regulation of chemical substances that present a hazard to human health or the environment. EPA primarily regulates the manufacture and processing of commercial distribution of chemical substances and mixtures. However, EPA also regulates the use and disposal of certain substances by

noncommercial entities, including Federal agencies. TSCA and the regulations promulgated under the Act pertain to the commercial and industrial production, use, and disposal of toxic chemicals. USDA concerns involve the provisions of the statute and regulations covering facilities and sites which may contain PCBs and asbestos.

(ii) Importance to PMCs: Most important to PMCs is the issue of asbestos and PCBs. PMCs should make sure that any substances believed to be asbestos are tested and abated, if necessary. The NRCS asbestos policy may be found in General Manual Title 360, Part 420, Subpart T.

(7) Clean Air Act

(i) The basic purpose of the Clean Air Act (CAA), 42 U.S.C. 7401-7642, is to protect and enhance the quality of the Nation's air resources to promote the public health and welfare and the productive capacity of its population. The CAA recognizes that prevention and control of air pollution at its sources is the primary responsibility of States and local governments.

(ii) Importance to PMCs: PMCs have the potential to generate air contaminants, especially during prescribed burning of study plots. Most important might be management activities that are concerned with natural occurrences, such as fire, having attendant air quality impacts.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.56 Outline for Safety Inspections at PMCs

The following list represents items which may be included in a safety inspection of a PMC. Guidelines found in General Manual Title 360, Part 420 should be followed as well. This list may not be inclusive nor pertain to all PMCs.

(1) General Safety Coordination

(i) Safety coordinator(s) should be appointed for the PMC and included on all contact sheets for emergency response.

(ii) Safety updates should be provided in staff meetings and in writing if needed.

(iii) Safety training should be provided to all employees at a level necessary for performance of the employee's job.

(iv) State NRCS safety coordinators should be identified.

(2) General Health Items

(i) Limit the amount of time employees work in confined spaces.

(ii) Appropriate clothing should be worn by employees, i.e., work boots for field work, hats for sun protection.

(iii) Conduct a job hazard analysis as needed.

(iv) Instruction on defensive driving and winter driving techniques may be provided through the State office.

(v) HIV/AIDS information.

(vi) Workplace violence information.

(vii) Lyme disease information.

(viii) Information on exercise or fitness programs, cancer awareness, and proper nutrition should be provided as available.

(ix) Travel safety information provided as available.

(x) A minimum of one PMC staff member should be trained in CPR and First Aid techniques, if possible, due to the many potential hazards which exist at a PMC.

(xi) Handicap access provided to PMC buildings as needed or appropriate so that facilities do not become a safety hazard to handicapped individuals.

(xii) Hantavirus pulmonary syndrome information.

(3) PMC Facility

(i) Structures and equipment used on a daily basis are in good working order.

(ii) Adequate lighting is available for tasks.

(iii) Building and facility security is adequate to protect staff members, i.e., adequate lighting around buildings and parking lots at night, security systems installed and functional, terrorist training, and sign in sheets for people visiting the Center.

(iv) Asbestos:

- Survey and analysis of suspected materials completed;
- Abatement has been done; and
- If abated asbestos present, contractors doing remodeling work should be notified of possible asbestos content.

(v) Radon surveys as needed.

(vii) Office safety given same attention as field safety.

(viii) Fire safety inspection completed on a regular basis:

- Combustibles not located near electrical panels, boilers, and heating units;
- Adequate space around electrical panels, boilers, and heating units;
- Signs posted on doors, which must be left open during business hours;
- Boxes and materials not blocking hallways and exit paths;
- Fire lanes marked for "no parking;"
- Oily rags stored in metal container with self-closing lid;
- Fire extinguishers properly positioned, mounted, and checked annually;
- Smoke detectors and carbon monoxide detectors in place and inspected or serviced regularly; and
- Regularly used extension cords should be replaced with permanent outlets.

(ix) First aid and emergency response:

- Supplies adequate and clearly identified; and
- Contact numbers available.

(x) Hazardous materials spills:

- Spill kits adequately stocked and accessible;
- Cleanup instructions identified;
- Emergency numbers clearly identified in appropriate locations; and
- Emergency response sheets for pesticides, chemicals, and petroleum should be posted and kept current.

(xi) Lock-out/tag-out procedures in place and followed.

(4) Equipment and Field Operations

(i) Agricultural equipment:

- Basic equipment safety instructions and protocols established;
- Heavy equipment safety covered; and
- Specialized equipment, i.e., combines, safety has been covered.

(ii) Operation of tools and equipment:

- Instruction on basic hand tool use and care;
- Machine operation and safety instructions conveyed;
- Proper training consistent with guidance found in 29 CFR 1910.178 has been received when powered industrial trucks (forklifts) are used; and
- Proper jacks, supports, and blocking used when servicing equipment.

(iii) Seed cleaning:

- Dust - provide air filtering and/or dust masks
- Noise - provide ear protection

- Moving parts - guards installed and warning markings as needed.

(5) Pesticides and Chemicals

(i) Pesticide/chemical handling:

- Respirators proper size and fit-tested by industrial hygienist;
- Adequate protective clothing provided for each individual;
- Worker Protection Standards followed for handling and use of pesticides;
- Chemical hygiene (lab) instructions and protocols in place; and
- Pesticide applicator's license displayed or carried with applicator according to State regulations.

(ii) Pesticide/chemical use and application:

- Proper application logs maintained;
- Signs used to mark treated areas and re-entry time; and
- Mixing area clearly identified and protected from running off the site.

(iii) Pesticide/chemical storage:

- Pesticides stored under approved storage conditions;
- Adequate ventilation in storage area;
- Pesticides and industrial chemicals (i.e., lubricants, cans of petroleum products, etc.) inventoried and safely stored in approved cabinets or storage areas; and
- MSDS sheets for each chemical used or stored are kept on-site and available for review.

(iv) Hazardous waste disposal protocols established and followed.

(v) Fertilizers stored and handled as appropriate.

(6) Miscellaneous

(i) Ergonomics of work stations, hand tools, etc., given consideration.

(ii) Fire and burning safety considered (field and trash pile burning).

(iii) Animal hazards (i.e., poisonous spiders, snakes, cattle) considered on the job site.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

PRESCRIBED BURN PLAN FOR A PLANT MATERIALS CENTER

PMC:_____ Date:_____

Address:_____ Phone:_____

Contact:_____

Acres to burn: _____ Planned date of burn:_____

Location: County:_____ Township:_____ Range:_____

Section:_____ Legal Description: _____

A. Description of burn area: _____

Land use: _____

1. Present plant cover

   a. Woody Plants:

Species	Height (ft.)	Average basal diameter (in.)	Canopy (%)	Fuel load (lbs/acre)

   b. Herbaceous Plants:

Species	Height (ft.)	Fuel load (lbs/acre)	Field Number	Wind Direction Required

Species	Height (ft.)	Fuel load (lbs/acre)	Field Number	Wind Direction Required

c. Total Estimated Fuel Load:

Woody and herbaceous plants _____ lbs/acre

2. Slope%_____ Aspect_____ Soil Type_____

3. Objective (CHECK ONE)

Stimulate forbs Stimulate grass seed production

Reduce wildfire hazard Remove litter

Reduce insect/disease/weed

Other Reason(s) for Burning:

4. Timing of Burn (CHECK ONE)

1-3" New growth stage

Before plant growth (forbs only)

Other (e.g., fall burn) _____

C. Acceptable conditions for prescribed burns:

Relative Humidity (%)	**Wind Speed (MPH)**						
	4	**6**	**8**	**10**	**12**	**14**	**16**
25-34	**A**	**A**	**A**	**XXXX**	**XXXX**	**XXXX**	**XXXX**
35-39	**A**	**A**	**A**	**A**	**XXXX**	**XXXX**	**XXXX**
40-44	**A**	**A**	**A**	**A**	**A**	**XXXX**	**XXXX**
45-59	**A**	**A**	**A**	**A**	**A**	**A**	**XXXX**
60-69	**XXXX**	**A**	**A**	**A**	**A**	**A**	**A**
70-79	**XXXX**	**XXXX**	**A**	**A**	**A**	**A**	**A**
80-89	**XXXX**	**XXXX**	**XXXX**	**A**	**A**	**A**	**A**
A = Acceptable; XXXX = Not acceptable							

1. Comments: (firing method, starting time, wind direction, soil surface moisture condition, etc.)

_____

_____

_____

2. Ignition plan and/or firing sequence (see plan map)

_____

* Parties igniting a prescribed burn may be liable for damages resulting from the fire and control cost, should fire escape the designated area.

D. Preparation of Area for Burning:

1. Firebreak construction:

   a. Firebreak widths will be equal to or greater than five times the height of adjacent vegetation.

   b. Burned firebreaks—being essentially devoid of fuel and of the proper width—can provide protection from fire escape (width 5—30 ft.)

   c. A combination of closely mowed vegetation and a bare ground strip firebreak can provide adequate protection, if combined widths are _____feet wide.

   d. kind of firebreak _____

   width feet _____ length feet _____

   date to apply _____

   e. Existing firebreaks, streams, roads, tilled fields, etc. (show on plan map). Describe.

   _____

   _____

   _____

   _____

   f. Potential hazards are present within the burn area:

   e.g.: power lines, snags, structures, etc. (show on plan map)

   yes no

   If yes, explain precautions:

   _____

   _____

   _____

   _____

   _____

E. Adjacent Areas (outside of burn area):

1. Special precaution areas: e.g. leaf litter, dry grass, roads, structures, smoke dispersion, etc.

   _____

   (show on plan map)

   Precautions needed:

   _____

2. Backup or secondary firebreak locations: (identify)

   _____

F. Equipment/Personnel Needs:

1. Safety equipment:

   _____

2. Tools/equipment needed for burn:

   rakes swatter torches pumper truck

   backpack pump

   other: _____

3. Personnel needed for burn:

   _____

4. Water needs: filling source portable tank

G. Special considerations:

1. Precautions to prevent fire escape: _____
2. Suppression plan if fire escapes: _____
3. Patrol and mop-up plan: _____

H. Emergency Phone Numbers:

1. Local fire department: _____
2. Sheriff: _____

I. Reviews and Approvals

Technical Review

Plan Prepared By:_____ Date: _____

Plan Checked By:_____ Date: _____

Approved By (burn boss):_____ Date: _____

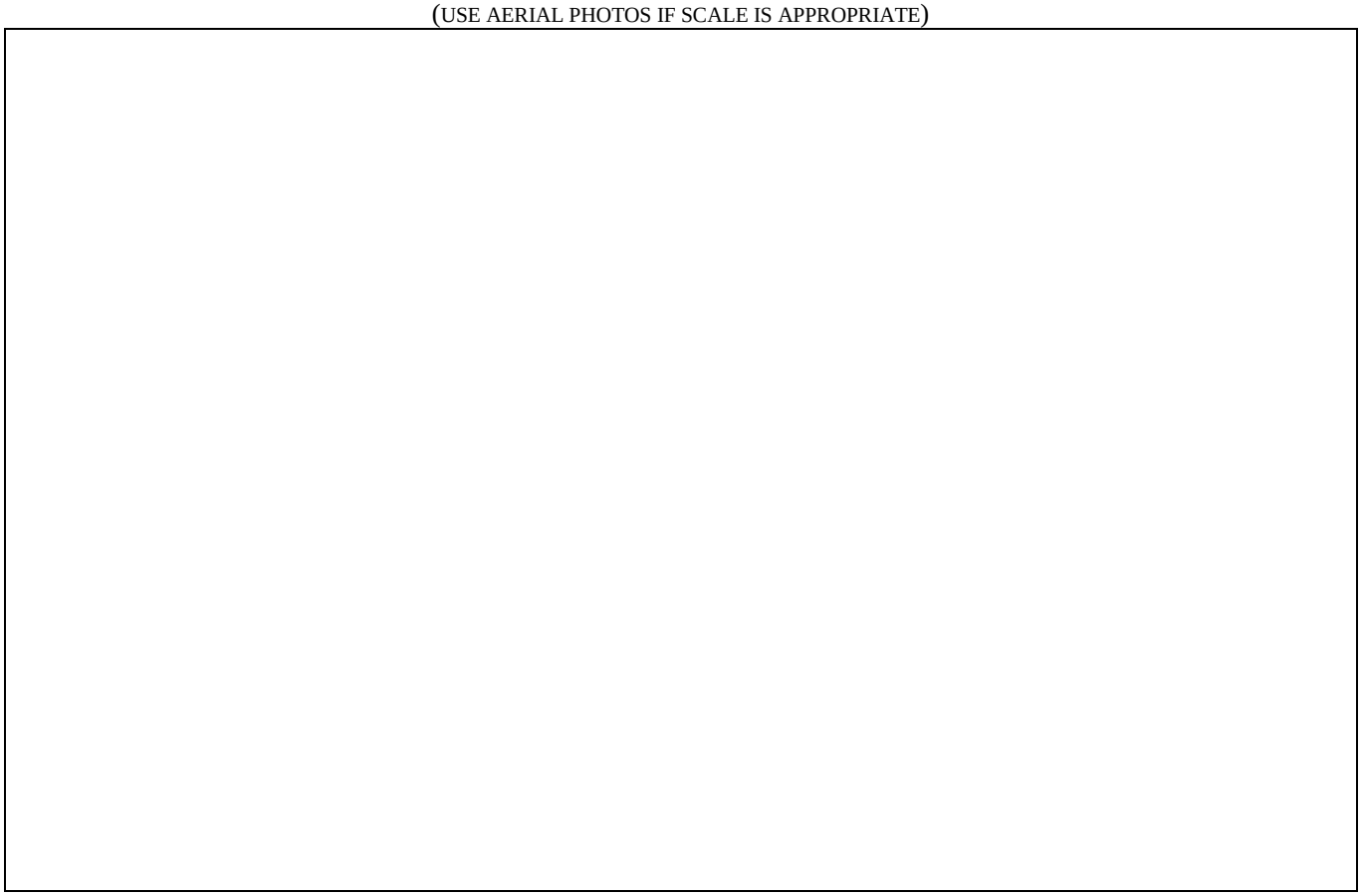
Administrative Approval

NRCS STC/SRC _____ Date:_____

Landowner: _____ Date: _____

PRESCRIBED BURN PLAN MAP

(USE AERIAL PHOTOS IF SCALE IS APPROPRIATE)



(IDENTIFY LAND USE IN ADJACENT FIELDS)

LEGEND

Approximate Scale: _____ inches = mile

B-B-B-B-B	Burned Firebreak	W	Water source
P-D-P-D-P	Plowed/Disked Firebreak	(A, B, etc.)	Firing crews
S-G-S-G	Short Grass Firebreak	(1, 2, etc.)	Firing sequence
M-M-M	Mowed Firebreak	(A1) $\rightarrow \rightarrow \rightarrow$	Firing direction
—WIND—	Wind Direction		

Other legends or information: _____

Plan prepared by: _____ Date: _____

Plan checked by: _____ Date: _____

Landowner: _____ Date: _____

PRESCRIBED BURN APPLICATION

PMC: _____ Date:_____

Address:_____ Phone:_____

Contact: _____

Acres to burn: _____ Planned date of burn:_____

Location: County:_____ Township:_____ Range:_____

Section:_____ Legal Description: _____

A. Preburn Checklist: (day of burn)

1.	Weather forecast favorable	yes	no
2.	Necessary firebreaks constructed	yes	no
3.	Potential hazards accounted for	yes	no
4.	Special precaution areas noted	yes	no
5.	Backup/secondary firebreak locations noted	yes	no
6.	Safety equipment adequate	yes	no
7.	Tools/equipment onsite	yes	no
8.	Personnel needed available	yes	no
9.	Special considerations reviewed with crew	yes	no
10.	Actual weather at burn:		
	Temperature_____ Humidity_____ Wind Speed_____		
	Cloud Cover_____% Fronts or changes expected_____		
11.	Appropriate neighbors informed	yes	no
12.	Notification of units of government made:	yes	no
	Local fire department (phone) _____		
	USFS (phone) _____		
	Sheriff (phone) _____		
	DNRC (phone) _____		
	Other: (phone) _____		
13.	Necessary permits obtained	yes	no
14.	Test burn performed as expected	yes	no

Do not proceed if any of these responses are checked "no."

Checked by:_____ Date: _____

B. Post Burn Evaluation: (day of burn)

1. Burning method used: _____
2. Start time of test burn beginning time am pm
   Mop-up completed am pm
   ending time am pm
3. Observed change in weather conditions during the burn:
   _____
   _____
4. Fire behavior: (check any that apply)
   a. Spotting: one few many
   b. Difficult to control yes no
   c. Convection column yes no
   d. Fire whirls yes no
5. Objective of burn met: _____
6. Post-burn management plan (additional treatment needs):
7. Future burn needed: yes no
   estimate when:
8. Other comments:
   _____

Checked by:_____Date: _____

* Parties igniting a prescribed burn may be liable for damages resulting from the fire and control cost, should fire escape the designated area.

C. Follow up Evaluation: (60-90 days after burn)

1. Objectives of burn met:
   _____
2. Post-burn management plan (additional treatment needs):
   _____
3. Future burn needed: yes no If yes, when? _____
   For what purpose?
   _____
4. Other comments:
   _____

540.59 Example of a PMC Business Plan

Plant Materials Center

Business Plan – FY2010

Introduction:

The following is the Business Plan for the Plant Materials Center. The purpose of this document is to serve as an outline of activities to be used to carry out the operation, evaluation, and activities of the Center. Attach yearly performance goal spreadsheet at end for reference and to assist with tracking performance.

Section I - Project and Study Activities - Initial Evaluation, Advanced Evaluation, Off-center, Inactive

Number	Title/Activity	Person Resp.	Description of Progress	Due Date	Complete Date
08I073J	IE antelope bitterbrush (*Purshia tridentata*)				
	Collect and process seed/cuttings				
	Plant seeds in greenhouse	BT/BA		07/01	
		BT/BA		09/30	
08I160K	IE thinleaf alder (*Alnus tenuifolia*)				
	Develop plot management plan	HT		10/01	
	Evaluate plots -spring	HT		05/25	
	Evaluate plots - fall	HT		09/25	
	Compile and summarize date from last year	HT		11/01	
13A120G	Evaluate eastern gamagrass for Forage Quality				
	Develop plot management plan	HT/BT		10/20	
	Fertilize plots	BT		Spr/Sum	
	Schedule clippings - 3 times	BT		Summer	
	Prepare samples for analysis	HT		08/25	
	Evaluate sample data	HT		Yearly	
	Summarize data and develop report	HT		03/15	

22A002S	Selection of *Spartina spartinea* for a sexually propagated cultivar Maintain PMC evaluation plots Select and transplant superior seed producing accessions Increase selected accessions Summarize performance data	 BT/BA BT/BA HT HT		 Ongoing 09/01 09/15 05/30	
48A200J	Nutrient Quality of Selected Forbs/Legumes for White-Tailed Deer Develop management plan/schedule Evaluate off-center sites - spr/fall Schedule clippings - 4X Evaluate and summarize data	 MGR BT BT HT		 10/30 04,09 Quarterly 03/01	

Section II - Field Operations/Seed & Plant Increase Activities - Seed Increase, Foundation Seed Production, Facilities/Equipment

Number	Title/Activity	Person Resp.	Description of Progress	Due Date	Complete Date
59S025D	**Foundation Increase of 'Crockett' herbaceous mimosa**	MGR			
	Develop field management plan	BT/BA		11/01	
	Apply fertilizer	BT		Seasonal	
	Carry-out required irrigation	BT		Summer	
	Inspect fields and rogue out off-type plants	BT/BA		08/30	
	Schedule field inspections	BT/BA		08/30	
	Harvest current year crop			09/30	
04S222P	**Increase of alkali sacaton, (*Sporobolus airodies*)**				
	Apply field management plan, fertilize, irrigate	BT		10/30	
	Field inspections	BT			
	Harvest crop	MGR		05/30	
	Clean and store seed	BT/BA		09/30	
		BT/BA		09/30	
	Harvest Seed from PMC Breeder Blocks				
	Determine anticipated needs	MGR/PMS		10/01	
	Develop maintenance and harvest schedule	MGR		10/01	
	Harvest selected cultivars	BT/BA		09/30	
	Clean and store seed	BT/BA		09/30	
	Field Management/Operations				
	Develop field management plan	MGR		Oct	
	Evaluate irrigation system	BT		Jan	
	Locate new plantings	MGR/BT		Nov	
	Develop fertilizer needs	BT		Mar	

	Facilities Management Plan				
	Review equipment status and needs	MGR			
	Equipment inspection	BT			
	Monthly safety inspection	FM			
	Snow removal	Staff			
	Yard/landscape maintenance	Staff			
	Repair/Maintenance of Irrigation System				
	Develop work schedule	MGR		12/01	
	Develop list of materials and cost estimates	BT		01/10	
	Repair conveyance system	BT/BA		03/30	
	Perform maintenance to system	BT/BA		Seasonal	

Section III - Technology Transfer Activities - Reports, Plant Releases, Written and Oral Information, Training

Number	Title/Activity	Person Resp.	Description of Progress	Due Date	Complete Date
	Develop Annual Technical Report	MGR/PMS			
	Summarize project(s) data				
	Prepare report	MGR/PMS			
	Printing	SE			
	Distribution	MGR/SE			
20A222A	**Naming and Select Release of dotted gayfeather**				
	Develop release notice	MGR/PMS		Jan	
	Review names for clearance	MGR		Jan	
	Submit information for review	MGR		Jan	
	Prepare articles to advertise release	MGR/PMS		Mar	
	Assist State NRCS PAS to produce video on PMC releases	MGR		Sept	
48A226T	**Develop training module to assist NRCS field offices with grass seeding**				
	Develop outline	MGR/PMS		1st Qtr	
	Complete literature review	PMS		1st Qtr	
	Complete draft	MGR/PMS		Feb	
	Review and update	MGR		May	
	Develop publish and distribution schedule	MGR/SE		June	
	Prepare and present paper at SAAS meeting	MGR		12/01	
	Produce/revise four plant guides				
	Arizona cottontop	MGR/SE		11/01	
	'Santa Rita' Four-wing saltbush	MGR/SE		02/02	
	'Sonora' black grama	MGR/SE		05/01	
	'Seco' barley	MGR/SE		05/01	

	Deliver plant guides and fact sheets to NPMC for posting on PMC homepage	MGR		Sept	
	OJT Training for Staff				
	Computer Use/Programs	SE		Jan	
	Plant Breeding	MGR/AGR		Mar	
	Pesticide Safety	FM/GHM		May	
	Pest Applicator License	BT		Seasonal	
	Develop technical notes for FO use				
	PM for Wildlife	FM		11/30	
	Bioengineering and PM	MGR		02/01	
	Cool Season Forages	HT		06/01	

Section IV - Administration and Operations - Budget, Long-Range Plan, Business Plan, Meetings					
Number	**Title/Activity**	**Person Resp.**	**Description of Progress**	**Due Date**	**Complete Date**
	Update Centers Long-Range Plan	MGR/PMS		06/30	
	Prepare Business Plan for FYXX **and submit to PMS for review**	MGR		09/15 09/30	
	Develop specifications and cost data for facilities and equipment needs ID in 5 year replacement plan	MGR		04/01	
	Develop Workload Analysis for PMC Review WA and approve	MGR MGR		05/30 06/30	
	Performance appraisals for staff Mid-year review Evaluate current years Develop new appraisals	 MGR MGR MGR		 04/30 10/30 11/30	
28A132B	**Hire Seasonal Employees for NPS Project** Advertise and Interview applicants Recommendations for hire to SO Complete application process Have seasonal on staff	 MGR/FM MGR/FM MGR MGR		 03/30 04/15 05/01 05/30	
	Update Staff EDP Manager All other PMC positions	 PMS MGR		 10/30 10/30	
	Conduct safety lecture at staff mgt.	FM/MGR		Each Q	
	Prepare 3-year budget plan for Adv. Mtg	MGR		07/30	
24A330B	**Prepare budget worksheet for new NPS agreement** Review IA agreement Calculate staff and monies needed Develop time schedule Submit to NPS for approval	 MGR MGR MGR MGR		 11/01 12/15 12/30 01/10	

	Evaluate work with cooperators and determine if new agreement are needed	MGR		Quarterly	
	Maintain PMC budget within limits				
	Review and pay monthly recurring bills	MGR/SE		Weekly	
	Reconcile bills with on-line program	MGR/SE		2-Weeks	
	Prepare reports for review and analysis	MGR/SE		Monthly	
	PMC State Advisory Meeting				
	Notify members of proposed meeting dates	MGR/SE		04/01	
	Develop agenda and distribute to members	MGR/SE		05/01	
	Prepare last years minutes for review	MGR/SE		05/01	
	Prepare progress report	MGR		05/01	
	Prepare Center for meeting/tour	BT/BA		05/01	
	Support the EO/CR activities in the state and have information presented at staff conferences				
	Quarterly Meetings	MGR		Quarterly	

540.60 Example of a PMC Workload Analysis

PLANT MATERIALS CENTER
STAFF WORKLOAD ANALYSIS – FY2006

	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
	FTE=	**1.00**	**FTE =**	**1.00**	**FTE=**	**0.90**	**FTE=**	**1.00**	**FTE=**	**1.00**	**FTE=**	**0.35**	**FTE=**	**0.15**		
	$/hr.=	**32**	**$/h.=**	**23**	**$/hr.=**	**15**	**$/hr.**	**15**	**$/hr.**	**11**	**$/hr.**	**8**	**$/hr.**			
Category/Item	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$
Projects and Studies																
IE Antelope Bitterbrush	200	6,400	75	1,725	10	150	100	1,500	150	1,650	30	240	40	0	605	11,665
IE Thinleaf Alder	50	1,600	200	4,600	10	150	50	750	75	825	0	0	40	0	425	7,925
Evaluate Eastern Gamagrass – Forage	220	7,040	30	690	30	450	100	1,500	175	1,925	45	360	70	0	670	11,965
Spartina spartinea - dev. of sexually prop. Cv.	50	1,600	230	5,290	10	150	75	1,125	25	275	60	480	20	0	470	8,920
Nutrient Quality of Forbs/Legumes for Deer	10	320	150	3,450	15	225	50	750	30	330	30	240	20	0	305	5,315
Subtotal	530	16,960	685	15,755	75	1,125	375	5,625	455	4,705	165	1,320	190	0	2,475	45,490
Field Operations/Maintenance																
Foundation Increase - 'Crockett	10	320	30	690	0	0	75	1,125	100	1,100	50	400	0	0	265	3,635
Increase of Alkali Sacaton	10	320	30	690	0	0	75	1,125	100	1,100	0	0	15	0	230	3,235
Harvest Seed from PMC Breeder Blocks	20	640	50	1,150	0	0	100	1,500	150	1,650	50	400	20	0	390	5,340

PLANT MATERIALS CENTER
STAFF WORKLOAD ANALYSIS - FY99

	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
Category/Item	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$
Field Management/ Operations	50	1,600	120	2,760	15	225	450	6,750	350	3,850	200	1,600	20	0	1,205	16,785
Facilities Management																
Buildings	20	640	25	575	0	0	70	1,050	100	1,100	25	200	0	0	240	3,565
Landscape	20	640	25	575	0	0	50	750	150	1,650	125	1,000	20	0	390	4,615
Equipment	50	1,600	50	1,150	40	600	75	1,125	100	1,100	30	240	10	0	355	5,815
Repair/Maintenance of Irrigation System	0	0	10	230	0	0	100	1,500	30	330	10	80	0	0	150	2,400
Subtotal	180	5,760	340	7,820	55	825	995	14,925	1,080	11,880	490	3,920	85	0	3,225	45,130
Technology Transfer																
Develop Annual Technical Report	30	960	50	1,150	100	1,500	20	300	0	0	0	0	0	0	200	3,910
Naming and Select Release of Dotted Gayfeather	20	640	10	230	10	150	0	0	0	0	0	0	0	0	40	1,020
Assist State PAS w/ video on PMC Releases	30	960	20	460	40	600	0	0	0	0	0	0	0	0	90	2,020
Develop training to assist FOs with grass seeding	30	960	50	1,150	30	450	30	450	0	0	0	0	0	0	140	3,010
Prepare and present paper at SAAS meeting	50	1,600	0	0	5	75	0	0	0	0	0	0	0	0	55	1,675
Produce/Revise four plant guides	50	1,600	40	920	25	375	0	0	0	0	0	0	0	0	115	2,895
Prep and deliver written info to NPMC for Internet	10	320	10	230	80	1,200	0	0	0	0	0	0	0	0	100	1,750

PLANT MATERIALS CENTER
STAFF WORKLOAD ANALYSIS – FY99

	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
Category/Item	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$
Develop technical notes for FO use	30	960	50	1,150	15	225	0	0	0	0	0	0	0	0	95	2,335
Subtotal	250	8,000	230	5,290	305	4,575	50	750	0	0	0	0	0	0	835	18,615
Administration and Operation	40	1,280	10	230	5	75	0	0	0	0	0	0	0	0	55	1,585
Update PMC Long-Range Plan	40	1,280	15	345	5	75	0	0	0	0	0	0	0	0	60	1,700
Prepare Business Plan for FY00	40	1,280	40	920	0	0	0	0	0	0	0	0	0	0	80	2,200
PMC Advisory Meeting	20	640	10	230	12	180	10	150	0	0	0	0	0	0	52	1,200
Develop Workload Analysis for PMC	10	320	10	230	3	45	5	75	0	0	0	0	0	0	28	670
Update facilities & equip. replacement plan	40	1,280	10	230	5	75	5	75	2	22	2	16	0	0	64	1,698
Personnel - summer hires, performance, update EDP's	50	1,600	40	920	10	150	40	600	30	330	5	40	0	0	175	3,640
Safety - training, reviews	130	4,160	30	690	75	1,125	0	0	0	0	0	0	0	0	235	5,975
Budget - prepare, track, update	50	1,600	30	690	80	1,200	30	450	0	0	0	0	0	0	190	3.940
Procurement -bidding, purchases, tracking	15	480	15	345	15	225	15	225	15	165	5	40	0	0	80	1,480
Support EO/CR activities	25	800	25	575	25	375	25	375	25	275	5	40	0	0	130	2,440
Staff training	50	1,600	50	1,150	650	9,750	5	75	0	0	0	0	0	0	755	12,575
Office Duties- phone, filing, mail, etc.	180	5,760	145	3,335	60	900	75	1,125	35	385	5	40	5	0	505	11,545

PLANT MATERIALS CENTER
STAFF WORKLOAD ANALYSIS – FY99

	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
Category/Item	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$	Hrs.	$$
Develop technical notes for FO use	30	960	50	1,150	15	225	0	0	0	0	0	0	0	0	95	2,335
Subtotal	250	8,000	230	5,290	305	4,575	50	750	0	0	0	0	0	0	835	18,615
Administration and Operation	40	1,280	10	230	5	75	0	0	0	0	0	0	0	0	55	1,585
Update PMC Long-Range Plan	40	1,280	15	345	5	75	0	0	0	0	0	0	0	0	60	1,700
Prepare Business Plan for FY00	40	1,280	40	920	0	0	0	0	0	0	0	0	0	0	80	2,200
PMC Advisory Meeting	20	640	10	230	12	180	10	150	0	0	0	0	0	0	52	1,200
Develop Workload Analysis for PMC	10	320	10	230	3	45	5	75	0	0	0	0	0	0	28	670
Update facilities & equip. replacement plan	40	1,280	10	230	5	75	5	75	2	22	2	16	0	0	64	1,698
Personnel - summer hires, performance, update EDP's	50	1,600	40	920	10	150	40	600	30	330	5	40	0	0	175	3,640
Safety - training, reviews	130	4,160	30	690	75	1,125	0	0	0	0	0	0	0	0	235	5,975
Budget - prepare, track, update	50	1,600	30	690	80	1,200	30	450	0	0	0	0	0	0	190	3.940
Procurement -bidding, purchases, tracking	15	480	15	345	15	225	15	225	15	165	5	40	0	0	80	1,480
Support EO/CR activities	25	800	25	575	25	375	25	375	25	275	5	40	0	0	130	2,440
Staff training	50	1,600	50	1,150	650	9,750	5	75	0	0	0	0	0	0	755	12,575
Office Duties- phone, filing, mail, etc.	180	5,760	145	3,335	60	900	75	1,125	35	385	5	40	5	0	505	11,545

540.61 Guidelines for Program Evaluations or other reviews of a Plant Materials Program

Guidelines for Evaluations of a Plant Materials Center or Program

The following items may be covered in a Program Review or other evaluation of a Plant Materials Program (PMP). Specific items to be covered will depend on the type of PMP being reviewed, i.e., PMC, PMS, or State program, and known issues which need to be reviewed for the program. This is only a guide of items that may be covered in a review.

Requirement	**Assigned**	**Complete**	**Comments**
Objectives and procedures of review.			
Review report of last PMC or Program Review.			
Review the organizational structure of the PM program within the service area and how it functions.			
Review report of previous State Conservationist's Advisory Committee (or comparable Advisory Committee) and progress made on decisions and actions.			
Review supplements to NPMM and impact on the PMC or program being reviewed. Have the supplements been forwarded to the NPL?			
History of the PMC, i.e., how old is the PMC, what activities have taken place and how they have changed over the history of the PMC?			
A written summary of studies and activities at the PMC should be provided near the beginning of the review.			
A tour of the PMC to look at items addressed below should be conducted near the beginning of the review. This will provide an overall picture of what activities the PMC is involved in.			

Requirement	Assigned	Complete	Comments
Operation of the PMC Physical Facilities Land adequacy and tenure (PMC and field evaluation sites available for PMC use). Water supply - domestic (date and results of last water tests if on well) and irrigation supplies. Infrastructure - are electric, water, natural gas lines, garbage disposal, and security adequate for the PMC? Inventory of Buildings - adequacy, maintenance, and needs - present information in table form as appropriate.			
Equipment Inventory - adequacy and replacement - "Equipment" includes farm and field equipment, office equipment, computer equipment, and audio/visual equipment regardless of cost. Are inventory records kept up to date for the PMC? 5-year acquisition and replacement schedule. Is equipment adequately maintained and are maintenance records kept?			
Financial Management of the PMC Budget. Who is responsible for maintaining the budget? Who prepares the budget request for the next fiscal year? How much is the State office offset and overhead? How good is the fund accountability for the PMC? A copy of the current year's budget should be available for the review committee. Reimbursable Projects – who, what, how much?			

Requirement	Assigned	Complete	Comments
Purchases and Procurement How are suppliers identified or sources for materials decided on? What records are kept at the PMC on expenditures? How are purchases made or handled at the PMC?			
Safety and Health Issues of PMC Buildings, Equipment, and Operations When was the last safety review conducted for your facility? Who conducted the last safety review? Does the PMC comply with Occupational Safety and Health Administration (OSHA), other Federal, State, or Local regulations as found in the NPMM (Parts 540.2(B)(iv) and 540.55)? Are current codes of State air, water, and waste quality standards available? Does the PMC have a safety coordinator, hazardous materials coordinator, and plans for emergency hazardous materials clean-up? Are regular safety meetings held? Are fire extinguishers, smoke detectors, first aid kits, etc., in working order and stocked? Have health issues been addressed? Is the storage, use, and disposal of pesticides/hazardous materials in compliance with Federal, State, NRCS, and NPMM (Parts 540.2(B)(iv) and 540.55) policy and guidelines? Are water quality issues (domestic water supply, irrigation tailwater, run-off) dealt with at the PMC? Are there fuel tanks at the PMC? Are they in compliance with current Federal and State regulations? Are their prescribed burns at the PMC? Do they follow NRCS policy? Provide an example of a burn plan. The review committee should look for non-compliance of the above items during the tour of the facility.			
Requirement	**Assigned**	**Complete**	**Comments**

Physical appearance and planning for the PMC. a) Does the PMC have an adequate conservation plan and is it being followed? Is a history of land use, maintenance, and treatment available for the PMC? Has the PMC had a cultural resource assessment completed?			
What is the appearance and quality of the facilities, grounds, and fields? Are there any demonstration areas at the PMC and how useful are they? Is the U.S. flag flown? Is the PMC sign up-to-date? Are local signs directing visitors to the PMC needed and, if so, are they in place and maintained? Are required Equal Employment Opportunity (EEO) statements, labor laws, worker's compensation, and other personnel information posted in the PMC office? Have provisions been made to accommodate physically challenged persons at the PMC?			
State(s) Long-Range Plan (LRP) for plant materials activities Are the LRPs developed on a State, multi-state, PMC service area, or regional level? Is the LRP current? Are these LRPs and/or plant materials needs and objectives being incorporated into State or Regional Strategic Plans? How are these LRPs developed? Do they provide the guidance outlined in Part 540.1? Are these LRPs of sufficient detail and scope to direct the development of the State PMP and PMC LRP to address the priority resource needs for the State? Are these LRPs filed as a supplement to the NPMM?			

Requirement	Assigned	Complete	Comments
PMC LRP for plant materials activities Does the PMC have a current LRP? Are the priorities established and specific needs in the LRP consistent with the objectives and priorities of the NRCS Goals and Objectives of the Strategic Plan (Part 539.20)? Does the PMC LRP relate to the priority needs established in the State(s) LRP for plant materials? How was the current LRP developed? Refer to Part 540.2(C)(1) for LRP development. Is the PMC LRP of sufficient detail and scope to direct the annual operations of the PMC to address the priority resource needs for the PMC service area? Does the PMC LRP have adequate non-Federal input?			
PMC Business Plan (formerly the Plan of Operations) Are the activities conducted at the PMC consistent with the PMC LRP? Is the Business Plan detailed enough to adequately direct the activities of the PMC? How is the Business Plan developed, and do others participate in the development or review of the Business Plan? Refer to Part 540.2(C)(2) for Business Plan development. Is the Business Plan reviewed periodically through the year? Are the items in the Business Plan being completed and products being delivered? How many of PMC releases are being maintained on the Center? What is acreage of each release in production at PMC? Are adequate amounts of germplasm being developed to meet needs?			

Requirement	Assigned	Complete	Comments
PMC Workload Analysis Is there a Workload Analysis for the PMC? (See Section 540.2(C)(3).) How is staff determined? Is staff adequate?			
Are PMC staff familiar with accessing the eFOTG, and is the FOTG being followed as appropriate for plantings being installed either on the PMC or off-center?			
PMP Procedures Is there a current copy of the NPMM maintained at the PMC and/or by the PMS? Does the plant materials staff use the NPMM? Are program activities consistent with policies and procedures contained in the NPMM? Are plans being prepared for all studies (see Section 540.12)? Is study information inputted into the current PM database? Plans clearly indicate purpose of study, expected product, and planned completion date? Plans have adequate literature review. Is plant materials inventory being maintained? Are the procedures for releasing plants being followed (see Section 540.34)? What is number of releases over last 5 years by release class? Is recommended use consistent with class of release? What is proposed 3-5 year release schedule? Pre-release activities Number of new accessions entered/currently pending over last 3 years? Number of active initial evaluation plantings installed/pending/evaluated over last 3 years? Number of active advanced evaluation plantings installed/pending/evaluated over last 3 years?			

Requirement	Assigned	Complete	Comments
Number of active off-center plantings installed/scheduled? Number of ICSTs/ observational plantings evaluated for other PMCs? How many technology development studies are installed/pending/evaluated? Planting quality Do assemblies in active studies meet NPMM requirements (Sections 540.32 and 540-79)? Are trial designs statistically sound? Is the Plant Materials Environmental Evaluation being completed for all releases? When in testing process is form being completed? Are the guidelines for database maintenance and Information Technology being implemented? Are reports being completed? Plant Materials Operations and Management System (POMS)? When? Annual Report on PM activities and accomplishments? When? Are the products outlined in the PMC Business Plan, study plans, and Workload Analysis being completed in a timely manner? How many studies are 1-3 years in age? How many studies are 4-6 years in age? How many studies are over 7 years in age?			
Technology Transfer Is the Plant Materials Progress Report of Activities current? What is the distribution of the Plant Materials Progress Report of Activities? Is the PMC Annual Technical Report prepared? Are results of studies summarized and published as State technical notes, in technical journals, or other appropriate places? How many scientific documents have been developed/pending over last 3 years by type as listed below?			

Requirement	Assigned	Complete	Comments
FOTG Specifications Major Publications Plant Fact Sheets Plant Guides PMC Annual Technical Report Scientific Poster Progress Report Published Abstracts Published Symposium Proceedings Refereed Journal Articles Release Brochure Release Notices Technical Notes			
Do scientific and popular document designations meet criteria as outlined in POMS?			
Have scientific and popular documents received required levels of review prior to release?			
Are scientific and popular documents of sufficient quality?			
How many popular documents have been developed/pending over last 3 years by type as listed below? Information Brochures and Flyers Interview Miscellaneous Popular Articles Newsletters Newspaper Articles			

Requirement	Assigned	Complete	Comments
Plant Materials Progress Report of Activities Popular Journal or Magazine Articles Popular Poster Does the PMC have a current brochure? How many training sessions has the PMC provided over the last 3 years and what was the estimated number of hours of these sessions? How much direct technical assistance does the PMC provide to field offices and others? (Detail others if substantial commitments.) Are oral presentations made on the activities and studies at the PMC? How many presentations has the PMC provided over the last 3 years, by type, as indicated below? Tour (min. 5 people) Field Day (min. 50 people) Presentation-Local Presentation-Regional Presentation-National Presentation-International Exhibit Set-Up & Staff			
What are the contributions of plants released from the Center?			
How are field personnel, other agencies, cooperators, and other potential users informed of new products from the PMP? Are planting guides and/or Technical Notes prepared?			
Requirement	**Assigned**	**Complete**	**Comments**

Are new releases and/or new technology included in the FOTG? Are other information leaflets and publications used? Are technical journals used to summarize results of plant materials studies?			
Relationship with other agencies, conservation districts, and others What agencies and organizations work with the PMC and PMS? Are there any problems concerning the cooperative release of new plants and/or technology?			
Does the State Conservationist enter into formal cooperative agreements, memorandums of understanding, and reimbursable agreements? With State and other Federal agencies and others? With conservation districts? With State experiment stations or crop improvement associations?			
Personnel administration Lines of authority. Job responsibilities, duties, descriptions, and standards of performance established for all staff positions. Job responsibilities, duties, descriptions, and standards of performance established for all staff positions.			
PMC relationship with the field PMS and other State specialists: In developing plans? In allocating plant materials? In evaluating field plantings and problems?			

Requirement	Assigned	Complete	Comments
EEO/ Civil Rights/ Outreach Is the EEO program supported? Are Title VI and VII posters displayed showing the name, address, and telephone number of the EEO officers and other pertinent information? What outreach efforts have the PMC participated in over the past 3 years?			
Training Are training plans current? Are employees provided the training outlined in their training plans? Are employees provided the opportunity to receive training from outside sources? What is done to encourage self-improvement? Is the PMC used as a training center?			
Is membership in professional organizations and attendance at meetings encouraged? What organizations do staff members belong to? What meetings have been attended in the last 2-3 years?			
Have staff members received any awards and/or commendations in the past 2-3 years?			
The Program Review report should include: Date of review. PMC or program being reviewed. Review committee. Summary of findings. Recommendations. Agreed-to changes. How will agreed-to changes be followed up? Recommendations for distribution of final Quality Assurance Review report.			

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.62 Checklist for Development of Technology Products

The following procedures may be used as a guide or checklist for the development of Field-based Technology Products and Information-based Technology Products.

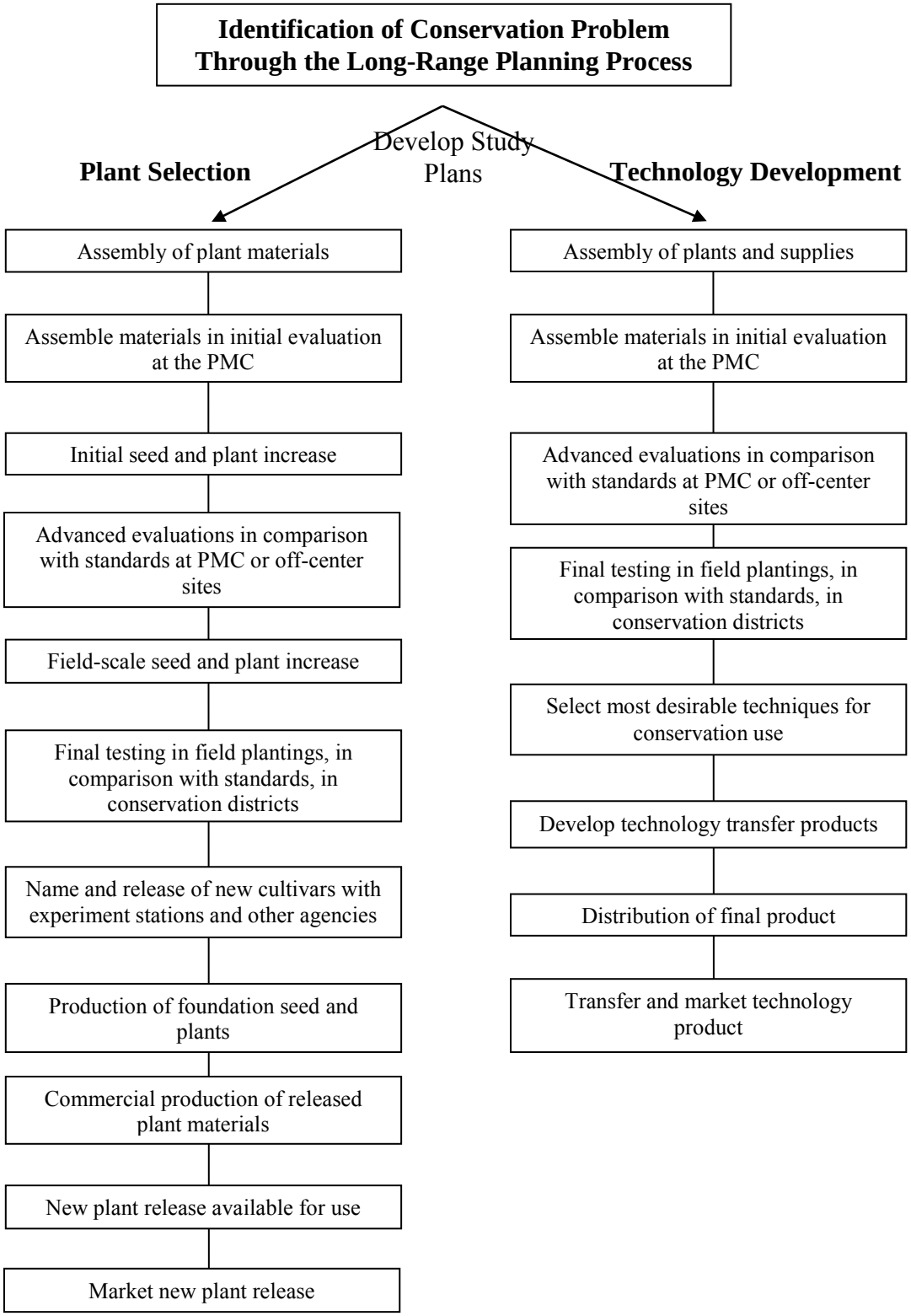
	Item	Date Completed
1.	A Study Plan (for Field-based Technology Products) or Outline (for Information-based Technology Products) has been prepared and approved.	
2.	Adequate consideration has been given to similar products already available to meet the specified need.	
3.	Adequate consideration has been given to identifying cooperators and partners who might be involved in preparation of the product, review, and/or printing and distribution.	
4.	A literature review and assembly of appropriate materials has been completed.	
5	Information-based product development has been incorporated into the Business Plan for the PMC and in the Performance Goals for the PMC.	
6.	The appropriate format of the finished product is assessed during product development. For example, NRCS FOTG technical notes will follow state guidance for preparing a technical note, and manuscripts submitted to refereed or popular journals will follow the format required by the journal.	
7.	Final product should receive proper review to ensure technical adequacy. The type and depth of review depends upon the nature of the product. Refer to section 540.16(C) for details.	
8.	The final product clearly identifies that NRCS and the Plant Materials Program was involved in preparation of the product.	
9.	The state Public Affairs Specialist has been consulted for format, printing, and distribution requirements.	
10.	File properties have been added and the document has been made 508 compliant for the visually impaired.	
11.	The product has been recorded with the completed PMC performance goals in POMS and PRS. The electronic filename has been entered into POMS.	
12.	An electronic copy of the final product has been sent to the PM Webmaster for archiving and use on the Internet. Contact the PM Webmaster if an electronic copy is not available.	

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.63 Typical Process for Product Development



540.64 Sample Project Statement for the Plant Materials Program

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
PROJECT STATEMENT

Project ID Code	Cropland 1.1
Title	Controlling erosion on cropland with cropping and residue management systems.
Project Statement	Winter legumes and other plants used for cover crops on cropland in the PMC service area do not produce a seed crop prior to chemical burn down in the spring. Therefore, if cover crops are an objective of the landowner, they will need to be replanted annually. Earlier maturing plants and other techniques are needed to reduce establishment costs of cover crops. In other parts of the U.S., row crops are often harvested too late for establishment of cover crops before the onset of winter temperatures. Without a cover crop to utilize excess nutrients and provide winter cover, surface erosion from wind and water results on fields in this area. With a cover crop, there is the opportunity to capture excessive nitrogen and phosphorus, produce organic matter for the site, trap snow and improve moisture infiltration.
Primary Resource	Soil
Other Resources	water, air
Primary Land Use	Cropland
Other land Use	Wildlife
Primary Vegetative Practices	Cover and Green Manure Crop
Other Vegetative Practices	Wildlife Upland Habitat Management Nutrient Management

540.65 List of National Projects

UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE PLANT MATERIALS PROGRAM PROJECT LIST		
Project #	**Project Title**	**Project Statement**
Biomass/Biofuel 1.1	Selection of plants and management techniques to promote viable options for fuel production or generation.	The U.S. Department of Energy identified herbaceous and woody plant species as biofuel sources (e.g., switchgrass, giant miscanthus, willows, and poplars). In addition to these plants, there are other herbaceous and woody plants that may have characteristics suitable for biofuel technology but have not been evaluated. Agronomic practices are needed to determine the most effective and efficient approach in maximizing biomass production and fuel quality of current and potential biofuel crops in different geographical regions of the United States.
Critical Area 1.1	Controlling erosion on highly disturbed areas such as highways, dams, etc.	Improved erosion control techniques and plant materials are needed to control erosion on highly disturbed areas such as highways, dams, etc.
Cropland 1.1	Controlling erosion on cropland with cropping and residue management systems.	Winter legumes and other plants used for cover crops on cropland in the PMC service area do not produce a seed crop prior to chemical burn down in the spring. Therefore, if cover crops are an objective of the landowner, they will need to be replanted annually. Earlier maturing plants and other techniques are needed to reduce establishment costs of cover crops. In other parts of the United States, row crops are often harvested too late for establishment of cover crops before the onset of winter temperatures. Without a cover crop to utilize excess nutrients and provide winter cover, surface erosion from wind and water results on fields in this area. With a cover crop, there is the opportunity to capture excessive nitrogen and phosphorus, produce organic matter for the site, trap snow, and improve moisture infiltration.
Cropland 2.1	Controlling erosion on cropland with vegetative barriers in the United States.	During the 1980s and 1990s, the potential of using herbaceous vegetative barriers to help prevent water erosion was tested at a number of locations by several agencies. A number of species have been used for this purpose and additional species are being tested.
Cropland 3.1	Controlling erosion on cropland by crop conversion to perennial crops or less erosive annuals.	Livestock farmers and ranchers have the option of growing perennial forage crops for feeding purposes. To make this option attractive, perennial forages are needed that have higher yields, quality, and adaptation to soils with limitations.

Project #	Project Title	Project Statement
Cropland 4.1	Protecting surface and ground water with vegetative filters.	Biological filters for surface and shallow ground water will be extensively used to correct and/or protect water quality. Improvements in design, plant materials, and management will aid both effectiveness and efficiency of vegetative filters.
Forestland 1.1	Conservation systems for controlling erosion and improving water quality within forested watersheds.	Forest practices differ throughout the country; however, all regions need native plant options to use in erosion control following forest disturbance and/or harvest.
Mineland 1.1	Improve erosion control and the quality of water leaving mined land and other drastically disturbed sites.	While great strides have been made in general revegetation of mineland, the demand for energy has reopened old mines and opened new mines. Improved plant materials are needed for bio-remediation and more effective treatments of these areas.
Natural Areas 1.1	Maintaining plant diversity and controlling soil erosion on natural areas.	Improved plant materials of additional species are needed to aid in preventing erosion and providing diversity from natural areas.
Pasture/Hayland 1.1	Improving forage production and other conservation systems with cool season plants.	Many cool season herbaceous species in common use for conservation systems are introduced. Native plant alternatives need to be developed.
Pasture/Hayland 2.1	Improving forage production and other conservation systems with warm season plants.	Improved selections of native warm season plants will aid in the effectiveness of conservation and forage systems. The number of improved warm season grasses for pasture and hayland is limited.
Rangeland 1.1	Improving the ecological status, production and soil protection of rangeland.	Rangelands have been degraded by recurring and extended periods of drought, improper use by domestic stock, colonization by invasive species, and wildfires. Management, establishment techniques, and improved drought tolerant, pest free native species are needed.
Urban 1.1	Developing plants to use in urban areas to control erosion and protect water quality.	Heavy use, compacted and "made" soils, limited rooting space, and heat islands effects make plants vulnerable in urban settings. Only a limited number of native species have been tested for use in urban settings.

Project #	Project Title	Project Statement
Urban 2.1	Developing plants to use in urban areas to reduce water quantity use (xeriscapes fit here).	Expansion of urban areas and population growth is threatening to overtake existing water supplies. Need for native plants for landscaping are increasing, and only a limited number of improved native plant materials have been fully tested for this use. Plants tested will be drought tolerant.
Water Quality 1.1	Develop the technology for creating and restoring wetlands for water quality improvement.	The technology of using wetlands for water quality purposes has improved dramatically over the last two decades. New wetland restoration and wetland creation techniques have provided the need for a diversity of technology and plant materials to address this purpose.
Water Quality 2.1	Develop plants and the technology for restoring or creating riparian areas for water quality improvements.	Riparian areas have been ravaged by recent hurricanes. There is a need to develop plants and t technology to assist municipalities reestablish riparian areas.
Water Quality 3.1	Develop the technology for stabilizing channels for soil erosion control.	The native species that can be used in bioengineering practices in the United States need to be improved. National Engineering Handbook, Part 650 (Engineering Field Handbook), Chapter 18 - Soil Bioengineering for Upland Slope Protection and Erosion Reduction, lists a number of potential species for these practices, but additional species are needed with supporting data and installation technology.
Water Quality 4.1	Develop plants for shoreline erosion control.	Development and changes in hydrology and littoral drift patterns accelerate coastal and shoreline erosion. Additional species are needed for effectiveness and diversity and help municipalities revegetate. Secondary dense species are particularly needed.
Wildlife 1.1	Develop plants for improving wildlife habitat.	Farm Bill programs increasingly target wildlife benefits. Native plant species and management technology are underrepresented in the marketplace for regional and sub-regional use.

540.66 Details of Assigning Numbers for Studies and Plantings

Study numbers will be assigned using the following format:

MTPMC-P-0911 or WY-F-0902

Nomenclature of Study Numbers

Where MT = PMC or State Abbreviation (ET = East Texas, etc.)
Where PMC or PMS = Plant Materials Center or Plant Materials Specialist
Where P = Type Code
Where 09 = Year Study Started
Where 11 = Consecutive Number assigned by the PMC or Plant Materials Specialist

PMC and Plant Materials Specialist Codes

Use the two letter state code, for example, Alaska = AK, except for the following PMCs:
ET – East Texas (PMC in Nacogdoches)
ST – South Texas (PMC in Kingsville)
TX – Texas (PMC in Knox City)

Type Code

P – Plant Selection Study
T – Technology Development Study
F – Field Plantings

It is recommended that for Field Plantings to use the state code where the Field Planting occurs rather than the PMC or Plant Materials Specialist code.

540.67 Example of a Study Plan for the Plant Materials Program

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
STUDY PLAN

Study ID Code	IDPMC-P-0601-CP
Title	Controlling erosion on cropland with cover cropping and residue management systems in the arid, semiarid and summer dry parts of the US.
National Project No.	Cropland 1.1
Study Type	Comparative Evaluation
Study Status	Active
Location	IDPMC
Study Leader	Derek Tilley, IDPMC
Duration	2006 through 2010
Cooperators	University of Idaho, Aberdeen Experiment Station
Land Use	Cropland Hayland
Vegetative Practices	Primary 340 COVER AND GREEN MANURE CROP Secondary 512 PASTURE AND HAYLAND PLANTING
Resource Concern(s)	Resource — Consideration/Problem Soil — Soil erosion, wind Water — Water quality, surface water contaminants, suspended sediment
Long Range Plan	Study falls under Part II, Item 3 of the IDPMC LRP
Description	Commercially available cultivars of a wide variety of plants will be assembled and tested. Some will be replicated and some not. The material will include grasses and legumes. Plantings will be made at four different times during the year to measure the effectiveness of the plants for use as cover crops in a variety of cropping systems.
Status of Knowledge	Many of the cultivars selected for this study are well documented as cover crops in other regions of the country and/or for use in different seasons of the year. Some of the cultivars are agronomic crops in other regions and may function in this region as cover crops. Most if not all of these cultivars have well documented performance during a single season, and we will be testing them in different seasons. Our knowledge of these cultivars for this use, in these seasons, in Idaho climate is very limited. However, we have sufficient confidence in some of them that we will replicate the plots based on an assumed level of survival.

Experimental Design	Randomized Complete Block Design
Treatment 1	Title: Accession Description: Cultivars Planted
Materials and Methods	Samples of seed will be assembled from Plant Materials Centers, University researchers, and Commercial sources. Seed will be assembled beginning in January 1996. Those with high potential will be seeded in replicated plots 160 inches wide and 33 ft long. Row spacing will be 10 inches, and seeding rates will vary by seed size, with 20 seeds per foot for large seeds, (<100,000 per lb), 30 seeds per foot small seeds, (>500,000 per lb). Planting equipment will be a Tye double disk drill. The design will be a Randomized Complete Block, RCB. 6 accessions will be replicated three times at each of three planting dates. The three planting dates are planned for early spring, late spring, and late fall
Final Evaluations	Field Plantings will be installed in each of the MLRAs found in Idaho to test regional adaptation of materials tested at the PMC
Technology Transfer Products	TechNotes, revise FOTG standards, Current events article
Literature Cited	PMC release documentation, Commercial literature, University research results
Keywords	Cover crops, new species and cultivars, pasture land, hayland, Idaho
Reviewed by:	Plant Materials Specialist, Idaho _____
Approvals:	State Conservationist, Idaho _____

540.68 Resources for Preparing Literature Reviews

The following resources may be used for compiling a literature review:

A. The National Agriculture Library (NAL)

(1) NAL has many resources and provides support for locating information for USDA employees. Complete details of the services provided by NAL can be found on their Web site (http://www.nal.usda.gov). The NAL Web site provides online access to AGRICOLA (AGRICultural OnLine Access), Current Research Information Network (CRIS), ISIS, and the Agriculture Network Information Center (AgNIC).

AGRICOLA is a machine-readable database of bibliographic records created by the NAL and its cooperators. Production of these records in electronic form began in 1970, but the database covers materials dating from the 16th century to the present. The records describe publications and resources encompassing all aspects of agriculture and allied disciplines, including plant and animal sciences, forestry, entomology, soil and water resources, agricultural economics, agricultural engineering, agricultural products, alternative farming practices, and food and nutrition.

CRIS is USDA's documentation and reporting system for ongoing and recently completed research projects in agriculture, food and nutrition, and forestry. Projects are conducted or sponsored by USDA research agencies, State agricultural experiment stations, the State land grant university system, other cooperating State institutions, and participants in USDA's National Research Initiative Competitive Grants Program.

ISIS is NAL's Online Public Access Catalog. AgNIC is a distributed network that provides access to agriculture-related information, subject area experts, and other resources.

(2) If Internet access is not available, NAL will conduct literature reviews for USDA employees. For a literature review, send a Computer Search Request or letter to NAL, Reference Division, Beltsville, Maryland 20705, or by contacting NAL by phone ((301) 504-5479), fax ((301) 504-6927), or by email (agref@nal.usda.gov) (note that phone numbers and email addresses are subject to change). A search of literature may be made by article, title, author, or general subject matter. The reference service request form provides space for a brief narrative description of a project, keywords, or categories of subject matter. The requester receives a bibliography of the articles available and an abstract for each document cited.

(3) Articles and documents may be requested by mail, fax, email, and other methods as described on the NAL Web site. Desired articles may be requested through fax or mail by submitting a Form AD-245-4. Photocopies of articles or abstracts of texts are then forwarded in response to the AD-245-4. The most efficient method of requesting documents after completing an online search is by email. Specific guidelines for sending requests are found on the NAL Web site.

B. Local Colleges and Universities

Many colleges and land grant universities have extensive agriculture libraries where information may be found. Oftentimes, these libraries provide access to the

AGRICOLA database or have Internet search engines to find information located in the library.

C. Internet Searches

The Internet is an excellent place to find information from a variety of sources. The use of popular search engines such as Google (http://www.google.com) may facilitate locating some materials. In addition, the libraries of most major universities are accessible through the Internet. Special attention should be given to the sources of materials from the Internet though, and the validity of some information may need to be checked before considering it in a literature review.

D. Contact with Other PMCs

Oftentimes, other PMCs are working on similar projects and may be a source of literature and technical information.

E. Personal Contacts

Communications with experts and practitioners in the field of interest may be useful for obtaining firsthand information on a topic and areas where work is needed. Personal contacts may be with university or government researchers, people in the industry, such as with seed companies and revegetation experts, and with qualified NRCS personnel, such as District Conservationists and State office specialists.

540.69 Types of Technology Products

The following are examples of the types and descriptions of products which may be developed as a result of Technology Development or Plant Selection Studies.

Product Type	Description
Conservation Field Trials	A planting used to evaluate technology for addressing local soil and water resource problems (see Section 540.14(G))
Displays and Exhibits	Display at a fair, career day, government-sponsored events, meeting, etc.
Field Office Technical Guide	Revision or writing new standards and specifications for the FOTG
Field Planting	A planting used to evaluate new plants and/or technology under actual use conditions (see Section 540.14(F))
Information Brochures and Flyers	Information in a brochure or flyer format intended to be non-technical in nature (i.e., general PMC brochure, release brochure, new technology)
Interview	Personal interview conducted by an author for inclusion in a newspaper, popular magazine, or technical journal where PM is being highlighted or a PM staff member is being cited as a technical expert
Major Publications	Major publications (longer than a Technical Note but not quite a book)
Miscellaneous Popular Articles	Miscellaneous popular articles published and distributed by the PMC or PMS
Miscellaneous Technical Articles	Technical information written in a general format
Newsletter-type Publication	Newsletter-type written materials prepared by the PMC or PMS on a regular basis
Newspaper Articles	Article written by PMC staff or a PMS which appears in a newspaper
One-On-One Direct Assistance	Direct technical assistance given to both NRCS and non-NRCS customers
Oral Presentation	A talk given to a group of people; may be popular, technical, or professional in nature
Plant Fact Sheets	Information for a species, including description, adaptation, uses, and management; usually in a 2-page format (see Section 540.76)
Plant Guides	Detailed information on a plant species and/or release or planting technology, including description, special characteristics, adaptation, use, establishment, and management, seed production, potential problems, and references. The Plant Guide is detailed enough to

Product Type	Description
	allow the user to repeat the technology (see Section 540.77)
Plant Materials Progress Report of Activities	Report giving highlights of studies and activities at the PMC; compiled and distributed annually (see Section 541.2(C))
PMC Annual Technical Report	Technical report which gives details of studies and activities; usually not for general distribution; compiled annually (see Section 541.2(D))
Popular Journal or Magazine Articles	Article published in a popular journal or magazine which has not been peer-reviewed
Posters	A presentation in poster format given at a technical or professional meeting
Progress Reports	Reports compiled to update others on the progress of a study or activity
Published Abstracts	Published abstract for a poster or oral presentation to be given at a technical or professional meeting
Published Symposium Proceedings	Paper which is published in the proceedings from a technical or professional meeting
Refereed Journal Articles	Articles which have been peer-reviewed and published in professional journals
Release Brochures	A brochure or flyer describing the characteristics, uses, establishment, and management of a plant release (see Section 540.94)
Release Notices	The formal notice for a new release which gets signed (see Section 540.34(F))
Special Demonstration Planting	Planting to promote the use and acceptance of released material and/or developed technology (see Section 540.17(D))
Technical Note	Written material used to convey technical information; usually conforms to NRCS or State guidelines for preparing and issuing the information (see Section 540.75)
Tours	A formal tour of the PMC
Training	A formal training session held for NRCS or non-NRCS attendees
Video/Media Production	A video, TV, or radio production with major content including plant materials information

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

Planting No. _____ **Field Office** _____

Cooperator _____ **Phone Number** _____

Address _____

State _____ **County** _____ **MLRA** _____

Township _____ **Range** _____ **Section** _____

Latitude _____ **Longitude** _____ **Location Map Provided** ☐ **Yes**

Slope % _____ **Aspect** **N** ☐ **S** ☐ **E** ☐ **W** ☐ **Elevation ft** ☐ **m** ☐ _____

Soil _____ **Texture** _____ **Soil Modifier** _____

Soil pH _____ **Annual Precipitation in** ☐ **mm** ☐ _____ **Irrigation Available** ☐ **Yes** ☐ **No**

Seedbed Preparation **Tillage** _____

Packing _____

Other _____

Planting Method ☐ **Drill** ☐ **Aerial** ☐ **Broadcast/Pack** ☐ **Broadcast/Harrow**
☐ **Hand-plant** ☐ **Tree Planter** **Other** _____

Weed Infestation ☐ **None** ☐ **Light** ☐ **Moderate** ☐ **Severe**

Soil Moisture ☐ **Good** ☐ **Adequate** ☐ **Too-Dry** ☐ **Too-Wet**

Irrigation Applied **Kind** _____ ☐ **None** ☐ **Pre-planting** ☐ **Post-planting**

Materials Applied	Rate/Acre	Notes/Date Applied
Lime		
Fertilizer, Nitrogen		
Fertilizer, Phosphors		
Fertilizer, Potassium		
Fertilizer, Other		
Herbicide		
Mulch		

Print Form Only Clear Form

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

(Continued)

	Scientific Name or Common Name	Cultivar/Release Name	Accession Number	Seeding / Planting Rate	Amount Needed	Supplied By
1						
2						
3						
4						
5						

Information to be completed at time of planting. Complete the evaluation for each plant listed above in the appropriate column below. Answer all questions in measurements requested. If a question does not apply or is unknown, enter N/A. Use remarks block for additional information pertinent to the planting. When planted as part of a mixture, please note other species and percentage information in the remarks section.

1 = Excellent 3 = Good 5 = Fair 7 = Poor 9 = Very Poor

Question/Criteria	No. 1	No. 2	No. 3	No. 4	No. 5
Planting Date (mm/dd/yy)					
Seedbed condition/site preparation at time of planting? (rank 1-9)					
Soil moisture conditions at time of planting? (rank 1-9)					
Condition of plant materials received? (rank 1-9)					
Planting Stock? BB=balled/burlapped BC=branches BL=bales BR=bare-root CO=container CU=cutting, unrooted LI=liner LS=live stakes SD=seed SP=sprig WH=whips OT=other					
Number of acres for this accession? (tenth of an acre)					
Number of plants? (if vegetatively planted, number)					
In-row spacing between plants? (if vegetatively planted, round to nearest foot)					
Between-row spacing between plants? (if vegetatively planted, round to nearest foot)					
Seeding rate? (PLS pounds/acre)					
Seeding rate? (PLS pounds/1000 ft^2)					
Was material planted as mixture or single species? (M = mixture, S = single)					
Was irrigation applied after planting? (Y = yes, N = no)					

Remarks

Completed By: Name _____ **Title** _____ **Date** _____

Print Form Only Clear Form

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

FORM INSTRUCTIONS

These instructions will assist in completing form NRCS-ECS-600.

Planting No.
Enter the unique number assigned by the Plant Materials Center staff or Plant Materials Specialist for this planting. The format for field plantings is identified in the National Plant Materials Manual, sections 540.14(F)(5) and 540.66. This number should correspond to a POMS database record if applicable.

Field Office
The name of the primary field office involved with the planting (if applicable).

Cooperator
The name of the land owner, individual or organization cooperating with this planting.

Phone Number
The phone number and/or email address of the cooperator.

Address
The address of the cooperator where the planting will occur.

State
The state where the planting will occur.

County
The county where the planting will occur.

MLRA
The MLRA where the collection was made. Major Land Resource Areas are geographically associated land resource units (LRUs). Identification of these large areas is important in statewide agricultural planning and has value in interstate, regional, and national planning. An interactive map can be found at http://soils.usda.gov/survey/geography/mlra/ that can assist in determining the MLRA of the collection site.

Township
Township name where the planting is planned (if applicable). This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html.

Range
Range where the planting is planned (if applicable). This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html.

Section
Section where the planting is planned (if applicable). This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html.

Latitude
The geographic latitude of the planting location in decimal degrees or degrees, minutes, and seconds.

Longitude
The geographic longitude of the planting location in decimal degrees or degrees, minutes, and seconds.

Location Map Provided
A separate location map should be included with this plan. Check the box if you provided a map.

Slope %
The slope at the planting location, as a percentage.

Aspect (N, S, E, W)
The exposure of the site. Check the box(es) corresponding to the planting location exposure: N = north, S = south, E = east, W = west. More than one box may be checked.

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

FORM INSTRUCTIONS

(Continued)

Elevation (ft, m)
The site elevation at the planting location. Check one box, either "ft" for feet or "m" for meters, to indicate the unit of measurement represented.

Soil
List the soil series or soil complex at the planting location.

Texture
List the dominant soil texture (sand, silt, clay) at the planting location.

Soil Modifier
List the dominant soil modifier at the planting location - if applicable.

Soil pH
A measure of the soil acidity or soil alkalinity on a scale of 1-14. For more information, see the publication at http://soils.usda.gov/SQI/publications/files/indicate.pdf.

Annual Precipitation (in, mm)
Indicate the site's mean annual precipitation. The range in precipitation assigned to the soil series or soil complex is recommended. Check one box, either "in" for inches or "mm" for millimeters, to indicate the unit of measurement represented.

Irrigation Available
Check "yes" or "no" to indicate if irrigation water is available for the site.

Tillage
Indicate what equipment was used to till the soil (plow, till, rip, etc.) prior to planting, if applicable.

Packing
Indicate what equipment was used to pack the soil prior to planting, if applicable.

Other
Indicate if any other methods/equipment were used to prepare the seedbed for planting.

Planting Method
Check the appropriate box to indicate the seeding or planting method used.

Weed Infestation
Indicate if there is no weed infestation, or if there is light, moderate, or severe weed infestation.

Soil Moisture
Indicate if the moisture in the soil is good, adequate, too dry, or too wet.

Irrigation Applied
Kind – Indicate what type of irrigation was applied (overhead, furrow, flood, trickle, etc.), if applicable.
None – Check this box if no irrigation was applied.
Pre-planting – Check this box if irrigation was applied before planting.
Post-planting – Check this box if irrigation was applied after planting.

Materials Applied
Listed are the most common materials that may be required for the planting. Lime, fertilizer, herbicide, and mulch are identified – if these materials are applied, indicate the quantity in the **Rate/Acre** field. In the **Notes/Date Applied** field, indicate any specific instructions, directions, or methods of application and the date applied. There are additional lines available to record materials applied that are not listed.

Scientific Name or Common Name
The Latin scientific name or the common name of the plant to be used

Cultivar/Release Name
The cultivar or release name of the plant to be used, if applicable.

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

FORM INSTRUCTIONS

(Continued)

Accession Number
The assigned accession number of the accession to be planted (example 9076517 Western wheatgrass), if applicable.

Seeding / Planting Rate
Indicate the planned seeding rate (in bulk or PLS lbs/acre) or planned vegetative planting rate (in number per acre or 1,000 ft) used for the planting.

Amount Needed
The quantity of material necessary to complete the planting for the site. Seed should be listed in PLS (pure live seed).

Supplied By
The name of the PMC, individual, organization, or company that will provide the planting materials.

Information to be completed at the time of planting

Planting Date (mm/dd/yy)
Enter the date of planting in the format shown.

Seedbed condition/site preparation at time of planting? (rank 1-9)
Indicate how well the site and/or seedbed was prepared prior to planting, taking into consideration weed control, tillage, soil packing, etc.

Moisture conditions at time of planting? (rank 1-9)
Indicate how moist the field was at time of seeding or planting each species or release.

Condition of plant materials received? (rank 1-9)
Indicate the condition of the seed or plants at the time of planting each species or release.

Planting Stock?
Using the codes to the left, indicate the type of plant material stock used for the planting for each accession.

Number of acres for this accession? (tenth of an acre)
Enter the number of acres planted for this accession. Round to a tenth of an acre.

Number of plants? (if vegetatively planted, number)
Enter the number of plants used for this plant accession if the materials were vegetative in nature.

In-row spacing between plants? (if vegetatively planted, round to nearest foot)
The amount of space between each plant within the row. If vegetative materials were used, round the number to the nearest foot.

Between-row spacing between plants? (if vegetatively planted, round to nearest foot)
The amount of space between each row of plants. If the materials used were vegetative in nature, round the number to the nearest foot.

Seeding rate? (PLS pounds/acre)
The actual amount of Pure Live Seed used per acre.

Seeding rate? (PLS pounds/1000 ft^2)
The actual amount of Pure Live Seed used for one thousand square feet.

Was material planted as mixture or single species?
Indicate whether the material was planted as a mixture with other species, or if it was the sole species planted. (M = mixture, S = single)

Was irrigation applied after planting?
Indicate if water was applied to the site after planting was completed. (Y = yes, N = no)

Remarks
Add any additional comments or remarks that may be useful.

ESTABLISHMENT OF FIELD, SPECIAL AND INCREASE PLANTINGS

FORM INSTRUCTIONS

(Continued)

Completed By

Name
The name of the individual completing the form.

Title
The position title of the individual completing the form.

Date
The date the form was completed.

TECHNICAL NOTES

USDA-Natural Resources Conservation Service
Boise, Idaho

TN PLANT MATERIALS NO. 44 **July 2005**

Using Windbreaks to Reduce Odors Associated with Livestock Production Facilities

Introduction

Preliminary research and observations made by farmers suggest that windbreaks placed around livestock production facilities may effectively reduce movement of odors emitted by manure to neighboring properties. Essentially, trees can be 'put to work' to reduce the movement of livestock production odors off-site. This information was developed by Missouri NRCS and has been modified for use in Idaho and Utah.

Although the idea of placing vegetative windbreaks and shelterbelts around agricultural buildings and farm fields is not new, additional benefits from farm windbreaks continue to be learned and tested. Windbreaks alone will not prevent odor problems associated with intensive livestock production but may provide farmers with one more tool to help reduce negative visual perceptions and detection of odors by neighbors and surrounding communities.

Figure 1
A windbreak of maturing conifers can significantly change the appearance of livestock production facilities and help filter out odor particles.

An odor-emitting source can include a livestock production barn, manure storage facility or a farm field where manure is being spread. Windbreaks have the ability to reduce odor concentrations significantly at or very near the source, which greatly improves the effectiveness of separation distances.

There are six ways that windbreaks and shelterbelts can reduce the effects of livestock odor and improve visual perception of production buildings:

1. Dilution and dispersion of gas concentrations of odor by a mixing effect created by windbreaks.
2. Deposition of odorous dusts and other aerosols to the windward and leeward sides of windbreaks.
3. Collection and storage (sinks) within tree wood of the chemical constituents of odor pollution.
4. Physical interception of dust and aerosols (odor particles) on leaves, needles and branches.
5. Containment of odor by placing windbreaks windward and leeward of the odor source.
6. Aesthetic appearance:
   - Trees create a visual barrier to livestock barns and manure storage facilities
   - Trees can make cropped fields and pastures more pleasing to look at
   - Trees represent an 'environmental statement' to neighbors that the producer is making every effort to resolve odor problems in as many ways as possible.

Dilution and Dispersion

Without wind management, odors emitted from livestock facilities and manure storage areas tend to travel along the ground as a plume with air movement, especially during atmospheric inversions with little or no dilution of odor occurring.

Figure 2 Without windbreaks and wind management, the odor plumes are picked up by passing air masses and travel near the ground with little or no dilution or filtration.

Windbreaks create an obstacle for moving air masses. When designed properly, windbreaks force turbulent fresh air up and over the tree row and will also moderate and evenly distribute a more gentle airflow through the trees. Less air movement past barns will mean less pickup and movement of odor off site.

It is believed that windbreaks have the ability to lift some of the odor plume into the lower atmosphere where winds aloft mix and dilute the odor. The greatest dilution of odor occurs above and downwind from the quiet zone created by the action of wind passing over the windbreak. Beyond the quiet zone, more fresh air and less odorous air returns to the ground, thereby reducing movement of livestock odors off site.

Approximately 60 percent of the wind should be deflected up and over the windbreak and 40 percent should pass through the canopy of the trees. Two to three rows of trees can provide an ideal 60 percent density (or 40 percent porosity) through the tree canopy. Windbreaks are less effective for odor reduction when wind is minimal but the visual appearance remains in place.

Windbreaks create a 'quiet zone' of air that measures a distance of 8 to 10 times the height of the tree row downwind of the windbreak, and an additional moderation of wind speeds 10 to 25 times tree height, beyond the windbreak. Back-pressure created by the blocking effect of the tree row also creates a small quiet zone upwind of the tree line that is equal to 2 to 3 times the height of the trees.

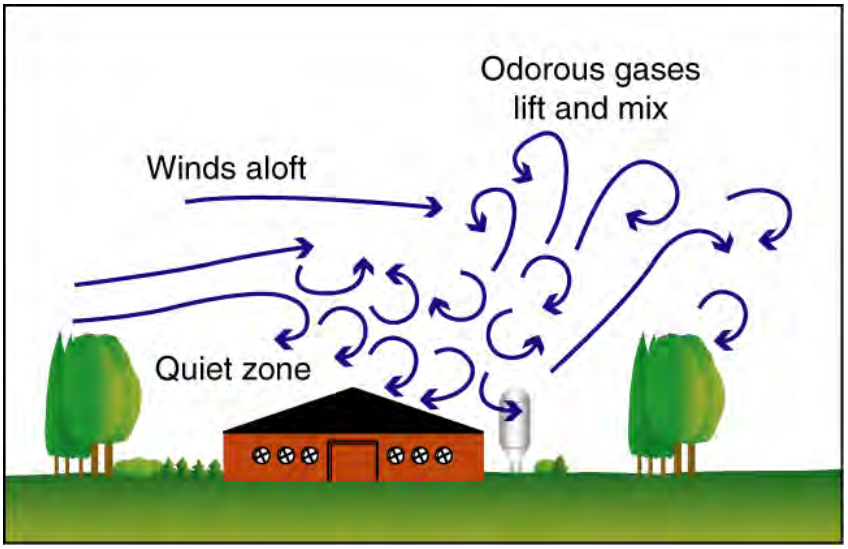


Figure 3
Windbreaks located upwind and downwind of livestock facilities will reduce and manipulate air flow around the facility to reduce the spread of odors. Overhead winds can lift particles and gases into the lower atmosphere to help dilute and disperse odors. Also, more clean air diverts up and over the source of odor.

Livestock barns and manure storage areas are best located in the quiet zone 100 feet downwind of windbreaks. In addition, windbreaks located downwind of the odor source are also important for filtering, absorption and trapping odors. Therefore, placing windbreaks around the entire perimeter of livestock production areas is ideal. Windbreaks should also be at least 100 feet from access roads and driveways to prevent snowdrifts from blocking farm vehicles during winter.

Deposition of Odorous Dusts

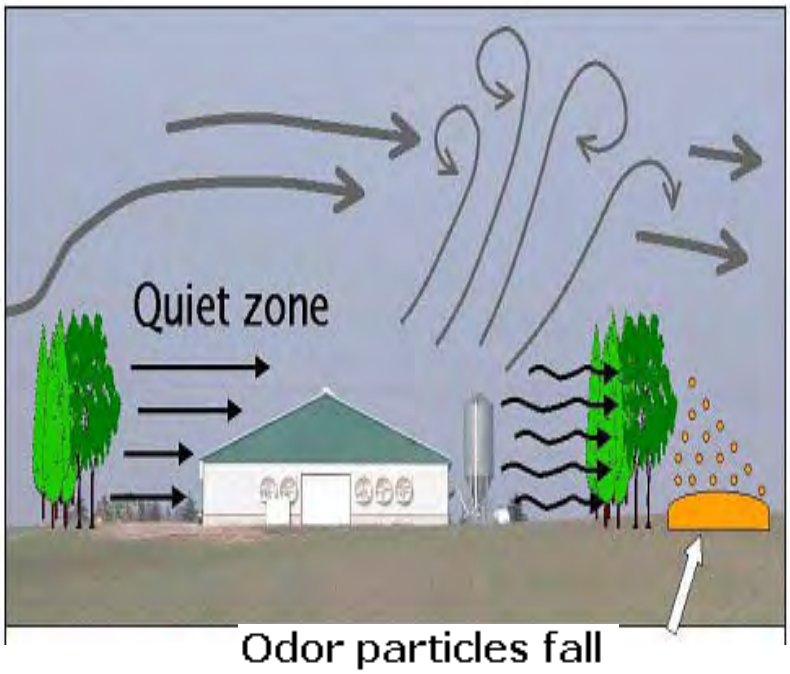
Windbreaks create a physical barrier to wind and air movement. The trees absorb wind energy and reduce its speed near the ground. As a result, fewer dust particles and less odorous gases will be picked up by the air coming from livestock facilities. Also in calmer air, dusts and gases already caught up in the air will be more likely to settle back to the ground on the downwind side of the windbreak. This deposition effect is commonly seen with living and non-living snow fences where snow settles downwind of the fencing or trees due to reduced wind speed.

Figure 4
Reduced wind speed in the quiet zone that is created downwind from a windbreak allows odorous dusts and particles to settle to the ground, similar to what happens with settling and drifting of snow.

To be most effective for deposition of odorous dust, windbreaks need to be located upwind and downwind of odorous livestock facilities. Upwind windbreaks reduce the quantity of dust and odor that is picked up by wind, and windbreaks located downwind of the facilities will further reduce wind speeds to allow settling of odorous dusts that have become airborne.

For cropland, the same may hold true for reduction of odor movement where manure is being spread onto farm fields. Windbreaks established around the full perimeter of farm fields should reduce movement of odor and can accommodate winds that are approaching the farm from any direction.

Figure 5
Windbreaks located downwind of livestock production barns allow settling of odorous wind-borne dust particles. Windbreaks should be located 100 feet away from barns.



Wind tunnel studies of mass transport have shown that windbreaks can remove 35 to 55 percent of the dust being carried in moving air which would provide a substantial reduction of offensive odors carried off-farm.

The amount of dust that is picked up or allowed to settle will depend on wind speed, direction of the wind, density of windbreak trees, height of windbreak trees and number of windbreaks.

Figure 6
Mature windbreaks around cropped fields may help lift and disperse odors during application of manure as a nutrient soil amendment, in addition to sheltering crops from damaging wind.

Collection and Storage of Pollutant Odors within Trees (sink)

Scientific evidence of plant intake of livestock odors by tree foliage in field situations is limited, however there have been many studies done on the ability of plants to absorb air-polluting odors and chemicals. Trees and shrubs clean the air of micro-particles of all sizes by interception. Interception of air pollutants may be 20 times higher in tree or forested areas than non-forested cropped or barren lands. In addition, conifers show a better ability to absorb air pollutants than deciduous trees.

Figure 7
In air pollution research, odorous gases and particles can be absorbed into the foliage of conifers and deciduous trees during the growing season. Pollutants diffuse inside leaves and needles through tiny openings called stomata or adsorb into waxy coatings that naturally cover leaf surfaces.

Odorous gases, chemicals and dust particles can become fixed to plant surfaces and can enter into the plant tissue in three ways: 1) gaseous diffusion through open stomata, 2) on wet leaves, soluble air pollutants can enter through stomata in a dissolved liquid form, 3) pollutants can absorb directly into plant tissues.

Windbreak trees and shrubs absorb air pollutants when they are healthy and not under drought stress. Trees and shrubs absorb more air pollutants when leaf surfaces are wet. Higher humidity can increase uptake of air pollutants into trees, which is commonly measured within tree canopies.

Micro-organisms cover plant surfaces and there is evidence that these micro-organisms associated with windbreak trees also contribute to absorbing odorous chemicals. Forests are often referred to as pollutant air filters. This may also apply to windbreaks trees.

Physical Interception of Odor Particles

Trees are highly effective at physically intercepting dust, gases and microbial particles that are carried in the wind. Windbreaks are commonly used to intercept and drop blowing snow, act as barriers to trap blowing soil caused by wind erosion, catch spray drift of agricultural chemicals, and reduce and catch pollen drift from agricultural crops. As leaf surface roughness increases, the capture ability of particles and odor increases. Leaves with complex shapes (large circumference to area ratios) collect particles most efficiently. Therefore, conifers may be more effective at intercepting livestock odors than deciduous tree and shrub species. Conifers also have leaves (needles) year around.

Figure 8
Similar to the air filters of home furnaces, windbreak trees, especially conifers, physically catch wind-borne odorous particles. Conifers have foliage year-round.

Windbreak Design and Planting

Selecting the species of trees and shrubs to plant will vary at each livestock facility and farm field site. Species selection should be based on the characteristics of each site including: soil type, natural drainage, common wind conditions, annual precipitation, natural range of each tree and shrub species and site needs. In addition, to maximize particulate trapping, select species based on high leaf surface roughness (plants with leaf hairs, leaf veins, and small leaf size), complex leaf shapes, and large leaf circumference to area ratios and medium to rapid growth rates.

It is usually best to select several species of trees and shrubs for use in windbreaks to prevent loss or destruction of the entire windbreak if attacking insect pests or tree diseases occur. Having diversity also offers a better chance for tree survival during alternating seasons of drought and wet soil conditions.

Windbreaks should consist of single or multiple rows of trees and shrubs. Shrubs are generally planted in the outside or inside rows, followed by conifers with deciduous hardwoods towards the middle or along the downwind side where they can grow more efficiently. Tree varieties and placement for the windbreak should be managed to maximize odor interception and dilution of air, and reduce odor leaving the source.
Where site conditions allow, place plantings around the entire perimeter of the odor source.
Adjust windbreak porosities/densities to meet air movement needs for naturally ventilated livestock confinement systems.
Keep the inner row of windbreak plantings away from all buildings and waste storage areas and at least 10 times the exhaust fan diameter or 50 feet, whichever is farther. A dike between any livestock effluent sources and trees/shrubs is also highly recommended to protect plantings.
Use wide “between row spacing” to increase particle surface area contact and foliage light levels.

Ideally once established, the tree barrier should have a density of about 60 percent for best results for wind management. Conifers such as spruce will provide uniform branch coverage from the ground level up. Tree rows should be spaced wide enough apart to allow access by equipment for mechanized management of vegetation.

Weed management is important during the first five years of tree establishment using herbicides, or weed barrier materials, plastic or organic mulch. Weed management is important until the young windbreak trees have overtopped most weed competition and are free to grow.

For additional information on windbreak design and planting, refer to Idaho Technical Note No. 43 Tree Planting, Care and Management http://www.id.nrcs.usda.gov/programs/tech_ref.html#TechNotes

Managing Odor

Odor management is a result of the overall management of the farm operation. General maintenance of the buildings and the nutrition of the feed ration are normal farm management needs that can influence odor emissions. Waste management plans have become a standard part of livestock operations in recent years. Livestock odor management techniques fall into three areas:

1. *Preventing the generation of odor*, including feed additives, aeration, manure additives, etc.
2. *Capturing and destroying the odor*, including biofilters, waste storage covers, organic mats, etc.
3. *Dispersing or disguising the odors*, including vegetative or structural windbreaks, setback distances, site selection, etc.

In particular, structural or vegetative windbreaks placed near exhaust fans on tunnel-ventilated livestock and poultry buildings appear promising, primarily because the air jets issuing from the exhaust fans are diverted upward. This effect promotes mixing of the odorous, dusty airflow with the

wind passing over the building, so that the plumes of air pollutants originating from the fans are made larger (extend higher) in addition to the physical trapping of odor particles on the windbreak.

Figure 9
Relevant design considerations and low-cost designs using UV-resistant tarpaulin or plastic material, roofing, or wood fastened to anchored pipe frames or posts are potential options for windbreak walls.

Windbreak structures may either be designed to withstand the same wind speeds as the buildings and be insured with the buildings, or lower wind speeds at reduced cost. If the windbreaks are not designed for maximum design wind speeds, a method of ensuring non-catastrophic failure is needed, such as breakaway ties fastening material to frames. The location of the windbreak affects the diversion of airflow from exhaust fans. Observations of windbreak action in several locations suggest that the windbreaks should be placed two to four fan diameters downwind from the fans to deflect fan airflow without back pressures, (Figure 11) and extend high enough to fully intercept the plumes of airflow issuing from the fans (e.g. 10-12 feet high for typical buildings).

Biofilters using biomass and microorganisms to treat ventilation air as it leaves the building have been used in the U.S. Some producers have installed windbreak walls using straw or other biomass. Windbreaks made from or incorporating straw have been installed on swine farms in North Dakota, Minnesota and Missouri and received favorable results. One facility in Minnesota with a biofilter achieved odor and H_2S reduction of 80-90% and NH_3 reduction of 50-60%. Weed control and rodent control were the primary problems experienced. A critical element in the use of biofilters is their dependence on power ventilated buildings where fans push the air through the filter. They don't work on naturally ventilated buildings.

Other Benefits

In addition to odor management, vegetative windbreaks also act to reduce the seasonal cost of heating and cooling of farm buildings without disrupting ventilation in livestock barns.

Windbreaks may also reduce the spread of specific infectious disease of livestock by blocking, intercepting or diverting wind-borne infectious organisms away from buildings.

Windbreaks placed around farm fields reduce damage to forage and crops (preserve crop yield potential) caused by damaging turbulent winds while allowing normal air circulation to continue. Windbreaks reduce soil erosion by wind. Around pastures, mature windbreaks will relieve livestock of stress during hot summer days and cold windy winter conditions. Avoid planting trees and shrubs that are know to be poisonous to livestock.

Figure 10
Where barns are surrounded by solid forest plantation, it is important not to block ventilation fans with excessive tree growth. Thinning the plantation and pruning off lower branches can improve air circulation. 100 feet is a good separation distance between trees and barn.

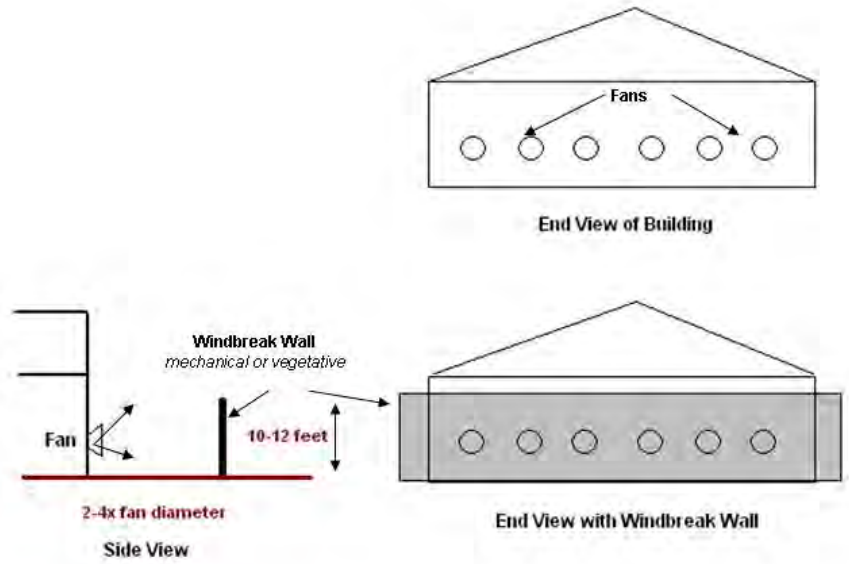
References

1. “Using Shelterbelts to Reduce Odors Associated with Livestock Production Barns” (January 2004) by Todd Leuty, Horticulture/Agroforestry Specialist, Ontario Ministry of Agriculture and Food.

2. “Air Quality and Shelterbelts: Odor Mitigation and Livestock Production – A Literature Review” 1999. John Tyndall and Joe Colletti; Iowa State University.

3. “Designs for Windbreak Walls for Mitigating Dust and Odor Emissions from Tunnel Ventilated Swine Buildings” 2000. R. Bottcher, R. Munilla, G. Baughman, and K. Keener. North Carolina State University.

Figure 11
Example layout of windbreak wall or biofilter for typical tunnel ventilated building.



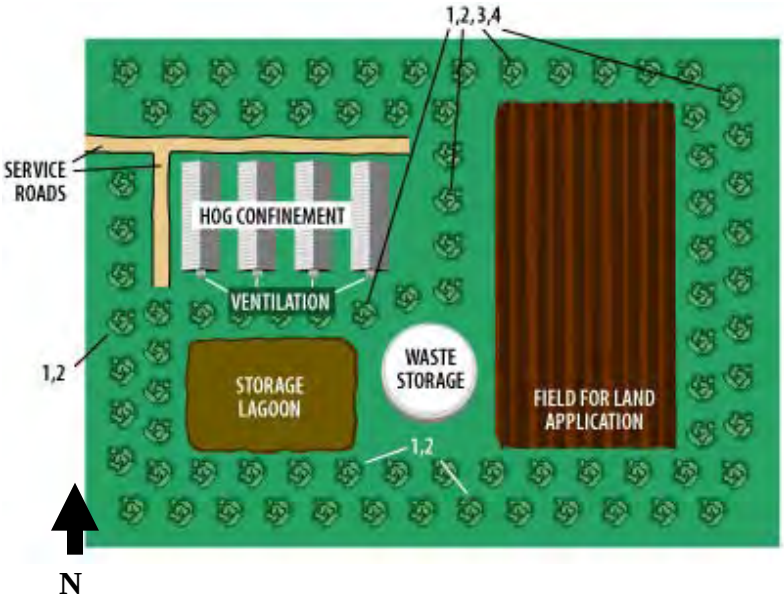


Figure 12
A hypothetical windbreak design for a swine facility. The numbers refer to the interaction and means by which the windbreak will mitigate livestock odor.

1. *Creation of air mixing turbulence*
2. *Dust deposition*
3. *Particulate interception*
4. *Pollution sinks*

Other important design considerations include: livestock type, odor sources, air/wind patterns, tree/shrub species, and aesthetics.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Fact Sheet

BLACK WILLOW

Salix nigra Marsh.

Plant Symbol = SANI

Contributed by: USDA NRCS Plant Materials Center, Manhattan, Kansas & Kansas State University, Forestry Research

Photo Courtesy of Philip Barbour, Wildlife Biologist, USDA NRCS, Madison, Mississippi

Alternate Names

American, Brittle, Champlain, Dudley, Gooding, gulf black, puzzle, rough American, scythe-leaf, scythe-leaved, southwestern black, swamp, tall black, Texas black, and western black willow; sauce, saule, saule noir, sauz, swamp walnut**,** weide, wilg, willow, and willow catkins

The name willow derives from the Old English *wilwe*. The botanical name *Salix* was the name given by the ancient Romans.

Uses

Ethnobotanic: The ancient Greeks knew the therapeutic values of willow. Tea made from willow bark was used for stiff joints and rheumatic pains. By the 1840's, chemists had isolated salicylic acid from willow and found it produced marked antipyretic (fever-reducing) and analgesic (pain-killing) effects and "striking relief of acute articular rheumatism." Modern aspirin (acetylsalicylic acid) is a synthetic product. Salicylic acid got its name from Salix.

Industry: Most black willow lumber is used for shipping boxes.

Wildlife: The willows are among the first plants to provide honey bees, after long winters, with nectar and pollen. Domestic grazing animals browse in willow thickets. Elk and beaver browse on willow leaves in the summer and willow twigs in the winter.

Ornamental: Black willow can be planted as an ornamental where a fine-textured shade tree is desired. It will tolerate dry soils with reduced vigor.

Conservation: One of the greatest services of the willows is as a soil-binder. Growing along the banks of countless streams, their fibrous roots help to prevent the soil from being washed away.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values.

Description and Adaptation

A member of the Willow Family (Salicaceae), black willow is a small to medium-sized tree 30 to 60 ft high and about 14 inches in diameter with a broad, irregular crown and a superficial root system.

Leaves are simple, alternate, deciduous, narrow, lance-shaped, with tapered bases, rounded base, finely toothed margin, blade yellow-green on both sides, with a few small hairs on the lower surface; petiole slender. Flowers of black willow: male and female catkins on separate trees. Catkins are 4-5 cm long, on ends of leafy shoots, many small, yellow-green flowers without petals. Twigs are light-red, slender, and flexible. Buds narrow, conical, orange-brown; leaf scars narrow, crescent shaped; broad, flat, often shaggy ridges; pith pale brown, small. The bark is dark gray-brown to nearly blackish, divided into deep fissures separating thick, interlacing, sometimes scaly ridges.

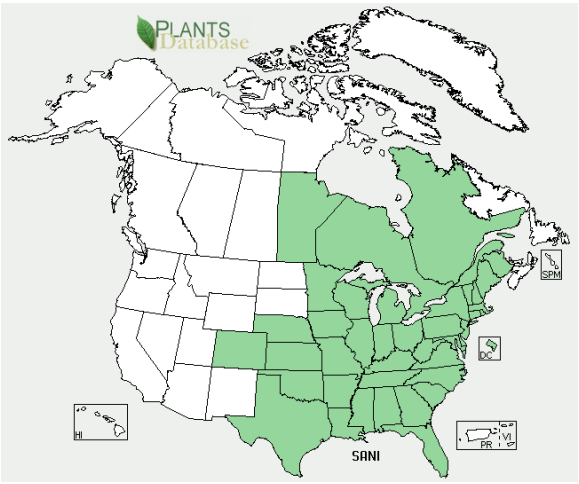
Black willow is adapted wherever ample soil moisture is found. Black willow grows best where the average annual rainfall is 51 inches, of which 20

inches falls during the growing season, April through August.

The estimated life span for black willow averages 65 years with a range of 40 to 100 years.

Wood characteristics: The wood is of moderately light to light density, moderately soft. It does not splinter easily, which makes excellent wood for toys, crates, and barn floors.

Distribution: Black willow ranges from New Brunswick to Manitoba, south to Florida and Texas



Black willow distribution from USDA-NRCS PLANTS Database.

Habitat: This species is usually found on moist or wet soils along banks of streams, lakes, swamps around farm ponds, and pasture sloughs.

Establishment
Black willow is easily established from cuttings. Stringent requirements of seed germination and seedling establishment limit black willow to wet soils.

Management
Stands of black willow can stagnate if not periodically thinned.

Pests and Potential Problems
A number of insect species attack black willow but few cause serious damage, such as, forest tent caterpillar, cotton wood leaf beetle, willow sawfly, stem borers, and twig borers.

Seeds and Plant Production
Good seed crops occur almost every year with only a few interspersed poor crop years. The seeds are widely disseminated by wind and water. Willow seed must be collected as soon as it ripens and sown immediately. Stem cuttings are highly desirable to propagate trees.

Fire Effects
Black willow is very susceptible to fire. Hot fires can kill entire stands of willows. Black willow will sprout at the base following fire.

Cultivars, Improved, and Selected Materials (and area of origin) 'Webb' compact willow is a "strikingly different vase-shaped form of black willow." This unusual form was found by Mr. Charles Webb in Madison County, Florida.

Control
Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. USDA, NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

Prepared By
John M. Row
USDA NRCS, Manhattan Plant Materials Center, Manhattan, Kansas 66502

Wayne A. Geyer
Forestry Division, Kansas State University, Manhattan, Kansas 66506

Edited:

For more information about this and other plants, please contact your local NRCS field office or Conservation District, and visit the PLANTS Web site<http://plants.usda.gov> or the Plant Materials Program Web site <http://Plant-Materials.nrcs.usda.gov>

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Guide

BLACK WILLOW
Salix nigra Marsh.
Plant Symbol = SANI

Contributed by: USDA NRCS Plant Materials Center, Manhattan, Kansas & Kansas State University, Forestry Research

Photos Courtesy of Philip Barbour, Wildlife Biologist, USDA NRCS, Madison, Mississippi

Alternate Names
American, Brittle, Champlain, Dudley, Gooding, gulf black, puzzle, rough American, scythe-leaf, scythe-leaved, southwestern black, swamp, tall black, Texas black, and western black willow; sauce, saule, saule noir, sauz (Espanol), swamp walnut**,** weide, wilg, willow, and willow catkins

The name willow derives from the Old English *wilwe*. The botanical name *Salix* was the name given by the ancient Romans.

Uses
Conservation: One of the greatest services of the willows is as a soil-binder. Growing along the banks of countless streams, their fibrous roots help to prevent the soil from being washed away. Willow has been planted frequently to help stabilize the banks of eroding streams, to hold the soil in road cuts and embankments, and to bind shifting sands. Black willows dense root system is excellent for stabilizing eroding lands (Pitcher and McKnight, 1990).

Ethnobotanic: The ancient Greeks knew the therapeutic values of willow. Tea made from willow bark was used for stiff joints and rheumatic pains. By the 1840's, chemists had isolated salicylic acid from willow and found it produced marked antipyretic (fever-reducing) and analgesic (pain-killing) effects and "striking relief of acute articular rheumatism." Modern aspirin (acetylsalicylic acid) is a synthetic product. Salicylic acid got its name from Salix (Randall, 1969).

Aboriginal peoples of North America used various plant parts of black willow for uses such as drugs to treat aliments, fiber for basketry and other uses.

Drug Uses – "The medicinal part of the plant is the inner bark and was used as a pain reliever for a variety of ailments (arnatural.org, 2010)." Antiperiodic: a medicine preventing the recurrence of periodic disturbances and irregularities. Anti-rheumatics: medicines correcting and relieving rheumatism. Antiseptics: agents preventing or countering decay, or the formation of pus. Astringents: agents producing contractions of organic tissues, or the arrest of a discharge. (Meridian Institute, 2010). Analgesic: Infusion of roots taken by the Koasati for headaches (Taylor, 1940). Antidiarrheal: An infusion of bark used by the Cherokee to check the bowels (Hamel and Chiltoskey, 1975); Blood Medicine: a decoction of roots and bark taken by the Houma for "feebleness" due to thin blood (Speck, 1941). Carminative: A compound decoction taken for stomach gas by the Iroquois (Herrick, 1977). Cough Medicine: A compound decoction was taken by the Iroquois for coughs (Herrick, 1977). Dermatological Aid: The Cherokee used a decoction or infusion of bark as a wash to make the hair grow; and the bark was also used as a poultice (Hamel and Chiltoskey, 1975); The Micmac made a poultice of bruised leaves used on sprains and bruises; also a poultice of scraped root and spirits was applied to bruises and sprains (Speck, 1917). Febrifuge: An infusion taken by the Cherokee for fever (Hamel and Chiltoskey, 1975); the Houma made a decoction of roots and bark was taken for fever (Speck, 1941); Cold infusion of roots was taken for fevers by the Koasati (Taylor, 1940). Gastrointestinal Aid: decoction of roots taken by the Koasati for dyspepsia (Taylor, 1940). Orthopedic Aid: the Micmac applied a poultice of bruised leaves to use on sprains and bruises; also a poultice of scraped root and spirits was applied to sprains and broken bones (Speck, 1917). Respiratory Aid: the root was chewed by Cherokee ball players "for wind" (Hamel and Chiltoskey, 1975). Throat Aid: infusion of inner bark taken for lost voice and root chewed for hoarseness by the Cherokee (Hamel and Chiltoskey, 1975) and used by the Iroquois for mouth and throat abscesses (Herrick, 1977). Tonic: the bark was also

used as a tonic by the Cherokee (Hamel and Chiltoskey, 1975).

Basketry and Weaving – The Papago split twigs in half lengthwise, sun dried and used as a foundation in coiled basketry and used for sewing coiled basketry; also used for curved structures in wrapped weaving (Castetter and Underhill, 1935).

Dyeing Agent – A dye made from willow bark has good wash fastness and fair light fastness. The bark also contains a natural catechol tanning agent used to prepare leather for tanning (Cameo.mfg.org, 2010). The Patowatomi made a scarlet colored dye from the willows roots (Active Concepts, 2010). The roots are also used to make a yellow dye for dyeing porcupine quills (Prindle, 2010).

Other – Rodent proof granaries (Anonymous No. 3, 2008).

Industry: Most black willow lumber goes into shipping boxes, baskets, and other containers, and into furniture (especially kitchen cabinets) and caskets. The lumber is sometimes used in building construction for roof and wall sheathing, and sub-flooring. It has been used for making charcoal, slack cooperage, veneer, cutting boards, woodenware, sash, doors, and other millwork, and for paper pulp. It is used sometimes as a core in hardwood plywood (Panshin and deZeeuw, 1980; Anonymous No. 1, 2008).

Wood characteristics: The wood is of moderately light to light density (specific gravity approximately 0.34 green, .42 oven dry), moderately soft. It does not splinter easily, which makes excellent wood for toys, crates, and barn floors. When properly seasoned, it warps very little. The heartwood is grayish-brown or reddish-brown color, often with darker streaks along the grain. Sapwood is whitish or creamy yellow (Panshin and deZeeuw, 1980). The wood is uniformly textured, grain somewhat interlocking, and has no characteristic odor or taste (Anonymous No. 4, 2008).

Ornamental: Black willow can be planted as an ornamental where a fine-textured shade tree is desired. It will tolerate dry soils with reduced vigor (Ohio Trees, 2008).

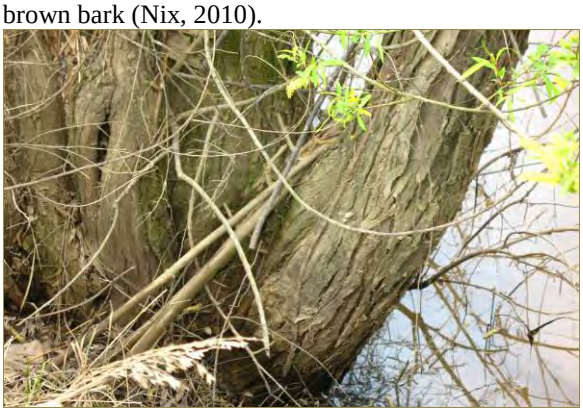
Wildlife: The willows are among the first plants to provide honey bees, after long winters, with nectar and pollen. Domestic grazing animals browse in willow thickets. Elk and beaver browse on willow leaves in the summer and willow twigs in the winter. Willow shoots are common food of beaver, hares, and rabbits. Black willow and other willows are host plants for Viceroy and red-spotted purple butterflies (Anonymous No. 2, 2008)

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

Description

General: About 90 species of *Salix* are native to North America, but only 27 of them attain tree size, of which, black willow is the most abundant. Most of the commercial willow timber is produced by *S. nigra* (Pitcher and McKnight, 1990). A member of the Willow Family (Salicaceae), black willow is a small to medium-sized tree 30 to 60 ft high and about 14 inches in diameter (max. 140 by 9 ft) with a broad, irregular crown and a superficial root system (Dirr, 1977). The leaves are simple, alternate, deciduous; narrow, lance-shaped, with tapered tip, rounded base, 5-13 cm long, 8-12 mm wide; finely toothed margin; blade yellow-green on both sides with a few small hairs on the lower surface; petiole slender, 6-10 mm long. The bark is dark gray-brown to nearly blackish, divided into deep fissures separating thick, interlacing, sometimes scaly ridges (Harlow *et al.*, 1979). Black willow is named for its dark gray-brown bark (Nix, 2010).



Black willow bark

Twigs are light-red, slender, and flexible. Buds narrow, conical, orange-brown; leaf scars narrow, crescent shaped; broad, flat, often shaggy ridges; pith pale brown, small. Flowers of black willow: male and female catkins on separate trees. Catkins are 4-5 cm long, on ends of leafy shoots, many small, yellow-green flowers without petals (Stephens, 1969).

Black Willow Catkins

The biggest tree, a champion black willow, according to The American Forestry Association's Hall of Fame for Trees was in Traverse City, Michigan, with a circumference at breast height of 7.9 m (26 ft-1 in), a height of 25.9 m (85 ft), and a spread of 24.1 m (79 ft) (American Forests, 2008). The estimated life span for black willow averages 65 years with a range of 40 to 100 years (Stringer, 2006).

Flowering and Fruiting: Black willow flowers between February and April in the southern part of its range and as late as May or June in the northern part. Flowers usually appear with the leaves. The trees begin to bear fruit at about 10 years of age; however, optimum seed-bearing age ranges from 25 to 75 years. The mature seeds fall between April and July (Fowells, 1965).

Distribution: Black willow ranges from New Brunswick to Manitoba, south to Florida and Texas (Steyermark, 1963). For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Habitat: This species is usually found on moist or wet soils along banks of streams, lakes, swamps around farm ponds, and pasture sloughs (Stephens, 1969).

Adaptation
Black willow ranges over most of the eastern half of the United States and attains tree size throughout the greater part of its range, commercial production of its lumber occurs mainly in the alluvial bottomlands of the lower Mississippi River. The species grows best where the average annual rainfall is 51 inches, of which 20 inches falls during the growing season, April through August. The willow survives temperature extremes of 115ºF to -50ºF in parts of its range. Typically, the average maximum is 93ºF in summer and 60ºF in winter (Fowells, 1965).

Photo Courtesy of Chris Hoag, Wetland Plant Ecologist, USDA NRCS, Aberdeen Plant Materials Center

Establishment
Black willow is easily established from cuttings. Stringent requirements of seed germination and seedling establishment limit black willow to wet soils, especially flood plains where it grows in pure stands near water courses (Pitcher and McKnight, 1990).

Management
Stands of black willow can stagnate if not properly thinned. A light thinning to remove understory trees should occur early and frequently to forestall stagnation and mortality. Avoid over thinning as open stands are subject to heavy windthrow and stem breakage. A proper thinning should leave a stand of about 65-75 square feet of basal area per acre (Fowells, 1965).

Pests and Potential Problems
A number of insect species attack black willow but few cause serious damage. Forest tent capterpillar (*Malacosoma disstria*), gypsy moth (*Lymantria dispar*), cotton wood leaf beetle (*Chrysomela scripta*), willow sawfly (*Nematus ventralis*), and the imported willow leaf beetle (*Plagiodera versicolora*) sometimes partially, occasionally completely, defoliate willow trees, reducing growth but seldom killing. Stem borers, such as the cottonwood borer (*Plectrodera scalator*) attack willows and may kill by girdling the base. Twig borers such as the willow-branch borer (*Oberea ferruginea*), feed on the branches and cause deformities that may be undesirable in ornamentals (Pitcher and McKnight, 1990).

A number of diseases plaguing willows are transmitted by insects. Willow blight, *Pollaccia saliciperda*, is transmitted by borers of which Salix species are the only known hosts (Pitcher and

McKnight, 1990). Symptoms are dead leaves and shoots due to fungal infection with striking black spots on the leaves shoot tips blackened and shaped like hooks. The damage can be so extensive that entire tree appears to have been denuded by feeding insects (Stihl, 2010). *Phytophthora cactorum* causes bleeding canker, lesions on the lower trunk that discharge a dark-colored, often slimy liquid. Confined to the phloem and cambium area, it can result in death if the canker girdles the trunk. *Cytospora chrysosperma* causes canker in poplar and willow. Under forest conditions, cytospora canker is of little consequence but when trees become weakened by drought, competition, or neglect, losses can be heavy. In nursery beds, losses of up to 75 percent of cuttings have been reported. Leaf rust caused by *Melampsora* spp. is common on seedlings throughout the range of black willow. Mistletoes (*Phoradendron* spp.) damage and deform but seldom kill willows (Pitcher and McKnight, 1990).

Droughts that lower the water table can cause serious mortality where willow tends to be shallow-rooted as on clay-capped alluvial soils (Fowells, 1965).

Environmental Concerns
None known

Seeds and Plant Production
Good seed crops occur almost every year with only a few interspersed poor crop years. Failures resulting from late freezes after the flower buds have begun to open are rare. Large volumes of seed are produced with an average of 2 to 3 million per pound. The seeds are widely disseminated by wind and water. When the seeds fall, the long silky hairs act as wings to carry the seed very long distances (Fowells, 1965). Willow seed must be collected as soon as it ripens and sown immediately. Stem cuttings are highly desirable to propagate trees (Brinkman, 1974).

Fire Effects
Although fires are rare in the bottomland areas where black willow grows, black willow is very susceptible to fire. Hot fires can kill entire stands of willows. Slow, light fires can seriously wound willows, allowing wood rooting fungi to enter. Young seedlings and saplings will be destroyed by fire. Black willow will sprout at the base following fire (Tesky, 1992; Pitcher and McKnight, 1990).

Cultivars, Improved, and Selected Materials (and area of origin) 'Webb' compact willow is a "strikingly different vase-shaped form of black willow. It forms a small, dense tree. This unusual form occurred as a single tree on the farm of Mr. Charles Webb in Madison County, Florida" (Woodlanders, 2008).

Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

Control
Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA, NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

References

Active Concepts. 2010. ABS Willow Bark Extract. Technical Data Sheet. http://www.in-cosmetics.com/ExhibitorLibrary/830/ABS_Willow_Bark_Extract_Powder-Technical_Data_Sheet-v5_3.pdf [online: cited 25 Feb 2010].

arnatural.org. 2010. Willow-Nature's Aspirin. Univ. of Arkansas, Div. of Agriculture, Co-op Ext. Serv. http://www.arnatural.org/Wildfoods/Uses_Trees.htm [online: cited 25 Feb 2010].

Anonymous No. 1. 2008. Black willow wood properties by Connected Lines. http://www.connectedlines.com/wood/wood15.htm [online: cited 23 May 2008].

Anonymous No. 2. 2008. http://www.butterflygardeningandconservation.com/plant/host/s-nigra.php [online: cited 17 November 2008].

Anonymous No. 3. 2008. Southern California Culture http://www.fourdir.com/southern_california_culture.htm [online: cited 9 Dec 2008].

Anonymous No. 4. 2008. http://www.exotichardwoods-northamerica.com/willow.htm [online: cited 17 November 2008].

American Forests, National Tree Register of Big Trees: *Salix nigra*. http://americanforests.org/resources/bigtrees/register.php?details=623 [online: cited 23 May 2008].

Brinkman, K. A. 1974. *In* Schopmeyer, C.S. Tech. Cord. *Seeds of woody plants in the United States*. USDA-FS Agriculture Handbook No. 450. Washington, DC.

Cameo.mfg.org. 2010. Material Name: willow bark. http://cameo.mfa.org/browse/popup_print_material.asp?materialid=10102&type=all [online: cited 25 Feb 2010].

Castetter, E. F. and R. M. Underhill. 1935. Ethnobiological Studies in American Southwest II. The Ethnobiology of the Papago Indians. Univ. of New Mexico Bull. 4(3): 1-84.

Dirr, M. A. 1977**.** *Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Progation and Uses*. Stipes Publishing Co., Champaign, Ill.

Fowells, H. A. 1965. *Silvics of Forest Trees of the United States.* Agriculture Handbook No. 271. USDA Forest Service, Washington, DC.

Hamel, P. B. and M. U. Chiltoskey. 1975. *Cherokee Plants and Their Uses – A 400 Year History*. Herald Publ. Co., Sylva, N.C.

Harlow, W. H., E. S. Harrar, and F. M. White. 1979. p. 224-225. *In Textbook of Dendrology.* Sixth Edition. McGraw-Hill Book Co., New York.

Herrick, J. W. 1977. Iroquois Medical Botany. State Univ. of New York, Albany, PhD Thesis.

Mausert, O. 1932. *Herbs for Heath*. www.meridianinstitute.com/echerb/Files/classics/mausert/matmedin.html [online: cited 25 Feb 2010].

Ohio Trees 2008. http://www.ohiodnr.com/forestry/trees/willow_black/tabid/5432/Default.aspx [online: cited 14 Nov 2008].

Nix, S. 2010. Black Willow, A Common Tree in North America. http://forestry.about.com/od/hardwoods/tp/Salix_nigra.htm [online: cited 5 Mar 2010].

Panshin, A.J. and C. deZeeuw. 1980. p. 547-549. *In Textbook of wood technology*, 4th Edition. McGraw-Hill Series in Forest Resources. McGraw-Hill Book Company, New York.

Pitcher, J. A. and J. S. McKnight. 1990. *Salix nigra* Marsh. Black Willow. *In* Silvics of North America. USDA-FS Agriculture Handbook No. 654. http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/Salix/nigra.htm [online: cited 14 Nov 2008].

Prindle, T. 2010. Natural Dyes for Porcupine Quills. http://www.nativetech.org/quill/dyes.html [online: cited 25 Feb 2010].

Randall, C. E. 1969. A willow grows aslant a brook. Enjoying Our Trees. American Forestry Association. P. 101-107.

Speck, F. G. 1917. Medicine Practices of the Northeastern Algonguians. Proceedings of the 19th International Congress of Americanists.

Speck, F. G. 1941. A List of Plant Curatives Obtained From the Houma Indians of Louisiana. Primitive Man 14:49-75.

Stephens, H.A. 1969. Trees, Shrubs, and *Woody Vines of Kansas.* Univ. Press of Kansas, Lawrence.

Steyermark, J. A. 1963. *Flora of Missouri*. Iowa State University Press, Ames, Iowa.

Stihl. 2010. Encyclopaedia of tree diseases. http://www.stihl.com [online: cited 4 Mar 2010].

Stringer, J. 2006. Two-age system and deferment harvests. Professional Hardwood Notes SP 679. http://www.uky.edu/Ag/Forestry/extension/pub/pdf/for103.pdf [online: cited 9 Dec 2008].

Taylor, L. A. 1940. *Plants Used As Curatives by Certain Southeastern Tribes*. Botanical Museum of Harvard Univ. Cambridge, MA.

Tesky, J. 1992. Salix nigra. *In* Fire Effects Information System, [Online]. USDA-FS Rocky Mountain Exp. Sta., Fire Sciences Laboratory (Producer). http://www.fs.fed.us/database/feis/plants/tree/salnig/all.html [online: cited 18 Nov 2008].

Woodlanders. 2008. Salix nigra "Webb" Willow, Webb, compact from Woodlanders, Inc. http://www.woodlanders.net/index.cfm?fuseaction=plants.plantDetail&plant_id=229 [online: cited 17 Nov 2008].

Prepared By
John M. Row
USDA NRCS, Manhattan Plant Materials Center,
Manhattan, Kansas

Wayne A. Geyer
Forestry Division, Kansas State University,
Manhattan, Kansas

Edited:

For more information about this and other plants, please contact your local NRCS field office or Conservation District, and visit the PLANTS Web site<http://plants.usda.gov> or the Plant Materials Program Web site <http://Plant-Materials.nrcs.usda.gov>

540.78 Checklist for Plant Selection Studies

The following checklist may be used to track the progress of a Plant Selection Study and to identify the proper order for items to be completed when making a plant release.

	Item	Date Completed
1.	A study plan has been prepared to identify the goals of the release.	
2.	Adequate consideration has been given to existing releases or commercial availability of the species to avoid duplication of efforts.	
3.	Collection strategies to meet the objective have been well thought out and are defensible to meet the purpose of the release.	
4.	Evaluation data has been summarized showing justification for this release.	
5.	Advanced evaluation documentation has been prepared.	
6.	The plant being released has been adequately identified as to genus, species, and subspecies, if appropriate.	
7.	The plant has undergone the Environmental Evaluation process and will not pose significant adverse effects on the environment. The release has been subjected to the considerations referenced in Sections 540.33(A)(3) and Section 540.83.	
8.	The cultivar or pre-varietal name has received clearance from the NPMC.	
9.	The approved name and new release is being registered with the appropriate authorities per Section 540.34(D)(6).	
10.	Consideration has been given to the desirability of seeking protection under the PVPA or patent statute.	
11.	Adequate seed, plants, or other propagules are available to meet expected demand by commercial producers.	
12.	A date has been estimated when seed or plants will be available commercially, which will serve as a public release date for promotional purposes.	
13.	The NPMC has been contacted regarding long-term storage of material in the National Plant Germplasm System.	

	Item	Date Completed
14.	An information campaign has been developed to promote the new release, as per Section 540.34(H). This is to include a schedule for special demonstration plantings (Section 540.17(D)), if any are planned.	
15.	A release notice has been prepared.	
16.	A release brochure has been prepared.	
17.	An existing Plant Fact Sheet or Plant Guide has been updated to include the new release or a new document prepared for the species.	
18.	A Conservation Plant Characteristics worksheet has been completed for the new release and submitted to the National Plant Data Center.	
19.	The PM Package has been provided to the PM Release Committee through a NTC Plant Materials Specialist for review.	
20.	All required signatures for the notice have been obtained. Note: The release is official on the date of the last signature, which is always the Director, ESD.	
21.	A paper copy of all documentation for the release (including evaluation documentation, cultivar name registration forms, signed release notice, and any articles, release brochures, and planting guides) has been distributed to cooperators on the release, and an electronic copy of these materials has been sent to the NPL.	

540.79 ESCOP Policy Statement for Developing and Releasing Improved Plants

ESCOP Policy Statement for Developing and Releasing Improved Plants

Publication Preparation

This revision was prepared by the Seed Policy Subcommittee of the Experiment Station Committee on Organization and Policy in 1988. The policy is still current:

K. A. Huston, Director-at-Large, North Central Region
C. R. Krueger, Pennsylvania, Northeast Region
P. A. Miller, ARS, USDA
M. H. Niehaus, Colorado, Western Region
R. L Thompson, Minnesota, ESCOP Representative to AOSCA
K. W. Tipton, Louisiana, Southern Region
R. L. Lower, Wisconsin, North Central Region

Publication History

June, 1954
Revised April, 1962
Revised February 28, 1967
Revised April 20, 1972
Final Revision June 26, 1972
Approved by ESCOP September 12, 1972
Approved by ARS, USDA July 20, 1972
Approved by SCS, USDA July 28, 1972
Concurred in by NCCPB August 29, 1972
Revised and Approved by ESCOP November 16, 1988
Policy is current as of August 2006

This revised statement has been approved by the four State Agricultural Experiment Station Directors' Association & and the Experiment Station Committee on Organization and Policy (ESCOP).

Before publication, informational copies of the guidelines were sent to ARS, SCS, FS, the American Seed Trade Association (ASTA) and the National Council of Commercial Plant Breeders (NCCPB).

For additional copies, address request to R.L. Lower, 136 Agriculture Hall. 1450 Linden Drive, Madison, WI 53706.

Contents

Appendix: Nomenclature

Foreword

This statement offers guidance to scientists and administrators of State Agricultural Experiment Stations (SAESs) concerning the development, release, and multiplication of germplasm of seed-propagated plants as either germplasm or crop varieties. Policies and practices addressed are those for which there is general agreement or for which uniformity or continued cooperation among the SAESs is critical.

In recent years, the policies and practices of SAESs have changed significantly in response to: continuing expansion of the private plant breeding industry; the changing needs of producers, growers, seedsmen and postharvest industries; the emergence of new research opportunities and industries in molecular genetics and biotechnology; continuing concern over adequacy of funding; public and private sector needs for new and replacement scientists; changes in state and U.S. Department of Agriculture (USDA) research policies, and new interpretations of patent laws. Less visible, but equally significant, have been the changing and diverging perceptions of universities and their state legislatures relative to public purpose doctrine and the use of public funds, intellectual property rights, academic freedom and conflict of interest.

Publicly supported germplasm development research by SAES began about a century ago. Since then, most SAESs have been directed into such work by congress and state legislatures in order to meet the specific needs of agriculture of those states. New knowledge, new technologies, new and improved germplasm resources, and new varieties are major products. Cooperation among the SAESs, USDA organizations -Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS), Forest Service (FS) and private industry is positive and strengthens opportunities for germplasm improvement. Hallmarks of cooperation include free exchange of information and of germplasm materials and varieties, shared development and maintenance of germplasm resource banks, shared responsibility for regional multilocational testing of each other's materials and varieties, release of only truly superior materials and varieties individually or cooperatively as appropriate, to the relative investments in developing them and fostering infrastructures to ensure entry, movement and maintenance of public varieties in intra- and interstate commerce. Legislative mandates for SAESs today operate in markedly changed circumstances.

The SAESs contribute to the education and training of future plant breeders, geneticists, biotechnologists and other plant scientists through linkages with instructional programs of parent universities. Plant science instructional programs gain most of their capacity for continual updating and modernization by engaging SAES research scientists in instructional activities. These scientists reflect the diversity and changes in specialization characteristic of the frontiers of plant science research. Student opportunities to gain firsthand work experience in research are similarly enriched by SAES research programs. About three-fourths of the assistantships available to graduate students in agriculture are in SAES programs. But as research programs shift emphasis, so also must instructional programs change. Paradoxically, growth in private plant breeding and variety development programs reduces the need for some public breeding programs but increases the need for trained plant breeders on which private industry depends for that growth.

Since the 1930s, privately supported germplasm development has expanded greatly. Private firms then and now rely heavily on publicly funded research to supply new advances in genetics, breeding, science and technology, and improved germplasm resource materials. Today, many private firms contribute to germplasm needs of agriculture, particularly in varietal development, notably in the multimillion acre crops. This competition among firms enhances variety improvement essential to keeping U.S. producers competitive at home and abroad. Rapid variety improvements are sustained, in part, by continuing releases of public germplasm with special qualities such as resistance to a new local race of pathogens or improved protein. Public varieties also contribute, though public varietal development in many crops has given way to private varietal development.

In many states, a lack of suitable private varieties or special production or marketing conditions have enhanced public support for germplasm development and variety releases in some relatively large acreage crops. In most states, small acreage or specialty crops are economically important to the state but offer little incentive to private firms to develop either germplasm resources or varieties. The SAESs respond as resources permit.

Currently, SAESs face several troublesome and unresolved issues. Maintaining free exchange of germplasm among researchers and its relatively free use in developing new germplasm resources and varieties is a major issue. Another issue is the extent and impact of the use of utility patents to protect intellectual property rights in the public and private sector research. Yet another issue is the impact of varying university policies relative to public purpose doctrine and uses of public funds, intellectual property rights, academic freedom and conflicts of interest.

Finally, prospects of intensified long-term competition for domestic and foreign markets are causing states to seek a competitive edge through locally controlled supply, research and marketing programs. Similar competition occurs internationally as plant breeding moves to multinational firms. Such competition can impede free flow of information and germplasm.

SAES personnel will continue to cooperate jointly with ARS and other agencies of USDA and private industry, to preserve, evaluate and enhance germplasm and to advance graduate training in plant breeding. Products of joint research between SAESs and ARS will be handled as mutually agreed by the cooperators following their respective policy guidelines.

Responsibilities and Guidelines Concerning Development, Release and Multiplication of Publicly Developed Germplasm and Varieties of Seed-Propagated Crops

These guidelines are intended to identify those practices and policies relating to development, release and multiplication of germplasm and varieties in SAES programs which may best serve public interests. They cover both agronomic and horticultural crops. Cooperation among scientists and among SAESs, federal agencies and private firms takes many forms. One of the most important is sharing of germplasm and information about germplasm. In this document, germplasm includes seed and vegetatively propagated genetic material, cell and tissue culture lines, DNA fragments and pollen.

I. Sources for New Germplasm Improvement

A. Collection, Introduction and Preliminary Evaluations of New Plant Germplasm

The USDA, through its ARS and the NRCS Plant Materials Center Program, in cooperation with the SAESs, collects, evaluates, preserves and distributes plant germplasm materials from foreign and domestic sources. Each introduction or accession is identified serially by an inventory number (PI no.) along with passport data. Through various cooperative arrangements, characteristics of accessions are evaluated and catalogued. These characteristics include reactions to insects, disease and climatic conditions, quality attributes, potential promising end-products, and other desirable traits. This information is made available to public agencies and the private sector through the USDA Germplasm Resources Information Network (GRIN) database.

State and federal agencies other than ARS also conduct domestic and foreign plant explorations. Such activities should be coordinated with those of the ARS to prevent duplicate introductions, evaluations and distributions of the same germplasm. Access to resulting plant collections by public and private plant breeders is encouraged; it is required of all ARS supported collections.

B. Use of Introductions

Persons receiving new materials through the National Plant Germplasm System are requested to report to donors their observations and performance test results of materials. These reports are

compiled, annotated and disseminated through the four regional research (RRF) projects on plant introductions1. Lists of stocks maintained in the Germplasm System are available from GRIN. Individuals or organizations proposing to increase and distribute seed or plant materials of such introductions in their original genetic form are asked to make this intention known to the donor agency. Plans for joint SAES/ARS release, thereby, can be considered. Confusion that might arise from duplication of identifying names or numbers given to the same introduction by public or private interests thus can be avoided (see Section V).

C. Recognition of Originating Source of Introduced Materials

Recipients of introduced materials should publicly acknowledge their source when such materials are increased or distributed in their original form. Recipients also should acknowledge their source when they create and release a demonstrably unique or novel line or variety by modifying the genetic makeup of the introduced materials.

[1]*Reference.* The National Program for Conservation of Crop, Athens, Germplasm. A Progress Report on the Introduction, Screening and Preservation of Plant Material, June 1971. University of Georgia Georgia. done for modifications by conventional (selection, inbreeding, etc.) and unconventional means (rDNA, fusion, etc.). In addition, the agency providing the original material should be informed of the specific characters in the new variety or line that were derived from the introduced materials. Public acknowledgments should cite original plant inventory number (PI) or other identification.

II. Studies of Heredity and Methods of Improvement, Enhancement via Biotechnologies and the Conduct of Basic/ Fundamental Research

A. Obligation of State Agricultural Experiment Stations

An objective of the SAESs is to research the characters and properties of plant materials, modes of reproduction, the inheritance of characters, and the modification and control of heredity.

B. Availability and Use of Basic Genetic Materials

Fundamental research on the inheritance, physiology and interaction of plants, pathogens and pests is a vital link in the development of improved varieties. The SAESs pursue this fundamental research to support the development of improved germplasm and varieties.

C. Prompt Availability of Results

The SAESs make the results of research studies available to all researchers, public or private, through prompt publication of research findings.

D. Acknowledgment of Use of Publicly or Privately Developed Basic Genetic Materials

Public acknowledgment of the use of publicly or privately developed basic genetic materials in the development of a new variety is the responsibility of the developer. Acknowledgment is strongly encouraged because it gives due recognition to the contribution of public or private programs.

III. Development of Superior Varieties and Novel Germplasm

A. A Function of the State Agricultural Experiment Stations

SAESs have responsibility to develop improved germplasm and varieties to reduce production hazards, improve quality and increase biological efficiency.

B. Interrelations with Private Plant Breeding Program

Free interchange of materials, specialized facilities, scientific competence in many disciplines, and the opportunity to test, observe, and to study reactions under a wide range of environmental conditions enhance the probability of a successful germplasm system. SAESs encourage germplasm exchange with private industry.

IV. Testing and Evaluating Experimental Varieties

A. Adequate Comparisons with Standard Varieties

Experimental varieties and lines should be tested for yield, quality, survival, disease and insect reaction, and other important characteristics in comparison with standard varieties. Experimental designs and statistical techniques that assure valid measures of performance should be used.

B. Interstate and Regional Tests

Some varieties are widely adapted and not limited. Interstate testing and, when appropriate, international testing should be encouraged. Regional testing facilitates more general use of widely adapted varieties. It also reduces time needed to provide reliable information on varietal adaptations. Material can be included in regional/international tests only with the permission of the developer or owner.

C. Testing for Special Requirements

New crop varieties to be used for food must be tested for nutritive composition, concentration of toxic constituents, or stability in processing when they reasonably might be expected to vary significantly from varieties in commercial production. The term "vary significantly" has been defined as varying 10 percent in toxicological content and 20 percent in nutritive content. The Food and Drug Administration requires submission of data for proposed new food varieties that have had significant alteration of such composition.

Submitted data will permit determination as to whether the variety merits listing as "Generally Regarded as Safe" (GRAS). (Federal Register, Document 71-8976, page 12094, June 18, 1971.)

New varieties of crops to be used for specialized industrial or other purposes should be tested for these uses. Potential users should have the opportunity to evaluate a variety before it is released.

D. Protecting Lines and Varieties Against Premature or Unauthorized Distribution

All reasonable precautions should be taken to protect the privileged or restricted status of propagating materials, experimental lines or experimental varieties during testing and seed increase to prevent pirating and premature or unauthorized distribution prior to release. The possibility that an application for some form of variety protection may be filed intensifies the need for such precaution.

V. Guidelines for SAES Release of Germplasm

SAESs develop and release improved germplasm for the benefit of agriculture within their states. Traditional releases have been as basic genetic materials, parental lines and varieties.

A. Availability and Use of Basic Genetic Materials

Germplasm from SAES programs should be made available under reasonable terms and provisions to foster research and cooperation by public and private scientists. International sharing of germplasm should stress reciprocity or other benefits to the donor.

Basic genetic materials should generally be made available to all plant breeders who request them. The term basic genetic material refers to plant material possessing one or more potentially desirable characters which, in the opinion of the plant breeders, may be of value in plant breeding and when, in their opinion, such general release is in the best interests of United States agriculture and the state research program.

Periodically, the originating station should make notification of germplasm releases, specifying limitations on use and on the amount of material available for distribution.

Every effort should be made to insure that basic genetic materials are not monopolized by any interests. Furthermore, inbreds, experimental lines and basic genetic materials normally should not be released in foreign countries prior to their release in the United States.

B. Releasing Finished Genetic Materials

SAESs will release finished varieties and inbreds as accomplishments of research and educational programs. These releases should be accessible to the public.

A variety or inbred should not be released unless it is superior to existing varieties in one or more characteristics important for the crop, or it is superior in overall performance in areas where adapted and is satisfactory in other major requirements or is novel in some other way. A single major production hazard which a new variety can overcome, e.g., a highly destructive disease, may become the overriding consideration in releasing a variety. Varieties with a very limited range in adaptation should not be released unless performance in that limited range is superior, or the variety possesses values not otherwise available, including diversification of the germplasm base for a species.

C. Policy Committee or Board of Review for Variety Release

Decisions on the release of new varieties and the type of release should be made for each state by the SAES director. The SAES should appoint a policy committee or board of review charged with reviewing the proposal for the release of a new variety. Appropriate information concerning characteristics, performance, area of adaptation, specific use values, seed stocks, and proposed methods of varietal maintenance and increase and distribution should be presented to this committee.

D. Interstate or Interagency Release Procedures

When a variety or inbred has been tested on an interstate basis, opportunity to consider simultaneous release of the seed must be given each state in the interstate program.

If, for some reason, prior interstate testing was not conducted, the state which releases a new variety should offer seed of the new variety to all interested states for testing and increase; thus nearby states may obtain information to answer questions from potential users about the new variety. Regional advisory committees may set guidelines for sharing of Foundation Seed stocks among states.

When the development of a new variety is a cooperative effort by a state or states and a federal agency (USDA/ARS, USDA/SCS or USDA/FS), joint releases could potentially be made by the agencies involved. Appropriate use should be made of the services of the Association of Official Seed Certifying Agencies, the U.S. Plant Variety Protection Office and the U.S. Patent and Trademark Office in determining novelty of and in cataloging new varieties.

E. Protection and Restricted Release

A SAES may elect to protect (Plant Variety Protection (PVP) or patent) or otherwise restrict certain uses of germplasm. The major consideration for patenting and restricted release should be benefits to U.S. agriculture. Royalties or fees that accrue from protected germplasm should be distributed to enhance and support research according to local institutional policies. When an SAES collects royalties firms of seed of a variety sold in another state and the variety was developed by cooperative research between the two SAESs, these royalties should be shared.

Utility patents likely will be used commonly to protect plant germplasm. To hasten plant improvement, a SAES should seek variances in protection offered by utility patents. Such variances also would counteract the adverse effects of one SAES asking another SAES for fees for patented materials which that SAES had participated in developing. At risk are cooperative efforts such as free exchange of germplasm and information and the voluntary and free multilocational regional testing of each other’s germplasm and varieties.

Unlike PVP protection, utility patents do not automatically allow use of patented material in research or plant improvement programs without approval of or compensation to the patent holder. A "research clause", or exemption from seeking approval for research use, is recommended. Also recommended is a waiver of certain dominance rights of a patent over future patents on materials derived from the initial patent. Holders of patents on marketed materials derived from an earlier patent should be required to compensate the holder of that earlier patent only during the first 5 years (time may vary according to local institutional policy) of the life of that patent rather than

the 17 stipulated in the law. In both cases, users of patented materials should acknowledge the source of germplasm.

F. Preserving Genetic Identity

Identical genetic material should not be distributed or sold under different names, varieties or brands. The genetic identity (i.e., the parentage) of all materials should be available to the user. Advanced methodologies or techniques that enable identification include analyses of seed proteins and isozymes and nuclear restriction fragment length polymorphisms.

VI. Naming and Registering Varieties

A. Designation

A new variety should be given a permanent designation before it is released. The designation should be acceptable to the states/agencies participating in the release, but the originating station or agency has the final responsibility for providing this designation and naming new varieties. Brevity in designation is desirable. When this designation is a name, one short word is preferable; two short words are, however, acceptable. Meaningful number designations or combinations of words, letters and numbers, consistent with accepted procedures, are also acceptable.

The International Code of Nomenclature for Cultivated Plants provides guidelines for naming varieties and should be consulted.

B. Use of Names

Identical germplasm can not be distributed or sold under different names. The same name should not be used more than once in a given crop. Similar names should also be avoided. Provisions of the Federal Seed Act (53 Stat. 1275) apply.

Once established, a legitimate varietal name should not be changed. Varietal names which are misleading or which are identical or similar to brand names or trademarks associated with agricultural products should be avoided, as there may be an implied association of the variety and trade names or trademarks. Proposed names should be cleared to determine previous use of the proposed variety name and for possible infringement of trademarks by contacting the Livestock and Seed Division, Agricultural Marketing Service.

C. Registering Varieties

Information on new varieties of crops for which national variety review boards have been established should be submitted to the review board following consideration by the state variety committee but before final release.

New varieties of crops should be registered. Following release of the variety, information for the registration or listing should be submitted promptly to the Crop Science Society of America (CSSA) or the American Society for Horticultural Science (ASHS). Procedures for registering varieties are available from CSSA, and procedures for listing varieties are available from ASHS. Materials registered with the CSSA become a part of the National Plant Germplasm System and small amounts of seed are freely available to bona fide researchers. This is a voluntary program.

VII. Definition of Classes Certified Seed and of Certification Standards

The Association of Official Seed Certifying Agencies, in the current issue of its "Certification Handbook", defines the various classes of certified seed and certification standards and procedures. These definitions, now and as amended in the future, are a part of this policy.

VII. Increase and Maintenance of Breeder Seed

A. Responsibility for Maintaining Breeder Seed

The originating SAES or agency should prepare a statement of plans and procedures for maintaining Breeder and Foundation Seed, including any limitations on the number of generations through which the variety may be sold by variety name.

When a variety is sufficiently promising to justify consideration for release, Breeder Seed should be increased to the volume needed to produce and maintain required Foundation Seed. So long as a variety is retained in the seed program of the originating state, that state should maintain a reasonable reserve of Breeder Seed, which will be used to replenish and restore Foundation Seed of the variety to the desired level of genetic purity. When the variety is distributed in several states, or when the originating state or agency ceases to maintain Breeder Seed of a variety, a mutually satisfactory plan should be formulated by the interested states or agencies regarding the maintenance of Breeder Seed. Interested states should be notified well in advance by the originating state or agency when it plans to discontinue maintenance of Breeder Seed of a variety.

When states jointly release a variety, they should formulate a procedure for making a supply of Foundation Seed available to each state.

B. Supplying Sample of Seed to National Seed Storage Laboratory

A sample of Breeder Seed of all newly released varieties should be supplied by the originating state or agency to the National Seed Storage Laboratory (NSSL), Fort Collins, Colorado. Recording forms are provided by that laboratory. Seed deposit in the NSSL is required for CSSA registration.

IX. Increase, Maintenance and Distribution of Foundation Seed

A. Multiplying Foundation Seed

An adequate and recurring supply of Foundation Seed is essential for multiplying a variety. Foundation Seed of publicly produced varieties should be increased by authorized parties who have the experience, facilities and skill to assure adequate supplies of seed with acceptable levels of genetic purity.

B. Distributing Foundation Seed

To avoid problems, Foundation Seed of a new variety should be simultaneously released in all interested states. If Foundation Seed is distributed into another state where the variety is being distributed under allocation as a new release, the Foundation Seed should be offered through, or with the concurrence of, the official seed stocks or certifying agency in that state.

C. Basic Principles in Foundation Seed Programs

Foundation Seed should be released in a manner that provides greatest benefit to users and the public. Within this context, Foundation Seed programs should recognize the following basic principles:

1. Qualified seed growers and seedsmen should have an opportunity to obtain appropriate planting stocks of unrestricted varieties at an equitable cost; however, selective allocations may be necessary to achieve quality increases to meet the needs of potential users.
2. Release of Breeder and/or Foundation Seed of a variety to one or a few growers or seedsmen is appropriate when more widespread distribution will not insure an adequate seed supply on a continuing basis. When limited release is anticipated, federal and state agencies and private grower or seedsmen should be notified and given an opportunity to bid for that release.
3. Planting stocks of varieties developed cooperatively with the agencies of USDA ordinarily will be made available through or with the concurrence of the seed stocks or certifying agency of the cooperating state(s) at an equitable cost to qualified seed growers and seedsmen. In special circumstances, e.g., No. 2 above, consideration may be given to, granting limited term exclusive rights. For this purpose, consideration should be given to applying for certificates of variety protection under the Plant Variety Protection Act or some other form of protection.

X. Preparation and Release of Information

A. Coordinating Publicity among States and Agencies

Seed producers, distributors and users should be informed as fully as possible, consistent with variety testing policies and procedures within each state, of the values and the adaptation of new varieties in comparison with other available varieties.

Pertinent information as to the basic facts of origin, variety characteristics, and data justifying the increase and release of a new variety shall be prepared by the fostering state(s) and agency(ies) and provided to other interested states or agencies. The information used in deciding upon release of a new variety should also be used to inform seed producers, distributors and the public of its value.

Participating states or agencies should use this material, supported or modified by their own information, in state or national publicity. Publicity intended for national or region periodicals should include information on the regional adaptation of the variety. A uniform date for the release of initial publicity should be agreed upon by the fostering states and/or federal agencies.

Appropriate information concerning actions with respect to PVP, including certification requirements, should be included in publicity releases.

The above procedure is intended to provide information that is complete, fair and unbiased, and enable seed producers, distributors and users to make sound judgments in selecting varieties.

B. Matching Seed Production and Demand for Varieties

Seed production and demand must be considered together to assure that a variety will make its maximum contribution to agriculture. Thus, promotional publicity in advance of the release of a new variety, or before seed is available, or incomplete publicity following its release are not desirable. An educational program setting forth the superior characteristics, region of adaptation, and any special limitations which have been identified should be coordinated with seed supply.

Appendix: Nomenclature

In this statement, the term variety (synonymous with the term cultivar) is used in accordance with the International Code of Nomenclature of Cultivated Plants, 1969. The correctness of use of the terms Cultivar and Variety in the English language is frequently not clearly understood. The International Code of Nomenclature of Cultivated Plants has adopted the term Cultivar as an international term which is proper for use in any language. In the English language, the term Variety may be used as an exact equivalent or as a synonym of Cultivar. Care should be taken not to confuse the term with the English translation of Varieties, also Variety, which is a botanical classification. To insure differentiation between Variety when used for a cultivated variety and Variety when used as a botanical classification, the abbreviation of the former is cv., and of the latter is var.

In the English language editions of the Code prior to 1969, the term Variety was included in parentheses following the term Cultivar to indicate the complete equivalence of the terms Cultivar and Variety when referring to cultivated varieties. This redundancy was eliminated in the 1969 edition by the International Commission for the Nomenclature of Cultivated Plants and the following explanations were included:

> "The term cultivar is equivalent to the term 'variety' in English, varieties in French, variedad in Spanish,…whenever these words are used to denote a cultivated variety."
>
> Article 10, Note 4:
>
> "The terms cultivar and variety (in the sense of cultivated variety) are exact equivalents. In translations or adaptations of the Code for special purposes either cultivar or variety (or its equivalent in other languages) may be used in the text."

Clearly, in no way does the 1969 edition change the policy regarding use of the English term Variety. In fact, if the Code were to be reproduced for popular use in the English language, the International Commission would sanction use of only the term Variety. There certainly is no regimentation in the Code for universal use of the term Cultivar when referring to cultivated varieties.

Good judgment should prevail in the use of the equivalent terms. In scientific papers which have international consumption, the international term Cultivar may be most clearly understood. In papers or documents intended for use by the English-speaking lay public or non-scientific community, the term Variety may often be the more desirable synonym.

The term "variety" means a subdivision of a kind which is distinct, uniform, and stable: "distinct" in that the variety can be differentiated by one or more identifiable morphological, physiological, or other characteristics from all other varieties of public knowledge; "uniform" in that variations in essential and distinctive characteristics are describable; and "stable" in that the variety will remain unchanged to a reasonable degree of reliability in its essential and distinctive characteristics and its uniformity when reproduced or reconstituted as required by the different categories of varieties. This definition of a variety is understood to include the following categories: clonal varieties, line varieties (inbreds), multiline varieties, open-pollinated varieties of cross-fertilizing crops, synthetic varieties, (first generation and advanced generation), hybrid varieties (F1), and (F2) varieties.

This statement has been developed with full cognizance of the contents and implications of the Variety Protection Act, Public Law 91-577. Mutually helpful working relationships among the SAES, the USDA, and private plant breeders and seed companies should be encouraged to enhance the effectiveness of both public and private plant breeding efforts.

The term "biotechnology" refers to the emerging techniques that include rDNA, protoplast fusion, genetic cross-protection and similar techniques.

[Editor's Note: The 1994 International Code of Nomenclature for Cultivated Plants revised the definitions of "cultivar" and "variety" and no longer considers these terms equivalent. The Plant Materials Program does not use the terms "cultivar" and "variety" interchangeably. See Section 540.34(B)(1).]

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

SEED AND PLANT COLLECTION INFORMATION

PLANT INFORMATION

Accession No. _____

Scientific Name _____

Plant Symbol _____

Common Name _____

Cultivar/Release _____

Plant Type _____

For PMC Use: Date Received _____

COLLECTION INFORMATION

Date Collected _____

Collector _____

_____

_____

Type of Collection ☐ Seed ☐ Vegetative

Number of Plants from Which Collected _____

Quantity Received _____

SITE INFORMATION

State _____ County _____ MLRA _____

Township _____ Range _____ Section _____

Latitude _____ Longitude _____ Location Map Provided ☐ Yes

Soil _____ Texture _____ Soil Modifier _____

Slope % _____ Aspect ☐N ☐S ☐E ☐W Elevation ☐ ft or ☐ m _____

Annual Precipitation ☐ in or ☐ mm _____ Water Depth _____ Salinity _____ ☐ Intertidal

Plants Growing in Association

_____

_____

SOILS INFORMATION

Soil Series & Texture _____

Soil Survey Sheet # _____ Soils Mapping Unit Symbol _____

REMARKS

_____

_____

Please fill in the above form as completely as possible, following the instructions below for collecting and handling seed and vegetative material. Attach a map showing local roads and the collection site or use the back of this sheet to draw a map. Be sure to label each collection as it is made so collections do not get confused. Send seed or plants to the Plant Materials Center serving the state, unless other specific instructions are provided.

Watch for superior plants that display unusual characteristics and record observations. Seed or cuttings from an individual plant or from several plants in the same colony can constitute a collection if warranted. Make separate collections of the same species if the growing site or location is different.

Seed Collection: Check each collection for filled seed and then attempt to get the equivalent of one-fourth pound of seed. Collection should be from a minimum population of 30-100 plants if possible. Mature seed is typically dry and hard and has separated from the rachis (grasses) or loosens easily from the pods, capsules, or flower heads. Do not collect unripe seed. Dry seed should be stored in paper envelopes or paper bags. Fleshy seed should be enclosed in a plastic bag. Keep all collected seed in a cool place out of direct light.

Vegetative Material Collection: Collect only good healthy material. Use a sharp knife, scissors or pruners for cutting vegetative material. Root cuttings should be a minimum of 6" in length. Stem cuttings should be 6-8" or longer and have a minimum of 2 nodes. Wrap roots or cuttings with moist paper or cloth. Place in a plastic bag with a few small holes in it. Refrigerate or keep cool until shipped. Material should be shipped or delivered as soon as possible so that it does not dry out.

Print Form Only Clear Form

SEED AND PLANT COLLECTION INFORMATION

FORM INSTRUCTIONS

Please fill in the associated form as completely as possible, following the instructions below for collecting and handling seed and vegetative material. Attach a map showing local roads and the collection site or use the back of this sheet to draw a map. Be sure to label each collection as it is made so collections do not get confused. Send seed or plants to the Plant Materials Center serving the state, unless other specific instructions are provided by the Plant Materials Center.

Watch for superior plants that display unusual characteristics and record observations. Seed or cuttings from an individual plant or from several plants in the same colony can constitute a collection if warranted. Make separate collections of the same species if the growing site or location is different.

Seed Collection: Check each collection for filled seed and then attempt to get the equivalent of one-fourth pound of seed. Collection should be from a minimum population of 30-100 plants if possible. Mature seed is typically dry and hard and has separated from the rachis (grasses) or loosens easily from the pods, capsules, or flower heads. Do not collect unripe seed. Dry seed should be stored in paper envelopes or paper bags. Fleshy seed should be enclosed in a plastic bag. Keep all collected seed in a cool place out of direct light.

Vegetative Material Collection: Collect only good healthy material. Use a sharp knife, scissors or pruners for cutting vegetative material. Root cuttings should be a minimum of 6" in length. Stem cuttings should be 6-8" or longer and have a minimum of 2 nodes. Wrap roots or cuttings with moist paper or cloth. Place material in a plastic bag with a few small holes in it. Refrigerate or keep cool until shipped. Material should be shipped or delivered as soon as possible so that it does not dry out.

Detailed directions for each form field are included below.

PLANT INFORMATION

Accession No.
Accession number of the plant. This is assigned by the Plant Materials Center when the collection is received.

Scientific Name
Scientific Latin name of the species. Refer to the PLANTS database at http://plants.usda.gov/ for information regarding plant names if needed.

Plant Symbol
Four to six letter/number symbol assigned to the plant. Refer to the PLANTS database at http://plants.usda.gov/ for information regarding plant symbols if needed.

Common Name
Common name of the plant.

Cultivar/Release
Cultivar or release name, if applicable

Plant Type
Plant type, such as shrub, grass, forb

For PMC Use: Date Received
Date the PMC received the collection material from the field

For PMC Use: Quantity Received
Amount of material received by the PMC

SEED AND PLANT COLLECTION INFORMATION

FORM INSTRUCTIONS

(Continued)

Date Collected
Date the material was collected in the field

Collector
Name, title, organization name, address, phone number and email address of the individual that made the collection (Please fill in all information that applies to ensure proper credit is given.)

Type of Collection (Seed, Vegetative)
Indicate whether the collection is seed or vegetative in nature

Number of Plants from Which Collected
Enter the number of plants from which the material was collected. Be as accurate as possible if an estimate is used.

SITE INFORMATION

State
State where the collection was made

County
County where the collection was made

MLRA
The MLRA where the collection was made. Major Land Resource Areas are geographically associated land resource units (http://soils.usda.gov/survey/geography/mlra/ that can assist in determining the MLRA of the collection site. LRUs). Identification of these large areas is important in statewide agricultural planning and has value in interstate, regional, and national planning. An interactive map can be found at

Township
Township name where the plant material was collected, if applicable. This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html

Section
Section where the plant material was collected, if applicable. This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html

Range
Range where the plant material was collected, if applicable. This is used in the Public Land Survey System (PLSS). For more information and online access to PLSS maps, go to http://www.geocommunicator.gov/GeoComm/lsis_home/home/index.html

Coordinates (GPS readings if available):

Latitude
The geographic latitude of the planting location in decimal degrees or degrees, minutes, and seconds

Longitude
The geographic longitude of the planting location in decimal degrees or degrees, minutes, and seconds

SEED AND PLANT COLLECTION INFORMATION

FORM INSTRUCTIONS

(Continued)

COLLECTION INFORMATION

Elevation (ft or m)

The site elevation at the plant collection site. Check one box, either “ft” for feet or “m” for meters to indicate the unit of measurement represented

Slope (%)

The slope at the plant collection site, as a percentage

Aspect/Exposure (N, S, E, W)

The exposure of the site; check the box(es) corresponding to the plant collection exposure- N = north, S = south, E = east, W = west; more than one box may be checked

Precipitation (in or mm)

Indicate the site’s mean annual precipitation. The range in precipitation assigned to the soil series or soil complex is recommended. Check one box, either “in” for inches or “mm” for millimeters to indicate the unit of measurement represented.

Water Depth

The measurement of the depth of a waterbody from the surface to the top of the bottom sediments. Indicate water depth for a collection in inches or millimeters.

Salinity

The saltiness or dissolved salt content of a body of water. It is a general term used to describe the levels of different salts such as sodium chloride, magnesium and calcium sulfates, and bicarbonates. Please note the unit of expression – parts per thousand (ppt or ‰), mg/L or ppm (parts per million).

Intertidal

The area that is exposed to the air at low tide and underwater at high tide (for example, the area between tide marks). This area can include many different types of habitats, including steep rocky cliffs, sandy beaches, or wetlands (e.g., vast mudflats). Check the box if the collection was made in an area so described.

Plants Growing in Association

List any plant materials that seem prevalent in the collection area.

SOILS INFORMATION

Soil Series & Texture

List the soil series or soil complex at plant collection site, as well as the dominant soil texture at the plant collection site

Soil Survey Sheet #

Web versions of soil survey maps can be obtained at http://soils.usda.gov/survey/online_surveys; for instructions on how to read and use a soil survey map, go to http://soils.usda.gov/survey/how_to/.

Soils Mapping Unit Symbol

The small letters or numbers that are within the same polygon as your area of interest, such as ScC, or KnC, or LaC designate a map unit. Note this map unit symbol – it is the key to finding information. Go to the text or tables for information on that map unit.

REMARKS

Describe any unusual findings or general observations about the plant collection site or the plant materials themselves. Also note any landmarks, crossroads, etc. that may assist in locating the site.

540.83 Worksheet for Documenting an Environmental Evaluation of NRCS Plant Releases

A. Introduction

This worksheet is used to conduct and document an Environmental Evaluation of Plant Materials releases. Criteria relating to the biological characteristics of a plant, the potential impact on species interactions and ecosystems, the ease of managing the plant, and conservation need are scored. These scores and their interpretation are used with a decision flowchart to determine the appropriate course of action for making a release. As with any such ranking system, it is necessary to use sound judgment and experience when interpreting the final results. What is appropriate for developed or agricultural areas may not be appropriate for wildlands. Final judgment and restrictions for use of releases should consider if the materials are intended for use on wildlands and if the plant species occurs naturally at project sites. Consider also if the plant is likely to be used in proximity to ecological or genetic reserves, wildlife corridors, or along roadways and riparian habitats that connect fragmented wildlands.

B. Understanding this Worksheet

The primary purpose for this worksheet is to determine if the plant release has the potential to adversely affect the environment or natural surroundings. It is possible for a plant to rate low on Part 1 (Impact on Habitats) and thus be released without further consideration, and still have a high rating on Part 4 (Biological Characteristics), indicating that the plant has the ability to propagate and maintain itself naturally. Good conservation plants usually need to persist to be able to solve the conservation problem or need for which they were intended. This is even more important for plants used in critical areas, i.e., severely eroding sites. In light of this fact, the most important criteria being used in this worksheet to determine release include those in Part 1 (Impact on Habitats) and Part 2 (Ease of Management). Parts 3 (Conservation Need) and 4 (Biological Characteristics) are used when the decision is unclear, there is the potential for a high impact on habitats, and control may be moderate to difficult.

C. Instructions

1. Rate the plant or release based on the following criteria by circling your assessment. If the criterion does not apply to the species or release, then do not rate for those criteria. If you do not have enough information on the species or plant release to complete at least Parts 1, 2, and 4 in Section A, then additional data must be accumulated through literature searches, cooperators, or studies to be able to complete these sections. Lack of data does not allow choice of a response. Positive responses under Section A shall only be used when there is data in support of no impact. Additional notes which may be used to clarify or interpret the ranking should be included in the margins of this worksheet. For plant releases which may be considered nearly unacceptable for release, it may be helpful to have other PM staff or cooperators complete copies of this worksheet to provide additional documentation.

2. All rating criteria must be completed for a plant material to be approved for release, even if it is found in Section A, Part 1 that the plant has a low impact on the environment. Evaluation of all criteria will provide documentation that a thorough

evaluation was completed for the plant at the time of release. This documentation may be needed in the future if questions are raised about the potential invasiveness or control of the plant.

3. When finished with ranking, interpretations, and decision making, record the final decision on the next page of this worksheet. A completed worksheet must be included with the release documentation and a copy sent to the NPMC for filing.

Environmental Evaluation of Plant Materials Releases

Name of person scoring: _____ **Date of scoring:** _____

Scientific Name: _____ **Common Name:** _____

Release Name: _____

Is the plant native to the United States? **Yes** **No**

Is the plant native to the area of intended use? **Yes** **No**

Authority used to determine native status: _____

What is the intended area of use for this plant? _____

What is the intended use for this plant? _____

Areas in which the release is known to be invasive or has a high probability of being invasive: _____

Summary of Criteria from Section A	**Score**
Part 1. Impact on Habitats, Ecosystems, and Land Use	
Part 2. Ease of Management	
Part 3. Conservation Need and Plant Use	
Part 4. Biological Characteristics	

Final Determination of Release Based on the Environmental Evaluation:

- ☐ **OK to Release**
- ☐ **OK to Release but qualify use and intended area of use***
- ☐ **Do Not Release - NPL determines if release is made***
- ☐ **Do Not Release - document and destroy materials**

I certify that this Environmental Evaluation was conducted with the most accurate and current information possible.

_____

Signature of Person Scoring Date

Signature of NPL indicating that it is OK to make the release:

_____ _____

National Program Leader, PM **Date**

* An Environmental Assessment (EA) and/or Environmental Impact Statement (EIS) may be required prior to release. If required, attach the EA and/or EIS to this worksheet and to the release notice.

Section A. Scoring of Criteria for Impact, Management, Need, and Biological

Characteristics

Circle the appropriate number for each of the following criteria. Add up the scores for each part and record at the end of each part. Comments which clarify answers or provide supporting information may be included in the right margin of the worksheet or attached on a separate sheet of paper.

Part 1: Impact on Habitats, Ecosystems, and Land Use

This section assesses the ability of the species or release to adversely affect habitats, ecosystems, and agricultural areas.

1) Ability to invade natural systems where the species does not naturally occur

a) Data show species not known to spread into natural areas on its own	0
b) Establishes only in areas where major disturbance has occurred in the last 20 years (e.g., natural disasters, highway corridors)	3
c) Establishes in mid- to late-successional natural areas where minor disturbances occur (e.g., tree falls, streambank erosion), but no major disturbance in last 20-75 years	6
d) Often establishes in intact or otherwise healthy natural areas with no major disturbance for at least 75 years	10

2) Negative impacts on ecosystem processes (e.g., altering fire occurrence, rapid growth may alter hydrology)

a) No perceivable negative impacts	0
b) Minor negative impacts to ecosystem processes	2
c) Known significant negative impacts to ecosystems processes	6
d) Major, potentially irreversible, alteration or disruption of ecosystem processes	10

3) Impacts on the composition of plant communities where the species does not naturally occur

a) No negative impact; causes no perceivable changes in native populations	0
b) Noticeable changes in community composition that have negative or unknown impacts on 1) biodiversity of natural systems, or on 2) desirable agricultural/developed systems	5
c) Causes major negative alterations in community composition	10

4) Allelopathy

a) No known allelopathic effects on other plants	0
b) Demonstrates allelopathic effects on seed germination or seedling growth of other plants	3
c) Demonstrates allelopathic effects to mature stages of other plants	5

5) Impact on habitat for wildlife (vertebrate or invertebrate) or domestic animals (aquatic and terrestrial), including threatened and endangered species (coordinate with the U.S. Fish and Wildlife Service and State Heritage Programs, as appropriate)

a) No negative impact on habitat, or this criteria not applicable based on intended use for the plant (explain intended use, why not applicable, and how to ensure plant will not be used in an inappropriate, sensitive context)	0
b) Minor negative impact on habitat or species interactions (e.g., decreased palatability; lower wildlife value; decreased value for undesirable animal species; shifts in herbivore frequency; shifts in disease frequency)	2
c) Significant negative impact on habitat or species interactions (e.g., foliage toxic to animals; significantly lower value for wildlife; excludes desirable animal species from a domesticated area or any native species from wildland area; increases exotic, invasive, or pest species in any area)	5

6) Impact on other land use

a) No negative impacts on other land uses	0
b) Minor impacts (plant could invade adjacent areas and decrease its value)	3
c) Significant impacts (plant may alter the system or adjacent lands significantly enough to prevent certain uses, or negatively affects biodiversity on same or adjacent wildlands)	5

Total Possible Points 45

Total Points for Part 1 _____

Part 2. Ease of Management

This part evaluates the degree of management which might be needed to control the species or release if it becomes a problem, or eradicate the species or release if it is no longer desirable.

1) Level of effort required for control

a) Effective control can be achieved with mechanical treatment	0
b) Can be controlled with one chemical treatment	2
c) One or two chemical or mechanical treatments required or biological control is available or practical	5
d) Repeated chemical or mechanical control measures required	10

2) Effectiveness of community management to potentially control the plant release

a) No management is needed, the plant release is short-lived and will significantly decrease or disappear within 5 years under normal conditions without human intervention	0
b) Routine management of a community or restoration/preservation practices (e.g., reasonably practical and financially feasible control methods, including some forms of prescribed burning, flooding, controlled disturbance, pasture renovation) effectively controls the release	2
c) Cultural techniques beyond routine management can be used to control the release	4
d) Cultural techniques beyond routine management can be used but are unlikely to	8

occur in a timely manner due to expense or difficult logistics	
e) The previous options are not effective for managing or controlling the release	10
3) Side effects of chemical or mechanical control measures	
a) Control measures used on release will have little or no effect on other plants or wildlife	0
b) Control measures used on release will cause moderate effects on other plants or wildlife	3
c) Control measures used on release will cause major effects on other plants or wildlife	5

**If spreads by seed, or both seed and vegetative means, go to #4
**If spreads by vegetative means only, go to #5

4) Seed banks	
a) Seeds viable in the soil for 1 year or less	0
b) Seeds remain viable in the soil for 2-3 years	3
c) Seeds remain viable in the soil for 4-5 years	5
d) Seeds remain viable in the soil for more than 5 years	8
5) Vegetative regeneration under natural conditions	
a) Regeneration from resprouting of cut stumps	1
b) Regeneration from pieces of the root left in the soil	4
c) Regeneration from root or stem parts left in the soil	6
6) Resprouts after cutting above-ground parts	
a) Does not resprout or resprouts but the release is sterile and does not produce seed	0
b) Resprouts and produces seed in future years	5
c) Resprouts and produces seed in same year	8
Total Possible Points	**47**
Total Points for Part 2	

Part 3. Conservation Need and Plant Use

This part evaluates the importance of the species or release to meet a conservation need. Describe the conservation need.

1) Potential Use(s) of the Plant Release	
a) Used for low-priority issues or single use	1
b) Has several uses within conservation	2
c) Has many uses within conservation as well as outside of conservation	4
d) Has high-priority use within conservation	5
2) Availability of Other Plants to Solve the Same Conservation Need	
a) Many other plants available	1
b) Few other plants available	3
c) No other plants available	5

3) Consequences of <u>Not</u> Releasing This Plant

a) No impact to conservation practices	0
b) Minor impact on one or more conservation practice	1
c) Serious impact on one conservation practice	3
d) Serious impact on more than one conservation practices	5
Total Possible Points	**15**
Total Points for Part 3	_____

<u>Part 4. Biological Characteristics</u>

This part evaluates the biological properties which indicate the natural ability of the species or release to propagate and maintain itself under natural conditions. Note: these criteria relate to the species <u>under natural conditions</u>, as opposed to the species under managed conditions used to increase the species, i.e., seed increase programs, or specific propagation methods which do not normally occur in nature.

1) Typical mode of reproduction under natural conditions

a) Plant does not increase by seed or vegetative means (<u>skip to #11</u>)	0
b) Reproduces almost entirely by vegetative means	1
c) Reproduces only by seeds	3
d) Reproduces vegetatively and by seed	5

2) Reproduction (by seed or vegetative) in geographic area of intended use

a) Reproduces only outside the geographic area of intended use	1
b) Reproduces within the geographic area of intended use	3
c) Reproduces in all areas of the United States where plant can be grown	5

3) Time required to reach reproductive maturity by seed or vegetative methods

a) Requires more than 10 years	1
b) Requires 5-10 years	2
c) Requires 2-5 years	3
d) Requires 1 year	5

<u>** If reproduces only by seed, skip to #5</u>

4) Vegetative reproduction (by rhizomes, suckering, or self-layering)

a) Vegetative reproduction rate maintains population (plant spreads but older parts die out)	1
b) Vegetative reproduction rate results in moderate increase in population size (plant spreads <3' per year)	3
c) Vegetative reproduction rate results in rapid increase in population size (plant spreads >3' per year)	5

<u>** If reproduces only vegetatively, skip to #11</u>

5) Ability to complete sexual reproductive cycle in area of intended use

a) Not observed to complete sexual reproductive cycle in the geographic area of intended use, but completes sexual reproduction in distant areas of the United States	1
b) Not observed to complete sexual reproductive cycle in the geographic area of intended use, but completes sexual reproduction in adjoining geographic areas	3
c) Observed to complete the sexual reproductive cycle in the geographic area of intended use	5
6) Frequency of sexual reproduction for mature plant	
a) Almost never reproduces sexually	0
b) Once every five or more years	1
c) Every other year	3
d) One or more times a year	5
7) Number of viable seeds per mature plant each reproductive cycle	
a) None (does not produce viable seed)	0
b) Few (1-10)	1
c) Few/Moderate (11-100)	3
d) Moderate seeded (>100 - 999)	5
e) Many-seeded (>1,000)	8
8) Dispersal ability	
a) Limited dispersal (<20') and few plants produced (<100)	1
b) Limited dispersal (<20') and many plants produced (>100)	3
c) Greater dispersal (>20') and few plants produced (<100)	7
d) Greater dispersal (>20') and many plants produced (>100)	10
9) Germination requirements	
a) Requires open soil and disturbance to germinate	1
b) Can germinate in vegetated areas but in a narrow range or in special conditions	5
c) Can germinate in existing vegetation in a wide range of conditions	10
10) Interspecific Hybridization	
a) Has not been observed to hybridize outside the species	0
b) Hybridizes with other species in the same genus	3
c) Hybridizes with other genera	5
11) Competitive ability (of established plants)	
a) Poor competitor for limiting factors	0
b) Moderately competitive for limiting factors	5
c) Highly competitive for limiting factors	10
Total Possible Points	**73**
Total Points for Part 4	_____

References

Many of the criteria used in this rating system were adapted from the following sources:

Hiebert, Ron D. and James Stubbendieck. 1993. Handbook for Ranking Exotic Plants for Management and Control. U.S. Department of the Interior, National Park Service, Denver, CO.

Randall, John M., Nancy Benton, Larry E. Morse, and Gwendolyn A. Thornhurst. 1999. Criteria for Ranking Alien Wildland Weeds. The Nature Conservancy, Arlington, VA.

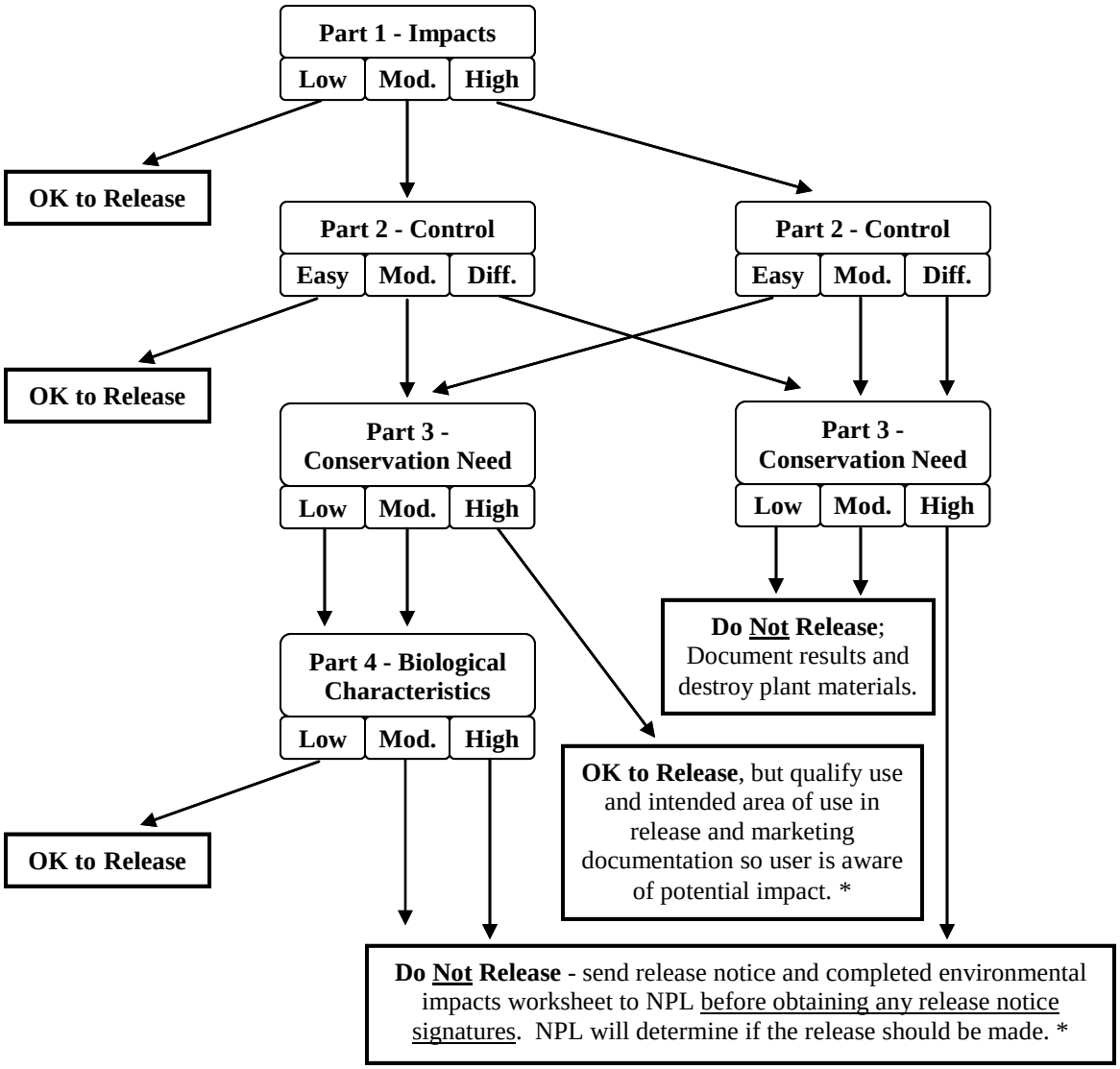
Section B. Scoring and Interpretation

Based on the scores from above, circle the points range you scored to determine the appropriate interpretation. The interpretation will be used to determine the course of action for the release.

Part	Points Scored	Interpretation
Part 1. Impacts on Habitats, Ecosystems, and Land Use	0-15	**Low** chance plant is going to affect the environment
	16-25	**Mod**erate chance plant is going to affect the environment
	26-45	**High** chance plant is going to affect the environment
Part 2. Ease of Management	0-20	**Easy** to control
	21-30	**Mod**erate to control
	31-47	**Diff**icult to control
Part 3. Conservation Need and Plant Use	0-5	**Low** need
	6-9	**Mod**erate need
	10-15	**High** need
Part 4. Biological Characteristics	0-25	**Low** chance plant is going to propagate and increase itself
	26-40	**Mod**erate chance plant is going to propagate and increase itself
	41-73	**High** chance plant is going to propagate and increase itself

Section C. Action to Take for Releasing Plants

Follow the decision tree below based on the interpretation above. Start with your interpretation rating for Part 1 (Low, Moderate, or High) and follow the appropriate arrow to the next level until you reach a decision box. Once you reach a decision box you may stop and record the decision on the first page of this worksheet.



* Indicates that an EA or EIS may need to be prepared prior to release (see NPMM Part 540.33(A)(3)).

Worksheet Updated 6/14/2010

540.84 Example of Information Found in a Documentation of Selection

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
Documentation of a Plant Accession Selected for Advanced Testing

Species:	*Elymus trachycaulus ssp. trachycaulus*
Common Name:	slender wheatgrass
Plant Symbol:	ELTRT
Accession Number:	432403
Year Selected:	2002
Selecting PMC:	MONTANA PMC
Lead PMC:	MONTANA PMC
Lead PMS:	MONTANA PMS
Selection Method:	Selection was based on emergence, seedling vigor, and persistence under saline-alkaline conditions.
DESCRIPTION	
Origin:	Collected in Carbon County, Montana, in a saline swale, 13 miles north of the Montana-Wyoming border and 5 miles north of Warren.
Botanical Description:	A short-lived, cool-season, native perennial bunchgrass. It has numerous, leafy stems with flat, broad leaves. Has an extensive, fibrous, root system that is relatively shallow.
Spread and Invasiveness:	
Spread by Seed:	medium
Spread Vegetatively:	none
Potential Invasiveness:	low
Area of Known Invasiveness:	none
Mode of Reproduction:	Self-Pollinated
Chromosome Number:	42
Out-crossing Percent:	5
Photosynthetic Pathway:	c4
Plant Type:	Grass
Growth Form:	Perennial
Growth Habit:	Bunch, Erect
Mature Height:	4.0
Seeds per pound:	97000
Seasons of Growth:	spring
ADAPTATION	
Climatic Conditions:	
Coldest Hardiness Zone:	2
Growing Season Days (Frost Free Days):	90
MLRA Potential:	32, 34, 52, 58, and 67
Maximum Precipitation:	25
Minimum Precipitation:	5

ADAPTATION (continued)

Soil Condition:

Soil Texture Range:	Fine Sandy Loam - Clay
Minimum Rooting Depth:	2
High pH:	8.9
Low pH:	5.5
Salinity Tolerance:	22
Inundation Tolerance:	1
Inundation in Days:	15
Drainage Tolerance:	Slightly Drained

STRATEGY

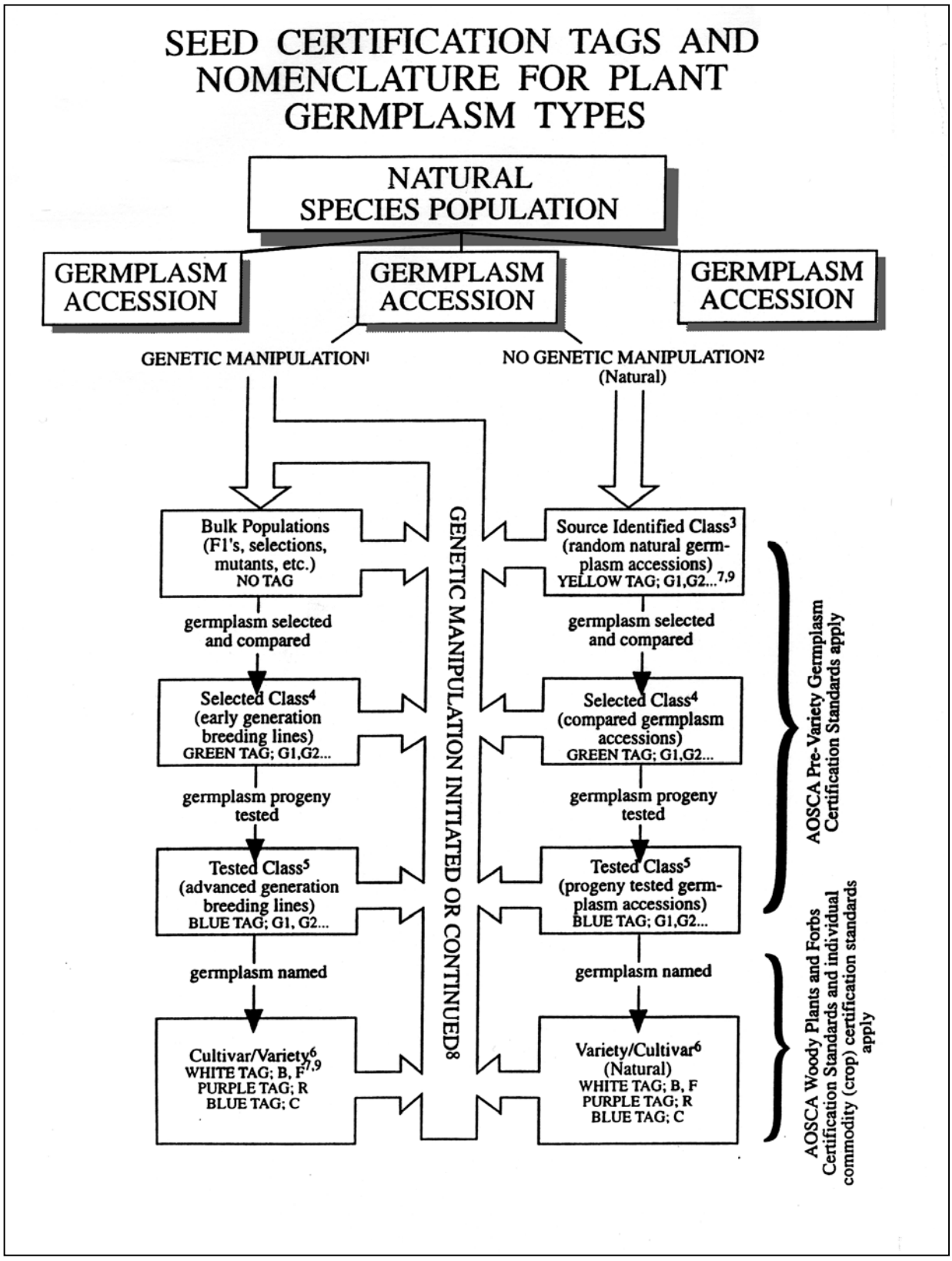
Standards of Comparison:	Revenue, Primar, or San Luis
Advanced Evaluation Strategy:	Test in Intercenter Strain Trials in the Northwest.
Field Planting Strategy:	Test in field plantings in the Northwest.

540.85 Summary of Plant Release Types and Criteria for Release

	Release Type				
	Cultivar	**Tested**	**Selected**	**Source-Identified**	**Germplasm**
Definition of release types	An assemblage of cultivated plants clearly distinguished by characters (morphological, physiological, cytological, chemical, other) and when reproduced (sexually or asexually) retains these characters	The progeny of plants whose parentage has been tested and has proven genetic superiority or possesses distinctive traits for which the heritability is stable as defined by the certifying agency; seed or plants must be produced to ensure genetic purity and identity from either rigidly controlled and isolated natural stands or individual plants, or seed fields or orchards	The progeny of phenotypically selected plants of untested parentage that have promise but not proof of genetic superiority or distinctive traits, produced to ensure genetic purity and identity from either rigidly controlled and isolated natural stands or individual plants, or seed fields or orchards.	Seed, seedlings, or other propagating materials where no selection or testing of the parent population has been made; produced to ensure genetic purity and identity from either rigidly defined natural stands, seed production areas, seed fields, or orchards. Source identified releases within the Plant Materials Program will generally not be used because of a lack of performance information.	Basic genetic material possessing one or more desirable traits that may be useful in plant improvement, the release of which is in the best interests of U.S. agriculture and the state or agency research program; it should not be expected to enter commercial use.
Genetic Manipulation vs. Natural Track	Typically involves purposeful genetic manipulation (e.g. crossing within species, wide hybridization, recurrent selection, gene transfer), but may also follow "natural" track of no purposeful manipulation	Purposeful genetic manipulation may or may not be involved (may follow "genetically manipulated" or " natural" track)	Purposeful genetic manipulation may or may not be involved (may follow "genetically manipulated" or " natural" track	No purposeful genetic manipulation involved (only "natural" track designation)	Typically involves purposeful genetic manipulation.
When to use	High priority need; commercially available materials do not perform adequately over a broad geographical and ecological area; performance testing, range of adaptation, and conservation value shown over a broad area	High priority need; low number of commercially available, adapted materials; performance testing shown	High priority need; lack of (or low number of) commercially available, adapted materials to meet identified need	High priority and urgent need; lack of commercially available, adapted materials, to meet need; high potential for immediate use; a local population source exists	Reduced priority for need that initiated evaluation, or material does not meet an NRCS priority and / or has a limitation that NRCS does not wish to overcome

	Release Type				
	Cultivar	**Tested**	**Selected**	**Source-Identified**	**Germplasm**
Size of Collection				Seed collection from at least 200 plants in a population (if possible) recommended	
Selection basis	Material has proven genetic superiority/ distinctiveness	Material has proven genetic superiority/ distinctiveness	Based on initial data, population is better than others in some way that will meet client needs	No human selection of material; source identified releases can be initiated by anyone	Material has proven genetic superiority/ distinctiveness
Criteria for release	Species literature search to be conducted Original site and plant population data IEP data, advanced evaluation data replicated at multiple sites, field plantings Multiple years of data (6-9+) Plant does not pose a threat (i.e., containing a poisonous substance or becoming invasive) Compared to other accessions/cultivars	Species literature search to be conducted Original site and plant population data IEP data, advanced evaluation data replicated at multiple sites Multiple years of data (3-6+) Plant does not pose a threat (i.e., containing a poisonous substance or becoming invasive) Compared to other accessions/ cultivars	Species literature search to be conducted Original site and plant population data IEP data on a site representative of conservation need One or more years of data (1-4) Plant does not pose a threat (i.e., containing a poisonous substance or becoming invasive) Compared to other accessions/cultivars	Species literature search to be conducted Original site (soil, climate, other physiographic) and plant population data No evaluation data Plant does not pose a threat (i.e., containing a poisonous substance or becoming invasive) No comparison to other accessions	Species literature search to be conducted Original site and plant population data IEP data, advanced evaluation data replicated at multiple sites Multiple years of data (6+) Plant does not pose a threat (i.e., containing a poisonous substance or becoming invasive)
Limitation of Generations	If field grown, generations limited to maximum of four and are indicated as Breeder, Foundation, Registered, and Certified; if a variety and wild collected, unlimited generations allowed	If field grown, generations limited to maximum of four and are indicated as G0 as equivalent to Breeder and G3 as equivalent to Certified class, if wild collected, unlimited generations allowed	If field grown, generations limited to maximum of four and are indicated as G0 as equivalent to Breeder and G3 as equivalent to Certified class, if wild collected, unlimited generations allowed	Unlimited generations are allowed; all germplasm types collected from natural stands are designated G0	

540.86 AOSCA Guidelines for Release Types and Development Tracks



SEED CERTIFICATION TAGS AND NOMENCLATURE FOR PLANT GERMPLASM TYPES

(Text which accompanies graphic in 540.86)

1. This involves "purposeful selection", such as recurrent selection, crosses within or between species, mutation inducement, biotechnology methods, etc.

2. Protocols should be established to minimize involuntary "non-purposeful" selection. If desired, the (Natural) designation may be printed on Source Identified, Selected, or Tested class or variety/cultivar Foundation, Registered, or Certified tags to indicate the "natural" genetic integrity of the germplasm collection, accession, or ecotype.

3. May be native or naturalized germplasm; wild collected or orchard produced. Tag must list geographic location of seed collection or production. Comparisons with other germplasm collections, accessions, or ecotypes of the same species not known.

4. Shows promise of superior and/or identifiable traits as contrasted with other germplasm accessions, breeding lines, or variety/cultivars of the species. Selection criteria and supporting comparative data is required. Seed of breeding lines at this stage would rarely be tagged; tagging and marketing wild collected or orchard produced seed of Selected class (Natural) germplasm may be commonly applicable in the reclamation seed industry.

5. Requires progeny testing to prove that traits of interest are heritable in succeeding generations. Testing procedures (number of sites, generations required, etc.) are outlined for each species by individual seed certification agencies (AOSCA guidelines are being developed).

   Tagging of Tested class advanced generation breeding lines may be accommodated, but normally pre-empted by cultivar release or discarding of the line. Tested class (Natural) wild collected or orchard produced germplasm may be tagged (as is customary for individual forest trees). Named variety release should also be a consideration if the germplasm has been tested in several locations and appears to have wide adaptation and usage demand.

6. Naming and recognition of a cultivar/variety must comply with Federal and State seed law definitions. Selected and Tested class germplasm may have a number or place designation associated with the species/kind listing on the tag (i.e., "ARS 2936 source" scarlet globemallow or "Maybelle origin" antelope bitterbrush), but it is not to be construed as a variety name in commerce.

7. Designation of generations through which germplasms may be multiplied. B = Breeder, F = Foundation, R = Registered, C = Certified. Source Identified, Selected and Tested Classes should use Generation 1 (G1) as equivalent to Foundation, and Generation 3 (G3) as equivalent to Certified. Number of generations allowed for seed production and length of stand for perennial plants varies by species.

8. When germplasm at any stage can be shown to have been significantly altered from the original collection or accession, it loses its non-manipulated (Natural) status and is routed to the bulk population (manipulated germplasm) track.

9. Tags are issued by individual seed certification agencies and clearly state the class of seed in block letters across the top of the tag. Tags also normally display agency insignia or logo along with other information that identifies and/or describes the variety or germplasm.

[Note: The Plant Materials Program does not use the terms “cultivar” and “variety” interchangeably. See Section 540.34(B)(1).]

540.87 Conservation Plant Release Review Worksheet

Conservation Plant Release Review Worksheet				
SECTION 1 – To be completed by the originating PMC				
Date:				
Releasing PMC:				
Contact Name:				
Reviewing NTSC PMS:				
Scientific Name:				
Release Name:				
Accession or PI No:				
Purpose of Release:				
----------Materials Submitted in this Release Package---------- **(Indicate "Yes" or "No")**				
Release Notice			Release Brochure	
Copy of the name clearance letter			Plant Fact Sheet or Plant Guide	
Verification of botanical identification			Press release or marketing plan	
Completed Environmental Evaluation			Name registration notice	
----------Availability of Materials and Growers----------				
Materials Available:	Seed:		Quantity (PLS):	
	Vegetative:		Type and Quantity:	
Size of Production Field:	Acres or linear feet:			
Annual Production:				
Certified as Foundation:	Yes or No:			
Number of potential growers:				
How will materials be distributed:				
Provide brief narrative regarding interest of seed and plant producers to grow and market this new release and how this interest was determined (are materials already in commercial production, are growers requesting this material, etc.):				
----------Testing and Adaptation----------				
List other PMCs where this material has been tested:				
Number of Field Plantings or demonstration sites				

conducted:	
States where plant material has been tested:	
Indicate where testing might be conducted in the future:	

SECTION 2 – To be completed by the NTSC Plant Materials Specialist

Points available	**Requirement**	**Points earned**
7*	Release notice and testing documentation for Tested and Cultivar release classes, environmental evaluation prepared and submitted to NRCS Plant Release Committee and receives positive recommendation.	
5*	Release notice and testing documentation for Selected release class, environmental evaluation prepared and submitted to NRCS Plant Release Committee and receives positive recommendation.	
1*	Release notice and testing documentation for Source Identified release class, environmental evaluation prepared and submitted to NRCS Plant Release Committee and receives positive recommendation.	
2	PMC has identified the quantity of foundation quality seed or other propagules in production (Required).	
1	PMC has provided evidence that commercial growers are available and interested in producing release.	
1	Release brochure prepared per NPMM.	
3	New Plant Fact Sheet and/or Plant Guide developed, posted on web and provided to PLANTS, and/or new "plant characteristics" attributes table in PLANTS developed; plant images provided to PLANTS.	
1	Revised Plant Fact Sheet and/or Plant Guide provided to PLANTS and/or "plant characteristics" attributes table in PLANTS revised, plant images provided to PLANTS.	
1	Draft release registration abstract or article is prepared for publication in *Native Plants Journal*, *Journal of Plant Registrations*, *HortScience*, *American Nurseryman*, etc. Required for all releases. See section 540.34(D)(6).	
	Total Points (max 15)	

* Point differentials reflect work required to obtain a plant release. "Source Identified" are plants which have been collected and increased at the PMC without any testing or evaluation.

540.88 General outline for an official plant release notice for all release types

The following is a template and guideline for preparing release notices. Content may vary slightly depending on the type of release. Summaries of all supporting documentation (collection site information, superior performance, etc.) should be included within the release notice.

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CITY, STATE

and

NAME OF COOPERATOR(S)
CITY, STATE

NOTICE OF RELEASE OF <RELEASE NAME> <COMMON NAME>

The Natural Resources Conservation Service, U.S. Department of Agriculture and <Cooperator Name> announce the naming and release of <Release Name> <common name> (<Scientific name Author>). <Release Name > <common name> has been assigned the NRCS Accession number <XXXXXXX> and the PI number <XXXXXX>.

If this is a pre-varietal release indicate the rationale for releasing it, e.g., there is a high demand or conservation need for materials of this level, additional selection or testing is not warranted, etc.

Collection Site Information: Include information such as site location (longitude and latitude), county, and State. Also note physiographic characteristics about site: soil series, taxonomy, pH, texture slope; elevation; aspect; hydrology (on wetland); climate; mean temperatures (low, high, averages, extremes, seasonal; mean annual precipitation); associated plants (habitat type, community). This section may not be appropriate depending on the method of selection. At a minimum, the range where initial collections were made should be included. For releases which are single collections and essentially unaltered include full collection site information. For composite releases (many collections) it may be useful to include a table of the collection sites.

Description: Include a botanical description of plant: vegetative, floral, and seed characteristics; method of pollination, if known. Life history information from the literature review can be included here. This description should be specific to the plant being released and not a general description of the species. For cultivars and tested releases indicate the improved or unique characteristics for the plant release. For releases where there is significant variation indicate the extent of variation.

Method of Breeding and Selection: Identify how many collections/accessions were involved in initial evaluations, standards for comparison, what traits were selected for, how selection was made, and the time period over which initial evaluations were conducted. Identify any breeding methods used to develop the release. Include a table summarizing the most convincing evaluation for this release if appropriate.

Provide detailed information about advanced evaluations, including number and location of evaluation sites, time period, selection methods used, data compiled for evaluated traits. For pre-varietal releases include any criteria used for any selection which was done, or indicate if there was no selection.

Ecological Considerations and Evaluation: State the methods used to determine any potential impact of the release on the environment. State the effects the release might have on the environment and any limitations or cautions to its conservation use or geographic area of use. Include any significant negative or positive attributes on the Environmental Evaluation that should be disclosed.

Conservation Use: State conservation applications for which the plant release is recommended. Indicate which traits make this plant suitable for particular functions. Be as detailed and specific as possible. This section might be broken into two parts – one part indicating the conservation uses which were tested and are known and the other part indicating potential conservation uses.

Area of Adaptation: Provide information regarding areas suitable for establishment and growth of the released material. Include such details as soil type, hydrology (if applicable), elevation, precipitation, hardiness/heat tolerance zones, and MLRA designations. DO NOT include a general description of the range of the species or the range found in PLANTS. For cultivars, the area of adaptation should be well known and described. For pre-varietal releases indicate where the release is intended to be used or the limited range of its testing. For all releases also indicate if the release should not be used in a certain area or under certain conditions.

Release Production: Indicate any special requirements for producing seed or plants of the release. This may include limitations of generations or years of production, requirements of certification classes, etc.

Availability of Plant Materials: State which generation of seed (Breeder, Foundation) will be maintained by the Plant Materials Center and where seed or other propagules of the plant release can be obtained. Include any limitations of generations which may be applicable to seed producers.

References:

List any sources used in preparation of notice.

Example: Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Prepared by:

Provide name(s) and address(es) of individuals responsible for preparation of notice.

Signatures for the release of:
<Release Name> <common name> (<Scientific name>)

_____ _____

Name Date

State Conservationist

United States Department of Agriculture

Natural Resources Conservation Service

City, State

_____ _____

Name Date

Director

Cooperating Agency

City, State

_____ _____

Name Date

Director, Ecological Sciences Division

United States Department of Agriculture

Natural Resources Conservation Service

Washington, D.C.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
COFFEEVILLE, MISSISSIPPI

and

MISSISSIPPI AGRICULTURAL AND FORESTRY EXPERIMENT STATION
MISSISSIPPI STATE, MISSISSIPPI

and

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
AMERICUS, GEORGIA

NOTICE OF RELEASE OF 'HIGHLANDER' EASTERN GAMAGRASS

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA) and the Mississippi Agricultural and Forestry Experiment Station announce the naming and release of 'Highlander' eastern gamagrass [*Tripsacum dactyloides* (L.) L.]. Highlander was tested under the accession number 9062680.

Collection Site Information: Highlander was collected in 1990 by Gregg Brann in Montgomery County, Tennessee (MLRA 122). Seeds were collected from plants on the Fort Campbell Army Base along Woodlawn Road at 36°32' latitude and 88°30'longitude. It was growing on a southern exposure on a Dickson silt loam with a 3 % slope. Collection site elevation was 182 meters (600 feet) and average annual precipitation for this location is 1016 millimeters (40 inches).

Description: Eastern gamagrass is a native grass that can be found from Massachusetts, west to Illinois and Nebraska, and south to the West Indies, Central America, and Brazil. Highlander eastern gamagrass forms large clumps, with thick, knotty, rhizomes. Mature foliage height ranges from 0.6 to 2 meters (1.5 to 5 feet) tall. Foliage is a bluish-green color and the blades are usually 1 to 2 centimeters wide and scabrous on the margins. Flowers are produced from June to August, with maximum seed production generally occurring in mid-July. Flowering culms are from 2 to 3.5 meters (5 to 9 feet) tall and may lodge somewhat when seeds mature. Racemes are 15 to 25 centimeters (6 to 10 inches), with the separate staminate flowers held distally. Pistillate spikelets are 7 to 10 millimeters (0.25 to 0.4 inches) long (Hitchcock, 1951). Seeds are produced apomicically. The caryopses are contained in a fruitcase composed of hardened segments of the rachis and lignified outer glumes. Highlander is a tetraploid ($2n = 72$) (Chet Dewald, personal communication).

Potential Uses: Highlander is recommended for forage production. It is best used as a hay crop; however, it can be grazed if given appropriate management (i.e. rotational grazing) to prevent damage to the plant stand. It also has potential as a perennial silage crop and as a source of biomass for bioenergy production. It can be used in many types of conservation plantings, such as buffers and vegetative barriers.

Method of Breeding and Selection:

Initial evaluation: Highlander was initially evaluated at the USDA-NRCS Jamie L. Whitten Plant Materials Center (PMC), Coffeeville, Mississippi, from 1992 through 1994. A total of 73 accessions, collected from nine states in the Southeast and southern Great Plains of the United States, were included in the study. From these initial evaluations, Highlander was determined to have superior vigor, growth form and development, and disease resistance (Snider, 1995).

Regional Genotype Trial: Highlander was selected by the PMC for inclusion in an regional trial comparing 13 eastern gamagrass accessions from southern and western seed sources (Snider, 1995). This trial was conducted from 1996 through 1998 at nine PMCs, including the Jamie L. Whitten PMC. Yield data was collected at of these six sites (Table 1) (Douglas et al., 2000).

Table 1. Average dry matter (DM yield) from 1996-1998 at six locations. (Adapted from Douglas et al., In Press.)

Accession	Booneville, AR	Knox City, TX	Nacogdoches, TX	Coffeeville, MS	Americus, GA	Brooksville, FL
	----------kg ha^{-1}----------					
Highlander	14 383	11 155	12 722	18 065	19 133	7522
Jackson	7930	*	14 492	12 427†	19 049	3201
434493	12 830	13 682	8172	14 041†	18 616	12 898
9043629	9032	8120	14 448	12 121†	12 858	7398
9043762	13 324	16 423	11 724	*	16 812	9967
9055975	*	*	2715	*	7455	10 957
9059213	*	2820	9179	*	14 791	13 306
9059215	*	3533	6799	*	16 579	15 131
9058465	11 436	11 269	11 823	15 653†	16 158	9405
9058495	13 665	12 553	10 261	18 436†	14 508	*
9058569	9214	8013	4742	10 626†	7204	*
9062708	11 625	8588	10 691	15 359†	18 040	8158
9066165	13 707	13 083	11 042	14 723†	18 810	5942
Mean	11 714	9631	9909	14 606	15 385	8644
LSD (0.05)	2903	3586	7132	------‡	2940	5969

* Indicates that plants died after the first winter.
† Plants were not harvested in 1998 because they succumbed to disease.
‡ Because this column contains both two-year and three-year yield averages, no LSD was determined.

Accessions 9055975, 9059213, and 9059215 were Florida accessions that did not survive the first winter at Booneville, Arkansas or Coffeeville, Mississippi and 9043762 from the Nacogdoches PMC also did not survive at Coffeeville. Plants of all accessions except Highlander died in the winter of 1997 or the early spring of 1998 at the Coffeeville location due to a disease problem. Plant and soil samples were taken and it was determined that Pythium spp. and Rhizoctonia spp. were present, but inoculations would be required to confirm whether either or both of the organisms were the cause of the mortality.

Genotype testing in Mississippi: Yields of Highlander, Pete and Jackson eastern gamagrass were compared at Coffeeville, Prairie, and Raymond, Mississippi (Table 2). Dry matter yields of Highlander and Jackson were comparable at all locations except Coffeeville, where Jackson once again succumbed to same disease discussed previously. Yields of Pete were lower at all locations, however, the difference was only significant in 2001 at the Prairie location.

Additional genotype testing was conducted at Mississippi State, Mississippi, comparing Highlander to other superior accessions from the initial evaluations at the Coffeeville PMC. Dry matter yields from 2000 and 2001 are presented in Table 3 (Lang et al., 2002). Highlander was the highest yielding accession in 2000. Although 9058543 produced significantly higher yields in 2001, Highlander was the most uniform producer during the two years.

Table 2. 2001 and 2002 dry matter yield of Highlander and Jackson eastern gamagrass at Coffeeville, Prairie, and Raymond, Mississippi.

	Coffeeville		Prairie		Raymond	
	2001	2002†	2001	2002	2001	2002
	----------kg ha^{-1}----------					
Highlander	13 801	8316	16 165	14 371	----§	21 600
Pete	10 972	7409	11 581	12 454	----	26 280
Jackson	12 415	----‡	18 822	16 199	----	18 130
LSD (0.05)	NS		2971	NS		NS

† Two harvests were made this year as opposed to three harvests in 2001.
‡ No plants survived after 2001. Plants showed signs of Pythium spp. and Rhizoctonia spp damage.
§ Not harvested in 2001.

Table 3. 2000 and 2001 dry matter yield of eastern gamagrass accessions at Mississippi State, Mississippi.

Accession	2000	2001
	----------kg ha^{-1}----------	
Highlander	13 011	12 073
9058543	8667	14 067
9062708	6351	11 248
9062714	5402	11 219
LSD (0.05)	3786	1672

Forage Production Comparisons of other Warm Season Grasses: Studies were conducted at the PMC from 1996 through 1998 to determine how forage yield and quality of Highlander, 'Tifton 44' bermudagrass , and 'Alamo' switchgrass responded to 30 and 45-day clipping frequencies (Table 4).

Table 4. Average yield of three warm season grasses clipped on 30 and 45-day frequencies from 1996-1998 at Coffeeville, Mississippi. (Adapted from Edwards et al., 2000.)

Species	30-day	45-day	LSD (0.05)
	----------kg ha^{-1}----------		
Highlander eastern gamagrass	10 957	13 952	2821
Tifton 44 bermudagrass	12 078	11 155	777
Alamo switchgrass	7454	8722	1046

Table 5. Average forage quality estimates of three warm season grasses clipped on 30 and 45-day frequencies from 1996-1998 at Coffeeville, Mississippi. (Adapted from Edwards et al., 2000.)

	Highlander Eastern gamagrass		Tifton 44 Bermudagrass		Alamo Switchgrass	
	30-day	45-day	30-day	45-day	30-day	45-day
% CP†	10 (8-12)	10 (6-11)	9 (6-12)	7 (5-9)	10 (7-13)	8 (6-10)
%ADF‡	38 (36-41)	39 (37-41)	36 (33-40)	38 (35-39)	35 (33-38)	37 (33-40)
%NDF§	68 (66-70)	70 (68-72)	71 (70-74)	73 (71-75)	68 (65-71)	69 (65-71)

† Crude protein. Numbers in parentheses are the range of values over all clippings in the study.
‡ Acid detergent fiber. Numbers in parentheses are the range of values over all clippings in the study.
§ Neutral detergent fiber. Numbers in parentheses are the range of values over all clippings in the study.

A 45-day clipping frequency typically represents two to three harvests per growing season in the lower southern states, but is greatly influenced by moisture and length of growing season. Highlander clipped at 45 days produced an average dry matter yield of 13 952 kg ha-1 over the three years with no significant variation between years. Bermudagrass clipped at 30 days resulted in one more clipping per year but only produced an average DM yield of 12 078 kg ha-1. Clipping on a 30-day frequency reduced stands allowing weeds to invade both Highlander and Alamo. A 45-day clipping frequency is recommended for Highlander for sustainable yields.

Highlander's response to N fertilization was evaluated at three locations, Coffeeville, Prairie and Mississippi State, Mississippi, in 2001 and 2002. (Figures 1-3) (Douglas et al., In Press). Results of these tests indicate that Highlander responds to increasing rates of N on silt loam and clay soils and has the capability to produce substantial amounts of biomass.

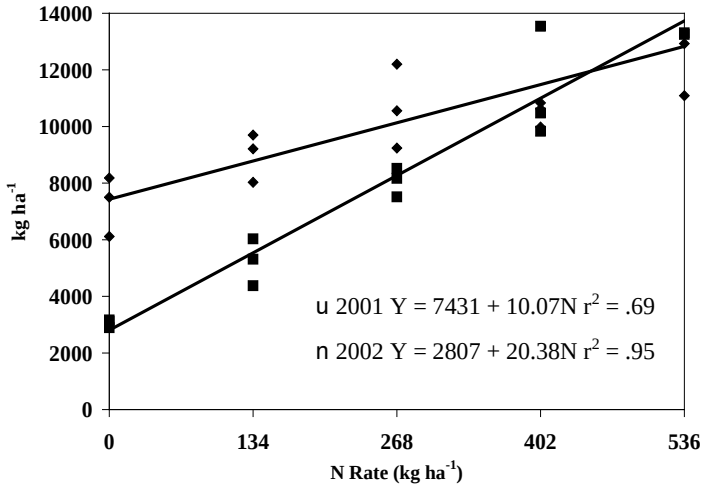


Fig. 1. Season total dry matter yield for Highlander in 2001 and 2002 as a function of N rates at Prairie, Mississippi.

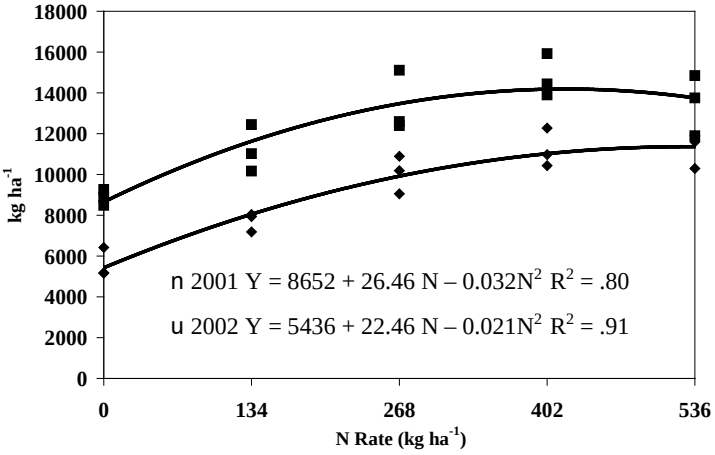


Fig. 2. Season total dry matter yield for Highlander in 2001 and 2002 as a function of N rates at Coffeeville, Mississippi.

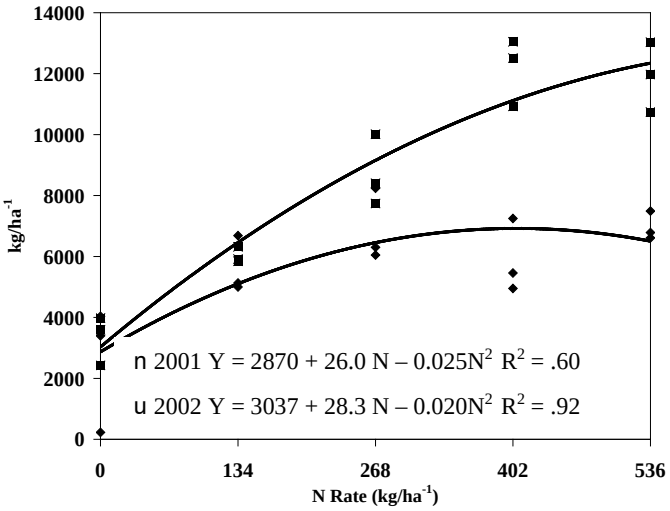


Fig. 3. Season total dry matter yield for Highlander in 2001 and 2002 as a function of N rates at Mississippi State, Mississippi.

Silage Production: A study comparing production and quality of silage from Highlander to silage from hybrid corn was established in 2001 at Newton and Holly Springs, Mississippi. Highlander was harvested two to three times during the growing season, whereas corn yields are from a single harvest (Table 6).

Table 6. 2002 silage yield and quality estimates of Highlander eastern gamagrass and corn varieties at Holly Springs and Newton, Mississippi.

Variety	Yield†	CP‡	ADF§	NDF¶	IVTD#
	----Mg ha^{-1}----	----------%----------			
		Holly Springs			
Highlander††	42.6	10	42	74	54
Pioneer 32K61	35.9	8	32	54	77
		Newton			
Highlander ‡‡	61.6	10	36	68	64
McNair 508	26.5	9	31	53	80
Northrup King N91-R9	31.4	9	28	64	77

† Silage yields based on 35% dry matter; ‡ crude protein; § acid detergent fiber; ¶ neutral detergent fiber; # in vitro true digestibility; †† forage quality estimates are the average of the 19 June and 5 August harvests; ‡‡ forage quality estimates are from 12 July harvest only (additional harvests 21 May and 2 October).

Total silage yields of Highlander exceeded those of corn at both locations. Forage quality estimates of crude protein, acid detergent fiber, and neutral detergent fiber were similar for Highlander and the corn varieties but digestibility is higher for corn.

Seed Production: Average seed yields of Highlander at Coffeeville range from 105 to 160 kg ha-1. These are similar to those reported for Pete grown in Kansas (USDA-SCS, 1988). Timing of harvest is critical for optimum seed yield, as seed heads are vulnerable to shattering.

Typically, eastern gamagrass plants produce 25 to 30 percent reproductive shoots and 75 to 80 percent vegetative shoots. Counts of reproductive shoots at Coffeeville have shown that Highlander produces 45 to 50 percent more reproductive shoots per plant than Jackson, enabling it to have much higher seed yield potential.

Field Establishment: It is well documented that dormancy in eastern gamagrass seeds adversely affects field establishment. Stratification has been shown to improve germination of eastern gamagrass seeds (Ahring and Frank, 1968) and research by Douglas and Grabowski (2000) confirmed the benefit of stratification on germination of Highlander seed (Table 7).

Table 7. Germination percentage of Highlander eastern gamagrass as influenced by cold, moist stratification for six weeks and no stratification at 7, 14, 21, and 28 days after planting in a growth chamber.

Seed Treatment	Days in Germinator			
	7	14	21	28
	----------%----------			
Stratification	11a†	48a	52a	52a
No stratification (control)	0b	1b	3b	3b

† Means in columns under days in germination chamber followed by different letters are significantly different at P<0.05.

Indeterminate seed maturity is another factor that may indirectly influence field establishment of eastern gamagrass. A typical combine-run harvest consists of complete seed units (cupulate

fruitcase with filled seed), incomplete seed units (cupulate fruitcase with unfilled seed) and other non-viable inert matter. Inability to adequately separate filled seeds from unfilled seeds may lead to poor seed lot quality and therefore poor establishment (Ahring and Franks, 1968). Douglas et al. (2000) found that by utilizing a gravity separator or an air fractionating aspirator it was possible to significantly increase quality of a seed lot cleaned with an conventional air screen cleaner; therefore, improving field establishment potential.

Ecological Considerations and Evaluation: An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS (USDA-NRCS, 2000), and the best available information for this species. Results of this evaluation determined that Highlander was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that eastern gamagrass is a naturally occurring species in the southeastern United States and planting Highlander would therefore not constitute an introduction of a foreign species into local ecosystems. Any negative impacts on other native plant species would likely be minimal to non-existent. Also, in addition to the substantial evidence that Highlander provides excellent forage for livestock, it also provides critical wildlife habitat and harbors beneficial insects and butterflies.

Conservation Use: Highlander can be used for forage and biofuel production, erosion control, wildlife habitat, and water quality improvement. It has a high degree of tolerance to environmental stresses and will tolerate wet, heavy soils. The apparent resistance to the disease problem encountered at the PMC also corroborates the need to release this plant.

Area of Adaptation: Highlander is well adapted for use in the eastern portions of USDA Hardiness Zones 6b to 8a, using Interstate 35 as its western limit. Current testing has not completely substantiated Zone 6b as the northern limit of its range of adaptation, so it may be adapted in more northern zones.

Availability of Plant Materials: Breeder seed will be maintained by the USDA-NRCS Jamie L. Whitten Plant Materials Center.

References:

Ahring, R. M. and Frank, H. 1968. Establishment of eastern gamagrass from seed and vegetative propagation. J. Range Manage. 21:27-30.

Douglas, J. L., Grabowski, J. M., Keith, B. C. 2000. A comparison of seed cleaning techniques for improving quality of eastern gamagrass seed. Seed Sci. & Technol. 28:163-167.

Douglas, J. L., Grabowski, J. M. 2000. Germination of two genotypes of eastern gamagrass with and without the cupulate fruitcase and stratification. USDA-NRCS Jamie L. Whitten Plant Materials Center. Technical Report. Vol. 15 No. 4.

Douglas, J. L., Houck, M. J., Brakie, M. R., Tharel, L. M., Owsley, C. M., Pfaff, S. L. 2000. Yield, Quality and Persistence of 13 Accessions of Eastern Gamagrass in the Southern U.S. In Eastern Gamagrass Technology Update. Jamie L. Whitten Plant Materials

Center, Coffeeville, MS. 45-55.

Douglas, J. L., Edwards, S. D., Lang, D. J., Elmore, R. L., Ivy, R. L., and Howell, J. L. In Press. Eastern gamagrass response to N fertilizer. In Proceedings of the Third Eastern Native Grass Symposium, October 1-3, 2002, Chapel Hill, NC (publication pending).

Edwards, S., Douglas, J., and Bloodworth, H. 2000. Clipping effect on yield and quality of eastern gamagrass, switchgrass, and bermudagrass In Proceedings of the Third Eastern Native Grass Symposium, Baltimore, MD, November 17-19, 1999, UDSA, Agricultural Research Service, and the USDA, Natural Resources Conservation Service, Beltsville, MD 121-126.

Hitchcock, A. S. 1951. Manual of the grasses of the United States. Miscellaneous Publication 200. United States Department of Agriculture. Washington, DC.

Lang, D. J., Boyd, B., Edwards, Jr., N. C., Elmore, R., Evans, R., Howell, J., Ivy, R., Johnson, B., Macoon, B., and Smith, T. 2002. Mississippi Forage Crop Variety Trials, 2002. MAFES Info. Bulletin # 391, 14 pp.

Snider, J. 1995. Initial Evaluations of Eastern Gamagrass Ecotypes for the Mid-South. Technical Note 6. Jamie L. Whitten Plant Materials Center, Coffeeville, MS.

USDA-Soil Conservation Service. 1988. Seed Production Record. In Proceedings of Eastern Gamagrass Workshop, Manhattan, KS, May 17-18, 1988.

USDA-Natural Resources Conservation Service. 2000. National Plant Materials Manual, Title 190 (Washington, D.C., U.S. Government Printing Office, June, 2000).

Prepared by:

Janet Grabowski
USDA-NRCS Jamie L. Whitten Plant Materials Center
2533 County Road 65
Coffeeville, MS 38922

Joel Douglas
USDA-NRCS Jamie L. Whitten Plant Materials Center
2533 County Road 65
Coffeeville, MS 38922

David Lang, Ph.D.
Dept. of Plant and Soil Sciences
Box 9555
Mississippi State, MS 39762

Signatures for release of:

'Highlander' Eastern gamagrass [Tripsacum dactyloides (L.) L.]

_____ _____

Homer Wilkes Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Jackson, MS

_____ _____

Leonard Jordan Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Athens, GA

_____ _____

Vance Watson, Director Date
Mississippi Agricultural and Forestry Experiment Station
Mississippi State, Mississippi

_____ _____

Director, Ecological Sciences Division Date
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
BROOKSVILLE, FLORIDA

NOTICE OF RELEASE OF GATOR GERMPLASM BLUE MAIDENCANE TESTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service, U.S. Department of Agriculture announces the release of a tested ecotype of blue maidencane [*Amphicarpum muehlenbergianum* (Schult.) Hitchc.].

This plant will be referred to as Gator Germplasm blue maidencane. It was tested under the NRCS accession number 9059971. It is being released as a vegetatively propagated material, increased from the original source collection.

This alternative release procedure is justified because there are no existing commercial sources of blue maidencane. This accession was selected for its outstanding vigor, spread, and stand persistence. The potential demand for this release is very high due to the need for additional wetland plants for use in reclaimed mined lands, constructed wetlands, and freshwater restoration sites in Florida. There is no potential to create improved materials through breeding due to its geocarpic seed production mechanism.

Collection Site Information: Gator Germplasm was collected in Citrus County, Florida, not far from its northeastern border with Marion County. It was found on the south side of state Hwy 200, 5 miles east (northeast) from the junction with US Hwy 41 at Hernando, Florida. The collection site is north of Tsala Apopka Lake and is in the floodplain of the Withlacoochee River, so it is often seasonally flooded. Soil type at the collection site is a Tavares fine sand, 0 to 5 percent slopes. Mean annual precipitation in the area is 53 inches, average maximum temperatures are 83 ºF and average minimum temperatures are 59 ºF, with approximately 300 frost-free days per year.

Description: Blue maidencane is a rhizomatous grass with erect culms that grow 15-100 cm tall. The fairly stiff leaves are bluish green, lanceolate, often with a narrow white margin, 5-15 mm wide and 10-15 cm long, without a prominent midrib. The genus name *Amphicarpum* is derived from the Greek word that means doubly fruit-bearing because this grass produces two types of spikelets. The obvious ones on the aerial inflorescence are bisexual, held in an open panicle that is 10-25 cm long. These spikelets are sterile. The subterranean fertile female spikelets are cleistogamous, produced on slender branches from the base of the culm (or occasionally from the lower nodes) and are 7-9 mm long. Due to its underground seed formation, this species is also commonly referred to as goobergrass.

Method of Breeding and/or Selection: Gator germplasm was selected from an assembly of 157 accessions of blue maidencane collected from throughout Florida from 1993 to 1998. Vegetative material, consisting of shoots, rhizomes, and roots, was collected from each site for testing. In March of 1999, these accessions were planted in an initial evaluation block at the Plant Materials Center (PMC) in Brooksville, Florida (Hernando County) in replicated 5' x 5' plots spaced 4 feet apart. Five plants were planted in each plot, with four plants on the corners and one in the middle to form the shape of an "X". 'Halifax' maidencane (*Panicum hemitomon* J.A. Schultes) was used as a standard of comparison. The blue maidencane accessions spread so quickly, that the plots began to grow together by the end of first year, which precluded continued evaluation; however, there was sufficient data to select eleven superior accessions for advanced evaluation (Table 1). These accessions were planted in tubs in March 2000 to confine them and ensure their isolation from the other blue maidencane accessions. Accessions 9059859, 9060309, and 9060311 had similar performance and were from a similar geographic location, so they were combined in one tub, which was assigned the accession number 9060489. Accessions 9059866, 9060066, and 9060067 were also combined in one tub for similar reasons and given the accession number 9060490 (Table 2). This resulted in seven tubs containing the superior blue maidencane accessions.

Table 1. Summary of initial evaluation results for eleven selected blue maidencane accessions at Brooksville, FL.

Accession	Cover	Height	Foliage Abund.[1]	Foliage Vigor[1]	Spread Potential[1]	Seedhead Abund.[1]	Disease Injury[2]	Insect Injury[2]	Weed Comp.[2]
	---%---	--cm--							
9059859	87	48	2.3	2.3	3.0	6.0	6.0	5.0	2.0
9060309	67	48	2.2	2.3	3.0	6.3	5.3	5.0	2.0
9060311	68	39	2.5	2.0	2.0	4.7	6.7	5.0	2.3
9059866	83	42	2.8	2.7	2.7	5.3	6.0	5.0	2.3
9060066	83	41	3.3	2.7	5.7	7.0	5.7	5.0	2.3
9060067	88	38	3.3	3.0	3.0	7.0	5.0	5.3	2.7
9059869	60	38	3.7	4.0	5.0	4.3	5.0	5.0	2.3
9059956	88	27	3.8	3.0	5.7	5.3	5.7	5.0	2.0
9059971	75	47	3.0	3.0	5.7	5.8	5.7	5.0	2.0
9060008	88	30	3.7	2.7	5.0	4.3	5.0	5.0	2.0
9060295	60	40	2.7	3.0	2.7	4.0	5.3	5.0	2.0

[1] Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.
[2] Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Table 2. Florida counties of origin and collectors for eleven superior blue maidencane accessions.

Accession No.	County of Origin	Collectors
9059859	Pasco	Pfaff/Gonter
9060309	Pasco	Deal/Pfaff
9060311	Pasco	Deal/Pfaff
Combined as 9060489		
9059866	Charlotte	Pfaff/Gonter
9060066	Sarasota (Myakka State Park)	Lackmann/Perry
9060067	Sarasota (Myakka State Park)	Perry/Lackmann
Combined as 9060490		
9059869	Palm Beach	Gonter/Pfaff
9059956	Madison	Gonter/Black
9059971	Citrus	Pfaff/Santucci
9060008	St. Johns	Pfaff/Santucci
9060295	Polk	Gonter/Pfaff

Two advanced evaluation plantings using rhizomes of these accessions were planted in 2000, one in Collier County, Florida, near Naples and the second in Polk County, south of Bartow. The Collier County site was a flatwoods site that had previously been treated to control Brazilian pepper (Schinus terebinthifolius Raddi) and the Polk county site was on reclaimed mined land, adjacent to a small lake. Halifax and Citrus Germplaasm common maidencane were planted as standards. A row of eastern gamagrass [Tripsacum dactyloides (L.)L.] was planted between the maidencane plots to act as a barrier to prevent the plots from growing together. Cattle grazing initially impacted growth on the Collier County site; however, after the site was fenced to exclude the cattle, the plants recovered nicely (Table 3). The height differential between the blue maidencane accessions and the common maidencane is due to inherent size differences between these two species.

Table 3. Performance of blue and common maidencane accessions on a flatwoods site in Collier County, Florida 11 months after planting.

Accession	Plant Height	Canopy Width	Vigor[1]	Ground Cover	Spread Rate[1]	Drought Tol.[1]	Disease Resist.[1]	Insect Resist.[1]	Weed Competition[2]
	---------cm--------			---%---					
9059869	9.7	7.0	4.3	18.8	3.5	4.5	5	5	6
9059956	6.0	4.7	5.3	5.3	6.7	6.3	5	5	6
9059971	9.0	7.7	4.0	12.0	4.0	4.7	5	5	4
9060008	7.7	7.0	3.8	21.8	3.5	5.0	5	5	4
9060295	7.7	5.3	5.6	7.5	5.0	6.0	5	5	4
9060489	9.5	5.5	5.8	7.8	5.8	5.8	5	5	6
9060490	10.5	6.3	4.0	14.5	3.5	4.6	5	5	5
Citrus	19.0	11.0	3.5	16.0	3.8	4.3	5	5	4
Halifax	12.5	5.8	5.0	7.8	6.0	5.8	5	5	6

[1] Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.
[2] Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Soils at the Polk County site consisted of overburden with a heavy clay fraction. These soils tend to be sticky when wet and crust badly as they dry. These soil physical characteristics negatively affected emergence because shoots of all accessions had difficulty penetrating the crust. A heavy infestation of bermudagrass [Cynodon dactylon (L.) Pers.] and torpedograss (Panicum repens L.) created severe competition that affected survival of the plants. Citrus Germplasm exhibited the best survival, with an average emergence of 10.5 shoots when the plots were evaluated seven months after planting. All of the blue maidencane accessions averaged less than 3 shoots that had emerged at this same evaluation date. The taller stature of the common maidencane and its greater affinity for heavy textured soils probably gave it a competitive edge over blue maidencane at this site.

A third advanced evaluation plot was planted in 2001 in Hamilton County, Florida, near Jasper. These plots were on disturbed soils near a cypress marsh. A similar planting scheme, using the same accessions and rows of eastern gamagrass between the plots was used. Partial shading at the site affected growth of Citrus and Halifax, resulting in tall spindly plants (Table 4). All of the blue maidencane accessions were better adapted to the shade and their growth was much more vigorous. Ample access to moisture from the marsh prevented evaluation of drought tolerance.

Table 4. Performance of blue and common maidencane accessions on a cypress swamp border site Hamilton County, Florida 6 months after planting.

Accession	Plant Height	Canopy Width	Vigor[1]	Ground Cover	Spread Rate[1]	Drought Tol.[1]	Disease Resist.[1]	Insect Resist.[1]	Weed Competition[2]
	---------cm--------			---%---					
9059869	22.3	7.3	5.7	3.0	8.7	---	5.8	5	2
9059956	21.5	8.3	4.8	4.5	7.5	---	4.8	5	2
9059971	20.8	6.3	5.5	3.5	8.3	---	5.5	5	2
9060008	26.5	19.8	3.3	9.0	6.5	---	3.1	5	2
9060295	26.0	9.3	5.5	3.5	8.3	---	5.3	5	2
9060489	22.0	4.0	6.5	1.5	9.0	---	6.0	5	2
9060490	53.5	26.3	4.0	17.0	6.8	---	5.0	5	2
Citrus	39.0	12.5	5.0	7.5	7.8	---	5.3	5	2
Halifax	22.3	7.3	5.7	3.0	8.7	---	5.8	5	2

1 Visual Observation Rating Scale: 9 = least; 5 = average; and 1 = most.
2 Visual Observation Rating Scale: 1 = least; 5 = average; and 9 = most.

Accession 9059971 consistently ranked near, but not necessarily at the top, in the evaluation criteria examined during these advanced evaluation plantings; however, the decision to release this germplasm was made based on its superior stand persistence under adverse conditions. The seven tubs at the PMC were provided minimal maintenance, other than regularly scheduled irrigation, for five years after planting. When examined in the fall of 2005, the other five accessions had mostly succumbed to severe weed pressure, but the tub containing 9059971 still had a fairly dense stand of shoots that were competing well with the weeds.

Ecological Considerations and Evaluation: Gator Germplasm is a clonal line increased from materials naturally occurring in the region of anticipated use of this release. Its vegetative rate of spread is not significantly greater than that of other blue maidencane plants found in its native range and the potential for widespread dispersal by seed is extremely limited. For these reasons, it is not anticipated to have the potential to displace other native species or have a negative affect on environmental quality. Gator Germplasm was evaluated through the Plant Materials Program Environmental Evaluation worksheet and was found to pose no problems for release.

Conservation Use: Blue maidencane is classified as a facultative wetland species; therefore, Gator Germplasm is well adapted for use in freshwater wetland restoration sites and constructed wetlands for wastewater treatment. Gator will form colonies with dense networks of roots and rhizomes and can provide excellent erosion control along the edges of ponds, streams, and ditches. Harvesting and spreading rhizomes on restoration sites can be mechanized, using standard agronomic equipment commonly available in Florida.

Blue maidencane is a palatable grass that is considered to be an important component of flatwoods rangeland in southern Florida. It is classified as a decreaser species that can provide grazing for up to 9 months. The University of Florida, IFAS Extension report yields for blue maidencane during the summer months averaged 4000 lb/ac of dry matter. Yield data for Gator Germplasm was not collected during the evaluation process, but should be comparable to these reported levels. Although vegetative planting of forages is generally considered to be prohibitively expensive, it is not an uncommon practice for many pasture grasses (i.e., hybrid bermudagrass, limpograss) used in Florida. Although commercial planting in those instances utilizes shoot material, since Gator Germplasm rhizomes can also be planted mechanically, using this grass in pastures and restored rangelands with suitable soils and hydrology is feasible. Deer will also graze blue maidencane and hogs will root up the rhizomes in the winter.

Anticipated Area of Adaptation: Gator Germplasm has been planted in northern (Hamilton County), central (Hernando and Polk Counties), and southern (Collier County) Florida. It grew well in all these areas, with the exception of the Polk County site, with its adverse soils and intense weed pressure. It has not undergone testing outside Florida; however, the native range of the species extends north to the coastal areas of Georgia and southern South Carolina. It is well adapted to acid to neutral sandy soils that are wet for part of the year. It will not grow in deep, stagnant water. Blue maidencane is reported to be tolerant of shade and Gator Germplasm grew well in the damp, shaded area at the Hamilton County site.

Availability of Plant Materials: G0 planting stock will be maintained by the Brooksville Plant Materials Center. Rhizomes can be requested from the Florida Plant Materials Specialist, Gainesville, Florida.

References:

Brooksville FL, PMC. 2002. 2001 Activity Report. pp. 9-10. Available from the USDA, NRCS Plant Materials Center, 14119 Broad St., Brooksville, FL 34601.

Clayton, W.D., K.T. Harman, and H. Williamson. 2007. GrassBase – the online world grass flora. [Online]. http://www.kew.org/data/grasses-db.html. (accessed 17 July 2007).

Leithead, H.L., J.L. Yarlett, and T.N. Shiflet. 1971. 100 native forage grasses in 11 southern states. Agric. Handbook 389, Soil Conservation Service, USDA, Washington, D.C.

Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the vascular flora for the Carolinas. Univ. of North Carolina, Press, Chapel Hill.

University of Florida, Center for Aquatic and Invasive Plants. 2002. Aquatic, wetland and invasive plant particulars and photographs, *Amphicarpum muhlenbergianum*. [Online]. http://aquat1.ifas.edu/amphmuh.html. (accessed 17 July 2007).

University of Florida, IFAS Extension, West Florida Research and Education Center at Milton. No Date. Range grasses of Florida little blue maidencane, goobergrass. Adapted from J.J. Mullahey and G.W. Tanner, Florida Range Grasses Impacting Grazing Management. [Online]. http://wfrec.ufl.edu/range/grasses/litlblu.html. (accessed 24 July 2007).

Watson, L., and Dallwitz, M.J. 1992. Grass genera of the World: descriptions, illustrations, identification, and information retrieval; including synonyms, *Amphicarpum* Kunth. [Online]. http://www.biologie.uni-hamburg.de/b-online/delta/grass/www/amphicar.htm. (accessed 17 July 2007).

Williams, M.J., and J. Grabowski. In Press. Brooksville Plant Materials Center: developing sources of native wetland plants for revegetation in Florida. Proceedings of the 33rd Annual Conference on Ecosystems Restoration and Creation, Plant City, FL, 2-3 Nov. 2006.

Yarlett, L. L. 1996. Common grasses of Florida and the Southeast. The Florida Native Plant Society, Spring Hill, FL.

Prepared by:

Janet M. Grabowski and Mary Anne Gonter
USDA, NRCS Brooksville Plant Materials Center
14119 Broad Street
Brooksville, FL 34601

M. J. Williams
USDA, NRCS
2614 N.W. 43rd Street
Gainesville, FL 32606-6611

Signatures for release of:

Gator Germplasm blue maidencane [*Amphicarpum muehlenbergianum* (Schult.) Hitchc.]

_____ _____

State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Gainesville, Florida

Date

_____ _____

Director, Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

NOTICE OF RELEASE OF MARIAH GERMPLASM HOODED WINDMILLGRASS

SELECTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected ecotype of hooded windmillgrass (*Chloris cucullata* Bisch.) for the south Texas ecoregion. Mariah Germplasm was tested under the accession number 9085313 or 313.

This plant will be referred to as Mariah Germplasm hooded windmillgrass and is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing commercial sources of hooded windmillgrass. The potential for immediate use is high especially for roadside plantings and critical site revegetation.

Collection Site Information: Accession 9085313 was collected in 1999 from native plants located near the headquarters of the La Paloma Ranch in Kenedy county at 27° 15' N. latitude and 97° 54' W. longitude (MLRA 83C). It was growing on a Delfina loamy fine sand soil type with a 1% slope. Collection site elevation was 16 meters (52 feet) and average annual precipitation for this location is 63.5 centimeters (25 inches).

Description: Hooded windmillgrass is a native, perennial bunch grass. Mature foliage height ranges from 15 to 60 centimeters (0.5 to 2.0 feet) tall. Leaves are glabrous to scabrous with the sheaths almost always being glabrous. The leaf blades are linear to 20 centimeters (8 inches) long and 2 to 4 millimeters wide. It has a ligule that is a short-ciliate crown. Hooded windmillgrass will flower multiple times over the growing season, and flowers can be produced from May through October. The inflorescence will have 10 to 20 branches that are 2 to 5 centimeters long. The branches are flexuous or arcuate, borne in several close radiating verticels. Spikelets are at first straw-colored but later becoming tawny, closely-spaced and widely divergent, with about 14 to 18 spikelets per centimeter of rachis. Glumes are lanceolate to obovate and glabrous except for the scabrous midnerve. The first glume is 0.5 to 0.7 mm long and the second glume is 1 to 1.5 mm long. The lower lemma is broadly elliptic and glabrous except for the appressed-pilose keel and margins. It is 1.5 to 2.0 mm

long with an obtuse apex and an awn that is 0.3 to 1.5 mm long. Spikelets have one sterile floret, markedly inflated, with the upper margins inrolled usually 1.0 to 1.5 mm long, unawned or with an awn to 1.5 mm long. The chromosome number is *2n=40*. Hooded windmillgrass is found in northeastern Mexico and throughout Texas especially in the central and western parts of the state.

Potential Uses: Mariah Germplasm is recommended for roadside plantings, critical site revegetation and in range seeding mixes. It can be used in many types of conservation plantings, such as grassed waterways, streamside buffers, filter strips, and pond embankments.

Method of Breeding and Selection:

Initial evaluation: Mariah Germplasm was initially evaluated at the USDA-NRCS E, "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas, from 2000 through 2001. A total of 43 accessions of windmillgrass were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9085301 and 9085313 were determined to be the best accessions of hooded windmillgrass for vigor, growth form and development, and disease resistance (Table 1 and 2).

Table 1. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on clay soils at Kingsville, Texas

Accession Number	Source (County)	Percent Survival	Foliage Density*	Seed Production*
9076951	Frio	100	5.2	3.9
9076977	Palo Pinto	95	6.5	4.5
9076946	Kleberg	100	5.3	5.4
9085229	Coleman	95	6.9	5.0
9085308	Lampasas	100	6.6	5.1
9085235	Lubbock	100	7.0	5.5
9085300	Bee	100	5.3	5.1
9085289	San Patricio	100	4.4	4.0
9085316	Kenedy	100	4.3	4.9
9085243	Burnet	100	6.1	3.7
9085285	Howard	100	6.2	4.8
9085288	Burleson	100	5.4	3.6
9085242	Austin	100	4.5	3.7
9085309	Kleberg	100	5.5	5.0
9085258	Goliad	100	4.6	4.8
9076968	Knox	100	7.0	4.3
9085264	DeWitt	100	4.4	4.8
9085260	San Patricio	100	3.1	3.8
9085240	Dimmit	95	5.3	4.5
9085234	Lubbock	100	7.4	4.8
9085301	Duval	100	5.4	4.7
9076971	Brown	100	6.5	4.3
9085313	Kenedy	100	4.6	5.0
9085245	Burnet	100	5.8	4.8
9076955	Kleberg	100	4.8	4.9
9085262	Refugio	100	2.9	4.3
BELL	-	100	3.3	4.2
9085265	DeWitt	100	4.1	4.8
9085259	Kleberg	100	4.4	4.8
9085271	Hidalgo	100	4.5	4.8
9085233	Andrews	100	7.4	3.8
9076974	Lubbock	100	7.7	4.5
9085283	Calhoun	100	3.7	3.8
9085276	Starr	100	5.3	4.3
9085291	Webb	100	4.9	4.8
Means	**All Counties**	**99**	**5.5**	**4.6**

*Ocular estimate (1 = Best)

Table 2. Summary of Initial Evaluations of Windmillgrasses (Chloris spp.) from 2000 through 2001 on sandy soils at Kingsville, Texas.

Accession Number	Source (County)	Percent Survival	Foliage Density*	Seed Production*
9076951	Frio	100	6.4	5.3
9076977	Palo Pinto	85	7.1	4.7
9076946	Kleberg	95	5.5	4.5
9085229	Coleman	95	6.8	4.7
9085308	Lampasas	100	7.1	5.0
9085235	Lubbock	90	6.7	5.2
9085300	Bee	100	5.4	5.4
9085289	San Patricio	95	5.2	4.0
9085316	Kenedy	100	4.8	4.6
9085243	Burnet	100	6.3	4.0
9085285	Howard	80	6.6	5.5
9085288	Burleson	100	5.5	4.2
9085242	Austin	100	5.9	4.8
9085309	Kleberg	83	6.5	6.5
9085255	Jim Hogg	100	5.8	4.7
9076968	Knox	85	7.2	4.6
9085240	Dimmit	90	5.0	4.7
9085234	Lubbock	65	7.1	5.0
9085301	Duval	85	5.8	4.5
9076971	Brown	100	7.0	4.7
9085313	Kenedy	100	5.5	5.5
9085245	Burnet	80	6.5	5.5
9076955	Kleberg	81	5.8	5.9
9085262	Refugio	100	4.0	4.8
BELL	-	100	4.0	5.0
9085258	Goliad	100	5.3	4.6
9085265	DeWitt	100	5.5	5.1
9085259	Kleberg	100	5.7	4.8
9085271	Hidalgo	100	5.9	4.6
9085233	Andrews	60	7.5	5.6
9076974	Lubbock	100	7.5	4.4
9085283	Calhoun	100	4.5	5.0
9085276	Starr	100	5.8	4.9
9085291	Webb	80	6.1	5.0
9085264	DeWitt	100	5.3	5.3
9085260	San Patricio	100	3.8	5.1
Means	**All Counties**	**95**	**6.1**	**4.9**

*Ocular estimate (1 = Best)

Advanced Evaluations: Advanced evaluation plots were established in 2002 at both the PMC in Kingsville and the Texas Agricultural Experiment Station (TAES) in Beeville. The Advanced evaluation plots at the PMC consisted of accessions 9085300, 9085301, and 9085313. The advanced evaluation plots at Beeville consisted of accessions 9085301, 9085313, and 9085316. Accessions 9085301 and 9085313 had the best field performance on these plots at the PMC during 2002 and 2003 (Table 3). Dr. Bill Ocumpaugh ranked 9085316 and 9085313 as his top two accessions at Beeville in 2002. Seed production rankings appear to favor accession 9085316 (Table 4). However, it became apparent upon looking at the growth form, harvest time and percent active germination that accession 9085316 was an intermediate form between hooded and shortspike windmillgrass. It was therefore eliminated from the hooded evaluations. The goal was a hooded windmillgrass that would have high active germination (>90%), have a high 2-day germination, produce multiple seed crops, and produce a satisfactory seed yield.

Table 3. Hooded Windmillgrass Advanced Evaluation in 2003 at Kingsville, Texas

Accession Number	Growth Habit	Percent Survival	Plant Vigor*	Foliage Density*	Seed Production*	Seed Shatter*
300	Bunch	100	5.4	5.4	5.5	5.0
301	Bunch	100	5.0	5.2	4.4	5.0
313	Very Spreading	100	5.3	4.6	6.8	5.0

*Ocular estimate (1 = Best)

Table 4. Hooded Windmillgrass Seed Harvest and Germination from Beeville, Texas in 2003.

Accession Number	Total Grams Harvested	2 Day Germination	Total Germination
300	65	93%	96%
301	118	76%	97%
313	97	87%	93%
316	318	56%	70%

- 12 hours dark 20oC (68oF) / 12 hours light 30oC (86oF).

Initial seed germination results indicated low germination from harvested seed at the PMC (ATR, 2001). In order to understand the cause of the low germination results from harvested seed, samples of the 2002 harvest from accession 9085313 was sent to two seed labs. Hulsey Seed Lab got 91% germination and Giddings TDA Seed Lab got 24% germination. Upon further investigation it was discovered that the majority of the harvested seed did not contain filled seed. Germination tests previously had been run on spikelets (apparently mostly empty), not bare caryopsis. Seed was collected from each plant of the advanced evaluation plots at Beeville in 2003. This harvest was tested in 2004 (Table 4). All of the accessions

appear to have good germination. Hooded windmillgrass appears to have a very high active germination (>90%) whereas shortspike windmillgrass will have an active germination of 60-70% and 20-30% dormant seed.

A field emergence study was established in May 2004 on a Victoria clay soil at the PMC. Ten by twenty foot flat plots were seeded at a rate of 20 PLS/ ft^2 and replicated three times for accessions 9085260, 9085283 and 9085313. These plots were not irrigated. Evaluation of these plots in November of 2004 (Table 5) indicated that accession 9085313 produced from 15 to 35% foliar cover.

Table 5. Windmillgrass Field Emergence Evaluation in 2004 at Kingsville, Texas

Accession Number	Rep	% Cover	Plant Vigor*	Foliage Density *	Foliage Production *	Uniformity *	Development Stage
260	1	50	4.0	4.0	4.0	4.0	Seed
260	2	60	4.0	4.0	4.0	4.0	Seed
260	3	70	2.0	2.0	2.0	2.0	Seed
283	1	35	4.0	4.0	4.0	4.0	Seed
283	2	30	5.0	5.0	5.0	5.0	Seed
283	3	70	3.0	3.0	3.0	3.0	Seed
313	1	15	6.0	6.0	6.0	6.0	Seed
313	2	35	5.0	6.0	6.0	5.0	Seed
313	3	15	6.0	6.0	6.0	6.0	Seed

*Ocular estimate (1= Best)

Seed Production: Average annual seed yields of Mariah Germplasm hooded windmillgrass at Kingsville have been 225 pounds per acre (252 kg ha^{-1}) (Table 6).

Indeterminate seed maturity is a factor that may influence economical seed yields of hooded windmillgrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Beeville, Texas ranged from 1.5 % to 3.7 % in 2003 (Table 7) and from 2.9% to 5.7% from an early May harvest in 2003 from Kingsville, Texas (Table 8). However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from hooded windmillgrass, accession 9085313, for both month of harvest as well as location shows a large variability in percentage of seed fill (Table 9 and 10). Therefore, location and ability to irrigate may dictate where seed production plantings of windmillgrass can be most economically grown.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a combine at the PMC in Kingsville and then run through a *Westrup Laboratory* brush machine (used for polishing, hulling or scarifing seed), hammermill, and tabletop C*lipper* seed cleaner produced 95% pure seed.

Table 6. Seed Attributes for Hooded Windmillgrass Harvested in Kingsville

Acc #	Year Harvested	Harvest Weight (lb/acre)	Clean Seed (lb/acre)	Seeds/ lb	Seed Rate (PLS lb/acre)	Available Seed (lb)
313	2004	310	33	2,564,646	0.33	3.3
313	2005	143	6	2,424,360	0.33	0.6
301	2005	423	26	2,899,244	0.33	1

Table 7. Seed Fill Percentages from Windmillgrass Harvest in 2003 from Beeville, Texas

Species	Acc#	Harvest Weight (grams)	Total Grams Clean	Seeds/ Gram	Germ Average	Seed Fill
Hooded	300	645	6	4257	96%	9.5%
Hooded	301	118	9	6386	97%	8.0%
Hooded	313	97	5	5649	93%	5.8%
Hooded	316	318	11	6211	70%	3.5%

Table 8. Seed Fill Percentages from Windmillgrass Harvest on May 21, 2003 from Kingsville, Texas

Species	Acc#	Harvest Weight (grams)	Total Grams Clean	Seeds/ Gram	Germ Average	Seed Fill
Hooded	300	331	16	4539	86%	5%
Hooded	301	444	21	6843	90%	5%
Hooded	313	83	4	5340	94%	5%
Hooded	316	100	5	5447	83%	5%

Table 9. Seed Fill Percentages from Hooded Windmillgrass, Accession 313 Harvested in September, 2004 at Kingsville, Texas

Date Harvested	Percent Filled Seed			Average Filled Seed
	Rep 1	Rep 2	Rep 3	
9/21/2004	23	29	26	26%
8/25/2005	10	7	8	8%
11/08/2005	33	26	30	30%

Table 10. Seed Fill Percentages from Hooded Windmillgrass, Accession 313 Harvested at Different Locations and Different Years.

Location	Percent Filled Seed by Year		
	2003	2004	2005
Kingsville	7	15	8
Beeville	11	19	-
Knox City	-	15	42

Ecological Considerations and Evaluation: An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS (USDA-NRCS, 2000), and the best available information for this species. Results of this evaluation determined that Mariah Germplasm hooded windmillgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that hooded windmillgrass is a naturally occurring species in Texas and planting it would therefore not constitute an introduction of an exotic species into local ecosystems. Any negative impacts on other native plant species would likely be minimal to non-existent. Also, release of this species will make available an additional native species for rangeland planting, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies. It will also provide a native alternative to planting exotics species on highway right of ways.

Conservation Use: Mariah Germplasm hooded windmillgrass will provide a new native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has high active germination (>90%), has a high 2-day germination, and produces multiple seed crops. These species characteristics, along with its preferred adaptation to central and western portions of Texas, make it a good complimentary species with Welder Germplasm shortspike windmillgrass.

Area of Adaptation: Mariah Germplasm hooded windmillgrass is well adapted for use in the southern and central portions of Texas, coinciding with MLRA 83 (Rio Grande Plain), MLRA 78 (Central Rolling Red Plains), MLRA 80 (Central Prairies), MLRA 81 (Edwards Plateau), MLRA 82 (Texas Central Basin) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. Existing test sites in Texas include Knox City and Nacogdoches. Additional will be planted in 2006 in Stephenville, TX, Oklahoma, Louisiana, and New Mexico.

Availability of Plant Materials: Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

References:

AOSA. 1992. Seedling Evaluation Handbook. Contrib. No. 35. 84-87. Association of Official Seed Analysts, Las Cruces, NM. 130 pp.

Correl, D. S. and M. C. Johnston.1996. Manual of the Vascular Plants of Texas. University of Texas at Dallas. Richardson Texas. p. 238-242.

Brecke, B. J. and W. B. Duke. 1980. Dormancy, germination, and emergence characteristics of fall panicum (*Panicum dichotomiflorum*) seed. Weed Science. 28: 683-685.

Fulbright, T. E. and K. S. Flenniken. 1988. Causes of dormancy in *Paspalum plicatulum* (Poaceae) seeds. The Southwestern Naturalist 33(1): 35-39.

Gould, F. W. 1975. The Grasses of Texas. Texas Agricultural Experiment Station. Texas A&M University Press. College Station. p. 316-327.

Hitchcock, A. S. 1971. Manual of the Grasses of the United States, Volumes 1& 2, 2nd edition. Revised by Agnes Chase. Dover Publications, New York. 1051 pp.

Kelly, K. M., J. V. Staden, and W. E. Bell. 1992. Seed coat structure and dormancy. Plant Growth Regulation 11: 201-209.

SAS Institute. 2000. Multiple Comparisons and Multiple Tests Using SAS System: Workbook/Peter H. Westfall, D. Tobias. Cary, NC.

Simpson, G. M. 1990. Seed Dormancy in Grasses. Cambridge University Press, Cambridge, UK.

Prepared by:

John Lloyd-Reilley
USDA-NRCS E. "Kika" de la Garza Plant Materials Center
3409 N. FM 1355
Kingsville, TX 78413

Shelly Maher
USDA-NRCS E. "Kika" de la Garza Plant Materials Center
3409 N. FM 1355
Kingsville, TX 78413

Signatures for release of:

Mariah Germplasm hooded windmillgrass (*Chloris cucullata* Bisch.)

_____ _____

Dr. Larry Butler Date
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

_____ _____

Texas Agricultural Experiment Station Date
College Station, Texas

_____ _____

Dr. Fred Bryant, Director Date
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

_____ _____

Robert Escheman Date
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

THE
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SCIENCE AND TECHNOLOGY
WASHINGTON D.C.

and

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
HELENA, MONTANA
and
MONTANA AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA
and
WYOMING AGRICULTURAL EXPERIMENT STATION
LARAMIE, WYOMING

NOTICE OF RELEASE OF DUPUYER STREAMBANK GERMPLASM SILVERBERRY SOURCE-IDENTIFIED CLASS OF NATURAL GERMPLASM

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) and the Montana Department of Natural Resources and Conservation announce the naming and release of Source-Identified germplasm of Dupuyer Streambank Germplasm silverberry, *Elaeagnus commutata* Bernh. ex. Rydb. This germplasm was identified by the USDA/NRCS Montana Riparian Team, Bozeman, Montana and the USDA/NRCS Plant Materials Center at Bridger, Montana.

Dupuyer Streambank Germplasm silverberry has been assigned the NRCS accession number 9081339. It was selected primarily for its vigorous sprouting, potential tolerance of temporary inundation, ease of propagation, and hardiness in the northern Plains for use in streambank stabilization applications, wildlife habitat projects, and potentially, windbreak and shelterbelt systems.

COLLECTION SITE INFORMATION: Dupuyer Streambank Germplasm silverberry was identified and collected by the NRCS Montana Riparian and Wetlands Team in Pondera County along Dupuyer Creek approximately 0.25 miles due south of the Dupuyer Diversion. The site is located in Section 28, Township 29N, Range 6W at a North Latitude of 48°14'30.53" and a West Longitude of 112°23'15.45". The area is classified as Major Land Resource Area 46, Northern Rocky Mountain Foothills. The elevation of the original collection site was 1,175 meters (3,857 feet), on a 2 percent or less slope with a westerly exposure. The soils are mapped as Havre/Ryell fine loams. The original collection site is located in USDA Hardiness Zone 3b (-30° to -35°F) or 4a (-25° to -30°F) in annual precipitation zone of 305 to 356 millimeters (12 to 14 inches). Plants growing in association include sandbar willow *Salix exigua*, cottonwood *Populus* species, and miscellaneous sedges *Carex* species and rushes. Seed collections were originally made on November 6, 1997 by Joe Carleton of the Intermountain Riparian and Wetlands Resource Technical Team, Bozeman, Montana.

SELECTION STATEMENT: Dupuyer Streambank Germplasm silverberry was identified for its ability to stabilize and armor streambanks by the vegetative spread of underground shoots. It appears to tolerate saturated soil conditions well, at least for short periodic events. It was also identified for its hardiness in Montana and its ease of propagation by seed and stem cuttings. Limited commercial availability of local ecotypes and an urgent need for species diversity in riparian restoration and stabilization work in the northern Plains warrants the use of the prevarietal release procedure. Field

testing of this ecotype, as well as two additional ecotypes, has been initiated in plantings at Huntley, Montana; Pinedale, Wyoming; and Cutbank, Montana.

Dupuyer Streambank Germplasm silverberry is one of two Source-Identified germplasms currently being released by Montana NRCS for riparian stabilization. Dupuyer Streambank Germplasm silverberry is recommended for lower riparian, bottomland sites characterized by high levels of soil moisture and periods of temporary inundation. In contrast, Pondera Floodplain Germplasm silverberry is recommended for upper streambank and floodplain terraces characterized by fairly well drained sites and adequate, but not excessive, available soil moisture. These recommendations are based on the site conditions observed at each respective germplasm source, under naturally occurring field conditions.

ECOTYPE DESCRIPTION:

Botanical Characteristics: Dupuyer Streambank Germplasm silverberry has the same general botanical, foliage, fruit, seed and phenological attributes noted below for the species as a whole. Slight variations in stem form, leaf shape and color, and rates of growth have been noted between Dupuyer Streambank Germplasm silverberry and other seed sources, but are not considered significant. Dupuyer Streambank Germplasm silverberry is a native shrub with potential use in streambank stabilization, wildlife habitat, windbreaks, and naturalistic landscaping projects. It is a multi-stemmed, suckering, deciduous shrub ranging from 1.5 to 3.6 m (5 to 12 ft.) tall. In Montana, heights of 1.5 to 2.4 m (5 to 8 ft.) are most common. It has an erect, upright habit with slender and sometimes twisted branches. The new stems are initially a light to medium brown color, the bark becoming dark gray, but remaining smooth, with age. The leaves are deciduous, alternate, 38 to 89 mm (1.5 to 3.5 in.) long and 19 to 38 mm (0.75 to 1.5 in.) wide (see Figure 1). The leaf shape is described as oval to narrowly ovate with an entire leaf margin. Both the upper and lower leaf surfaces are covered with silvery white scales, the bottom sometimes with brown spots. The highly fragrant, yellow flowers are trumpet-shaped (tubular), approximately 13 mm (0.5 in.) in length, and borne in the leaf axils in large numbers in May or June. The fruit is a silvery-colored, 7.6 mm (0.3 in.) long, egg-shaped drupe that ripens in September to October. Some fruit may persist on the plant until well into December. It can spread vegetatively by underground stems, forming thicket-like colonies. This species has several characteristics that distinguish it from its exotic relative, Russian olive. Silverberry is a multi-stemmed shrub averaging about 1.8 m (6 ft.) in height, whereas Russian olive is a multi-stemmed tree reaching heights of 6 m (20 ft.) or more on favorable sites. Russian olive has pronounced thorns, silverberry does not. The leaves of Russian olive are about the same length as silverberry but are much narrower, usually only about 12.7 mm (0.5 in.) wide and, therefore, linear in shape. Silverberry is also confused with silver buffaloberry *Shepherdia argentea* because of similarity in common name and silvery-green foliage. Silverberry is distinguishable from this species because silver buffaloberry has thorns, opposite leaves and buds, and a red or yellow-orange, berry-like fruit. Silverberry is native from eastern Canada to the Northwest Territories, south to Minnesota, South Dakota, and Utah. It is the only *Elaeagnus* native to North America.

Propagation by Seed: The seed of silverberry can be hand-collected in October through December, depending on location. The seed is readily cleaned by processing in a macerator, using water to float off the pulp, and then air drying the cleaned seed. Cleaned seed can be stored in sealed containers at 6 to 14 percent moisture content for up to 2 years with good viability. Greenhouse propagation by seed is easy, the fresh seed germinates readily with little or no cold chilling. Although the literature recommends 30 to 90 days of cold chilling prior to sowing, tests at the Bridger Plant Materials Center (PMC) indicate that, at least for certain seed sources, fresh seed germinates well without cold chilling (see Table 1). It should be noted that old or improperly processed/stored seed may benefit from a cold chilling period. Sow fresh seed onto a commercial peat-lite mix with moderate nutrition. The growth of this species is rapid, so fairly large (20 cubic inch or greater) containers are needed for a 5 to 6 month growing season. If the plants are seeded in the greenhouse in the fall, and kept actively growing until the following fall, they need to be planted or potted up in 2 gallon pots. Few problems are reported, but include aphids, scale, and branch canker. Late-fall sown seed germinates the next spring. Seed sown too early in the fall, however, may germinate prematurely if warm temperatures and adequate moisture prevail. Fresh seed sown in the field in the spring often germinates within 2 to 4

weeks. Use a 60-day artificial chilling pretreatment prior to sowing to ensure good germination. Put the seed in a lightly moistened, sand:peat mix in a ziploc bag and place in cold storage at 0.55° to 2.8°C (33° to 37°F). Bareroot production in a nursery bed is similar to that of other easy-to-grow species. Cultivate a fairly well-drained soil to eradicate weeds and allow good seed:soil contact. Rototilling followed by light packing works well. Sow the seed by hand, with a push-type, one-row belt seeder, or other mechanical planter. Because germination is normally high, sow 15 to 20 seeds per linear foot of row. If hand planting, cover the seed with approximately 6.3 mm (0.25 in.) of soil. The use of an agronomy cloth covering over the seeded rows may increase germination by reducing erosion and animal predation, and by maintaining optimum soil moisture. Root prune production beds early in year two if a 2-0 or older plant is to be produced. Harvest 1- or 2-year old stock in the early spring or late fall as dormant material. Follow established guidelines for the handling, storage, transport, and planting of bareroot material.

Table 1. Germination results of three germplasms of silverberry, Bridger PMC 1998.

Seed-Source	Accession Number	Origin	Seed Age	Number Seeded	Number Germinated	Percent Germination
PMC Source	9005352	Wheatland County, MT	1998	98	56	57
Streambank	**9081339**	**Pondera County, MT**	**1998**	**98**	**71**	**72**
Floodplain	9081340	Pondera County, MT	1998	98	81	83
					Grand Mean:	**(70)**

Vegetative Propagation: Greenhouse asexual propagation of this species is by dormant, hardwood cuttings taken in January through February. Tests conducted at the PMC indicate a rooting percentage of 80 percent or better when the cuttings are taken from wildlings (see Table 2). Percentages should increase when the cuttings are taken from cultivated plants. Take 20 to 30 cm (8 to 12 in.) long stem cuttings that are 6.3 to 12.7 mm (0.25 to 0.50 in.) in diameter, making sure that at least two internodes (and hence, buds) are included. Place the cuttings in a ziploc bag, lightly moisten with a spray bottle, then place in cold storage at 1° to 2.8° C (34° to 37°F). Although the cuttings should store well for several days, prepare and place them in the greenhouse propagation bench as soon as possible. Prepare cuttings by trimming them to a uniform size. Recut the base of each cutting at a 45° or greater angle with a sharp grafting knife to increase water uptake. Wound the bottom of the stem with a shallow, 2.5 to 3.8 cm (1 to 1.5 in.) vertical slice that just exposes the bark cambium. Lightly mist the base of the cutting prior to treatment with 3,000 to 5,000 ppm indole-3-butyric acid (IBA) powder. Place the cuttings in a well-drained, sterile media such as a mix of sand, perlite, and/or vermiculite. Use overhead, intermittent mist and 21° to 24°C (70° to 75°F) bottom heat. As an alternative, cuttings may be placed directly into 4 to 6 inch pots under mist until rooting. In such cases, amend the propagation mix with a 50 percent peat-lite mix. Cuttings should root in about 8 weeks. Pot into a 1- to 2-gallon pot in a well-drained, peat-lite mix with baseline nutrition. Harden-off for 2 months outdoors prior to field planting. Anticipate losses of 10 to 15 percent as a result of lifting and transplanting. No information is available on softwood propagation or root cuttings, but both are assumed to work well. Information on the field propagation of this species by dormant, unrooted hardwood cuttings is not available, but may prove successful on favorable sites.

Table 2. Adventitious rooting of three germplasms of silverberry, Bridger PMC 1998.

Seed-Source	Accession Number	Origin	Treatment (hormone)	Number Stuck	Number Rooted	Percent Rooting
PMC Source	9005352	Wheatland Co., MT (at Bridger PMC)	Rootone®	18	17	94
			16,000 ppm	18	18	100
			45,000 ppm	14	14	100
			Dip-N-Gro®	18	17	94
					Mean:	(97)
Streambank	**9081339**	**Pondera Co., MT**	Rootone®	18	17	94
			16,000 ppm	18	17	94
			45,000 ppm	18	16	89
			Dip-N-Gro®	18	17	94
					Mean:	**(93)**
Floodplain	9081340	Pondera Co., MT	Rootone®	18	18	100
			16,000 ppm	18	16	89
			45,000 ppm	18	15	83
			Dip-N-Gro®	18	18	100
					Mean:	(93)
				Grand	**Mean:**	**(94)**

ENVIRONMENTAL IMPACT ASSESSMENT: Dupuyer Streambank Germplasm silverberry demonstrates growth, reproductive habits, and ecological niche functions comparable to the species as a whole, as observed in its original collection site and as compared to silverberry performance overall in Montana. It is a native species that spreads readily via underground shoots and is capable of forming dense colonies of thicket-like growth. In naturally occurring populations in Montana, silverberry is not invasive. It can be considered comparable to colonizing members of the Genus willow *Salix*, quaking aspen *Populus tremuloides*, and other sprouting native species such as American plum *Prunus americana* and snowberry *Symphoricarpos albus*. It tends to spread vegetatively more readily on moist, high fertility sites where competition from other species is moderate. It may spread between and within rows of windbreak and shelterbelt systems but is usually controlled by frequent mechanical cultivation as part of standard windbreak maintenance operations.

ANTICIPATED CONSERVATION USE: Dupuyer Streambank Germplasm silverberry has several valuable conservation uses. It readily sprouts by suckers, especially on moist, fertile sites, making it useful in streambank stabilization work (NRCS Montana is currently testing three ecotypes for this purpose). It is adaptable to high pH (8.0) and saline soils. It is quite drought tolerant and will grow well in 279 to 305 mm (11 to 12 in.) annual precipitation zones in eastern Montana, once established. It is a potential shrub component in windbreak and shelterbelt systems, although it may, however, prove unacceptably vigorous on moist, high fertility sites. Mechanical cultivation between rows has effectively controlled the spread of suckers into adjacent rows in a long-term planting at the PMC. It is recommended for Conservation Tree/Shrub Suitability Groups 1, 3, 4, 5, 6, and 9 (see Subgroups for more specific information). Silverberry provides dense, thicket-like cover for numerous wildlife species. The buds and fruit are food for song and game birds. Although this species provides emergency food for deer during critical winter periods, it has a lower palatability for deer and cattle than many other sources of browse. Moose are also thought to utilize silverberry for browse. It is also susceptible to girdling by rodents and rabbits.

POTENTIAL AREA OF ADAPTATION: Dupuyer Streambank Germplasm silverberry should grow well in all areas where the species is found occurring in Montana and Wyoming east of the Continental Divide. It may also perform well in western Montana and Wyoming but has not been field tested in those areas to date. It is considered USDA Hardiness Zone 2 hardy, capable of tolerating average

minimum winter temperatures of -40° to -46°C (-40° to -50°F). Although it prefers moist, well-drained sites associated with riparian and streambank environments, it will tolerate relatively low annual precipitation zones (12 inches) and heavy soils given proper establishment care and regular weed maintenance.

AVAILABILITY OF PLANT MATERIALS: Seed and cuttings of Dupuyer Streambank Germplasm silverberry are available from the original collection site with permission of the private landowner. Contact the USDA/NRCS Plant Materials Specialist, Federal Building, Room 443, 10 East Babcock Street, Bozeman, Montana 59715 or the Bridger Plant Materials Center, Route 2, Box 1189, Bridger, Montana 59014 for more information. Propagules may also be available from the Nursery Supervisor, Montana Conservation Seedling Nursery, 2705 Spurgin Road, Missoula, Montana 59804. Propagules may also be available from commercial nurseries as advertised.

REFERENCES: Dietz, D.R.; Uresk, D.W.; Messner, H.E.; and McEwen, L.C. 1980. Establishment, survival, and growth of selected browse species in a ponderosa pine forest. Res. Paper RM-219, Rocky Mt. For. and Range Exp. Sta., Forest Service, USDA.

Dirr, M.A. 1983. Manual of woody landscape plants. Their identification, ornamental characteristics, culture, propagation and uses. Stipes Publishing, Champaign, IL.

Herman, D.E.; Stange, C.M. and Quam, V.C., editors. 1996. North Dakota Tree Handbook. N.D. Sta. Soil Conserv. Com., USDA-NRCS, NDSU Ext. and West. Area Power Admin.

Schopmeyer, C.S., Technical Coor. 1974. Seeds of woody plants in the United States. Forest Service, USDA, Washington, D.C. Ag. Handb.

PREPARED BY: Joseph D. Scianna, Research Horticulturist, USDA/NRCS Plant Materials Center, Route 2, Box 1189, Bridger, MT 59014 and Joe Carleton, Conservation Agronomist USDA/NRCS Intermountain Riparian and Wetlands Resource Technical Team, Bozeman, MT.

APPROVALS

_____ _____

SHIRLEY A. GAMMON
State Conservationist — Date
Natural Resources Conservation Service
Montana

_____ _____

LINCOLN E. BURTON
State Conservationist — Date
Natural Resources Conservation Service
Wyoming

_____ _____

SHARRON QUISENBERRY
Director — Date
Montana Agricultural Experiment Station
Dean, College of Agriculture

_____ _____

JAMES J. JACOBS
Director — Date
Wyoming Agricultural Experiment Station

_____ _____

BUD CLINCH
Director — Date
Montana Department of Natural Resources and Conservation

_____ _____

DIANE GELBURD
Director — Date
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service

UNITED STATES DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

and

NEW YORK STATE COLLEGE OF

AGRICULTURE AND LIFE SCIENCES,

CORNELL UNIVERSITY

Notice of Germplasm Release of 'SG4X-l' eastern gamagrass

The United states Department of Agriculture, Natural Resources Conservation Service and New York State College of Agriculture and Life Sciences, Cornell University announce the germplasm release of SG4X-l (PI-59l482) eastern gamagrass (Tripsacum dactyloides (L.) L. forma prolificum, Dayton et Dewald. SG4X-l designation reflects the sexual gynomonoecious and tetraploid nature of this germplasm. It was developed cooperatively at The Big Flats Plant Materials Center and Cornell University.

SG4X-l was developed by the chromosome doubling of a gynomonoecious diploid, GSF-I, PI-483447, (2n=2x=36), to the tetraploid level (2n=4x=72). Chromosome doubling was induced by the application of 20 micromolar solution of aminoprophos-methyl using a tissue culture microtillering technique.

Present cultivars of eastern gamagrass are of a diploid nature. They have a monoecious inflorescence which limits their seed production potential. The high seed producing gynomonoecious inflorescence found in eastern gamagrass occurs naturally at the diploid level. Tetraploid germplasm of eastern gamagrass is more robust, with thicker stems, a later flowering date and an apomictic reproductive system. Tetraploids, due to their apomictic nature have limited potential to be improved by conventional breeding techniques. The production of a gynomonoecious sexual tetr aploid would allow for breeding at the tetraploid level. This would enable the recombination of desirable characteristics of tetraploid genotypes, and to incorporate the gynomonoecious inflorescence onto new tetraploid lines. Superior genotypes will be able to be stabilized by using apomictic plants as pollen parents.

SG4X-l is vegetatively similar to PI 483447. It is semi-prostrate in growth habit, with relatively narrow dark green leaves. The inflorescence exhibits the gynomonoecious form with no modification to the inflorescence or seed, due to the increased ploidy level. It is fertile with a seed set of 43%. Crosses with known diploids and tetraploids have produced triploids and tetraploids respectively. It differs from other tetraploids by being able to reproduce sexually instead of apomictally and by having the gynomonoecious inflorescence having 20 times more pistil bearing florets than the monoecious inflorescence.

The germplasm will be maintained vegetatively at the Big Flats Plant Materials center, USDA NRCS. Limited quantities of vegetative material will be provided to interested people upon receipt of a written request and agreement to make appropriate recognition of its source a matter of open record when the germplasm contributes to the development of a new cultivar or hybrid.

Approvals for Notice of Release of SG4X-l eastern gamagrass

_____

Director, Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

_____

State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Syracuse, New York

_____

Associate Dean/Director of Research
College of Agriculture and Life Sciences
Cornell University
Ithaca, New York

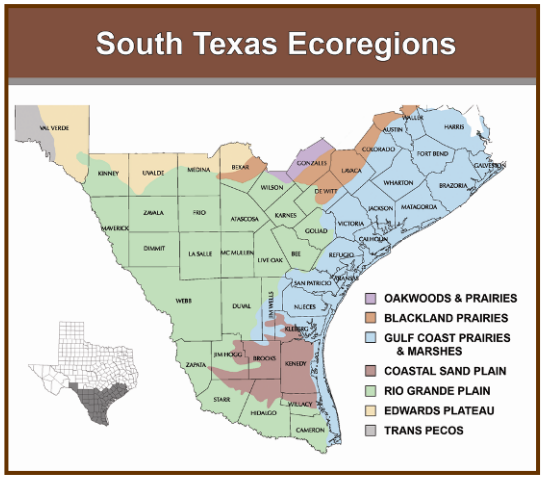
Description

Welder Germplasm shortspike windmillgrass (*Chloris* × *subdolichostachya Muell. (pro sp.)* [*cucullata* × *verticillata*]) was collected in San Patricio County, Texas. Shortspike windmillgrass is a naturally occurring hybrid between the native grasses *Chloris cucullata* and *Chloris verticillata*. Welder Germplasm is a cooperative release between the USDA-NRCS Plant Materials Program, *South Texas Natives*, and the Texas Agricultural Experiment Station at Beeville. It is a perennial grass which produces seed and also spreads vegetatively by stolons. The mature foliage height ranges from 1 to 3 feet tall. It may produce seed heads from May to October, but most of the seed is produced in September and October.

Uses and Adaptation

Welder Germplasm is recommended for use in roadside plantings, critical site revegetation, and rangeland seed mixes. It can be used in many types of conservation plantings, such as grassed waterways, riparian buffers, filter strips, and pond embankments.

Welder Germplasm has performed well at locations in the Rio Grande Plain, Gulf Coast Prairies and Marshes, Rolling Plains, and Pineywoods regions of Texas. Shortspike windmillgrass also occurs naturally in the Blackland Prairie, Edwards Plateau, and Oak Woods and Prairies regions. Welder Germplasm may be adapted to these regions as well, but this has not been verified through field testing.



Planting Methods

Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or non-residual herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. Seeding should occur in early spring, or where there are few cool-season weeds, windmillgrass can be seeded in the fall.

Welder Germplasm can be seeded using a grass drill with a small seed box. Broadcast seeding may be used in areas not easily planted with a drill, but additional practices to encourage good seed to soil contact, such as cultipacking, harrowing, etc., may be necessary. Sand can be mixed with seed to aid in distribution. There are approximately 3,000,000 seeds per pound of shortspike windmillgrass.

Seed should be planted 1/8 to 1/4 inch deep. It is better to plant too shallow than too deep. A seeding rate of 1/4to 1/2 pound of pure live seed (PLS) per acre is recommended. This corresponds to planting 20 to 40 live seeds per square foot. When planting a mixture, the rate of windmillgrass should be reduced according to the total percentage desired in the mixture.

Management

Welder Germplasm shortspike windmillgrass can be grazed the first year once the stand is established. Contact you local NRCS office to develop a grazing management plan. It is recommended that it be mowed or grazed to a 2 to 3 inch stubble height at least once per year. Welder Germplasm should not be burned.

Availability

Welder Germplasm was released in 2006. Breeder and foundation seed will be maintained by the E. Kika de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service. Breeder seed may be obtained by contacting the PMC.

For More Information

Kika de la Garza Plant Materials Center
3409 North FM 1355
Kingsville, Texas 78363
Phone: (361) 595-1313
http://plant-materials.nrcs.usda.gov/stpmc/

or

Plant Materials Specialist
USDA-NRCS
WR Poage Federal Building
101 South Main Street
Temple, Texas 76501-7682
Phone: (254) 742-9888

or

South Texas Natives
CKWRI-TAMUK
MSC 218, 700 University Blvd.
Kingsville, Texas 78363
Phone: (361) 593-5550
http://www.southtexasnatives.org

or

Any USDA Natural Resources Conservation Service Office

Revised February 2007

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Welder Germplasm

Shortspike Windmillgrass

***Chloris* × *subdolichostachya* Muell. (pro sp.) [*cucullata* × *verticillata*]**

E. "Kika" de la Garza Plant Materials Center Kingsville, Texas

South Texas Natives

S T O R A G E I N F O R M A T I O N F O R M (SIF)

USDA-ARS
NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION (NCGRP)

_____Submitted for Registration in *Crop Science* _____Submitted for inclusion in NPGS

_____Cultivar _____Parental Line _____Genetic Stock
_____Germplasm _____Mapping Population

Name of Donor or Contact Person_____ Phone No.(___)_____

Institution or Company_____ Email_____

Address_____

The policy of the National Plant Germplasm System (NPGS) is that all non-restricted material deposited in the NPGS will be freely distributed to scientists for research purposes. For all material registered in *Crop Science*, the donor is expected to maintain and distribute seed for a minimum of five years following registration after which time unrestricted material will be entered into the NPGS for public distribution. For PVP, Utility Patent or other restricted use crop material being registered in *Crop Science*, the material is deposited in NCGRP but the owner is responsible for maintenance and distribution throughout the duration of the restriction unless different arrangements are made with the NPGS.

Submitted material will be released into the NPGS (check one box):

- ☐ ***Immediately upon receipt.*** **After processing, NPGS will distribute the material publicly to any qualified person globally who requests the material. To facilitate distribution of Crop Science Registered samples received from foreign countries, permission will be sought from the owner for distribution by the NPGS after quarantine requirements are met.**
- ☐ ***After five years*****. For material of US origin registered in *Crop Science* the donor agrees to maintain and distribute the seed for a minimum of five years.**
- ☐ ***After some other designated period.*** **For material covered by PVP or a patent, <u>or</u> for non-PVP or non-patented material where the owner desires restricted access (not to exceed 20 years), the owner agrees to maintain and distribute the material throughout the duration of the restriction unless different arrangements are made with the NPGS. <u>If this box is checked, the owner must identify a date (or indicate that the restriction is tied to expiry of PVP or patent) when material is to become available for unrestricted public distribution by the NPGS.</u>**

The owner's institutional legal signature on this SIF authorizes the NPGS to distribute from the CSR sample after the expiry date of restriction noted below. Distribution will be done under the prevailing NPGS policy.

Date of release to unrestricted public distribution by the NPGS (not to exceed 20 years) (Date of release is required for CS Registration): _____

Authorized Institutional Legal Signature (required) _____**Date** _____

Official Title of Authorized Signatory_____

Revised 8/15/2006

NOMENCLATURE:

Genus_____ Species_____Sub-species_____

Common name_____

Variety/cultivar name and/or designation number _____

PI Number (if previously assigned) _____

Other Identifiers_____
(For Mapping Population, provide a list of identifiers for mapping lines and parents)

SEED REQUIREMENTS: (**UNTREATED SEED REQUIRED**)

_____Cross/Open Pollinated (Cultivar, Germplasm): 7500 seeds
_____Self Pollinated (Cultivar, Parental Line, Germplasm, Mapping Population Parents, Genetic Stocks*); 5000 seeds
_____Mapping Population Lines: 500 seeds
_____*Difficult Genetic Stocks (those where seeds are difficult to grow, maintain or analyze): 50-1000 seeds

Percent Germination determined by Donor_____ Date of test_____

Date harvested_____ Approx. percent self fertilization under normal field conditions:_____

Seed provided to NPGS active collection? YES_____ NO____ Date provided_____

NPGS Active Site Location_____ Amount of seed supplied_____

Seed provided to NCGRP YES_____ NO _____ Date provided _____

RESTRICTIONS:

PVP Applied for or Granted? YES____ NO_____ PVP Number_____

Utility Patent Applied for, Granted, or incorporated? YES____ NO_____ UP Number_____

Plant Patent Applied for or Granted? YES____ NO_____ PP Number_____

Restricted use materials: describe condition(s) for access and distribution (Material Transfer Agreement, Research Agreement, License & Sales Agreement, etc.) and additional contact information if different than above:

_____

_____

GROWTH HABIT:

Annual: Spring_____ Winter_____ Facultative_____

Biennial _____ Perennial_____

FORM RECEIVED:

Seed _____ Bud_____ Pollen_____ Tissue Culture_____

DESCRIPTIVE INFORMATION: In order for each entry to be properly identified, donors are asked to prepare a narrative and pedigree of each entry. Key features in the narrative might include agronomically important traits such as maturity, plant height (metric terms or dwarf, semi-dwarf, etc.), seed characteristics (size, oil content, milling quality, type, etc.), nutritive value, tolerance to diseases, insects, nematodes, cold, lodging, and others. Identify transgenes and the traits that they govern. Give the scientific names of pest organisms. Avoid comparisons with other cultivars or lines unless these are part of the parentage, or unless the comparisons are important for rating disease and insect resistance levels. Accessions deposited in the NPGS will be documented in the Germplasm Resources Information Network (GRIN) database of the National Plant Germplasm System, except for mapping populations.

PEDIGREE: (The pedigree should not exceed 500 characters.)

NARRATIVE: (The narrative can be no more than 2000 characters in length.)

Ship to:
National Center for Genetic Resources Preservation
Attn: Storage Samples
1111 S. Mason St.
Fort Collins, CO 80521-4500
Tel: 970-495-3200
Fax: 970-221-1427
Email: Judy.Grotenhuis@ars.usda.gov

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

540.96 Seed Storage Policy of the National Center for Genetic Resources Preservation

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION

1111 South Mason Street

Fort Collins, Colorado 80521-4500

ABBREVIATED POLICY STATEMENT

1. The Laboratory is a federal facility and all seed accepted for storage comes under the jurisdiction of the U.S. Government.
2. Only seed will be accepted for storage.
3. Valuable seed stocks will be accepted by the Laboratory from federal and state institutions, commercial seed interests, and private individuals.
4. Any bona fide research worker of the United States, its territories, and possessions, can receive seed from collections stored at the Laboratory, subject to restrictions in item 5. However, seed will not be provided by the Laboratory if they are available commercially or are in working stocks of research agencies. The Laboratory will suggest sources of supply.
5. The Laboratory will not provide bulk supplies or seasonal stocks.
6. Inventories of the stocks held in storage are available on GRIN and hard copies can be obtained upon request.
7. Only clean seed of reasonably high germination is acceptable for storage. If seed of low viability (below 60 to 65 percent germination) is received, they will be held on a tentative basis until the donor is able to provide replacement seed of higher viability (85 percent germination or better).
8. No charge will be made by the Laboratory for furnishing seed.
9. If seed has been accepted officially, the National Plant Germplasm System will be responsible for the increase of stocks if, during storage, viability drops to a point that there is a danger of loss of the accession or if stocks become depleted as a result of seed distribution.
10. The Laboratory will not assume responsibility for replenishing stocks if the accessions received are subminimal in quantity or in viability.
11. The principal objective of the Laboratory is long-term holding of valuable seed. Research projects related to the Laboratory's objective (physiological problems in seed viability and longevity) will be conducted at the Laboratory.

In addition to the policy above, recommendations have been made as to what constitutes "valuable seed." The following categories of seed will be accepted by the Laboratory.

New Varieties or Cultivars:
All newly released varieties or cultivars, whether private, public, or commercial origin, including reselections from varieties or cultivars continuing in current use.

New Alternative Releases:
All new Alternative release which fall within the AOSCA accepted categories of either Tested, Selected, Germplasm, or Source Identified releases.

Current Varieties and Cultivars:
Varieties and cultivars currently in use and under registration by respective crop group organizations, or otherwise documented as to specific origin and distinguishing characteristics. This group includes varieties approaching obsolescence that have been superseded by new or currently popular varieties or cultivars.

Open-Pollinated Varieties:
Stocks representing earlier varieties or types of specific crops that have been or will be replaced in the commercial field by hybrids.

Obsolescent Germplasm:
Samples representing holdover material from earlier research programs and of no immediate interest.

Genetic Stocks:
Materials of academic and genetic interest, such as marker genes, mutants, translocations, monosomics, trisomics, and other chromosomal aberrations. Replenishment of such stocks, if in a heterozygous state, is the obligation of the donor. For the later type of stocks, the Laboratory serves only as an insurance against loss.

Plant Introductions:
From regional and federal introduction stations or other agencies (NRCS) as seed is increased beyond "working stocks."

All inquiries concerning minimum quantities of seed required for specific crops, documentation, seed condition or quality, and other routine information should be addressed to the USDA-ARS, National Center for Genetic Resources Preservation, 1111 South Mason Street, Fort Collins, Colorado 80521-4500.

REQUEST FOR PLANT MATERIALS ALLOCATION AND DISTRIBUTION

Order By.: _____

Plant Materials Order No.: _____ **Order Date:** _____ **Approx. Date Needed:** _____

Order To Address

_____
_____
_____
_____
_____

Ship To Address

_____
_____
_____
_____
_____

Field Planting No.: _____

Study No.: _____

Purpose: _____

Cooperator: _____

Contact phone: _____

Contact email: _____

State/Area: _____

SPECIAL INSTRUCTIONS

_____
_____
_____

Allocate and/or ship the following seed or stock as indicated below, in accordance with approved allocation of seed and/or planting stock:

NRCS-ECS-596 (D&D #): _____ **Order Prepared By:** _____ **Date** _____

PMC	Accession Number and/or Variety	Scientific name and/or Common Name	Certification Class	Request Amount	Unit of Measure and/or Type

Print Form Only Clear Form

REQUEST FOR PLANT MATERIALS ALLOCATION AND DISTRIBUTION

(CONTINUED)

PMC	Accession Number and/or Variety	Scientific name and/or Common Name	Certification Class	Request Amount	Unit of Measure and/or Type

USDA IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER

Print Form Only Clear Form

REQUEST FOR PLANT MATERIALS ALLOCATION AND DISTRUBUTION

FORM INSTRUCTIONS

These instructions will assist in completing form NRCS-ECS-001.

Plant Materials Order No.
Plant materials order number assigned by the Plant Materials Specialist or Plant Materials Center Manager

Order Date
Date the material was requested

Approximate Date Needed
Approximate date the material will be needed for pick-up or shipment

Order By
Name of the Plant Materials staff member responsible for initiating the plant material allocation

Order To
Name and address of the individual or organization that is making the request for the plant materials; this is also where the Distribution & Delivery record from POMS will be sent

Ship To
Individual or organization that will receive and utilize the plant materials, which may differ from the requestor

Cooperator
Name of the land owner, individual or organization that is working with or is associated with these plant materials

Contact phone
Phone number of the land owner, individual or organization working with or associated with these plant materials

Contact email
Email address of the land owner, individual or organization working with or associated with these plant materials

State/Area
State or area where the plant materials will be utilized

Field Planting No.
Enter the unique number assigned by the Plant Materials Center staff or Plant Materials Specialist if this is a Field Planting. The format for field plantings is identified in the National Plant Materials Manual, sections 540.14(F)(5) and 520.66. This number should correspond to a POMS database record if applicable.

Study No.
Enter the unique number assigned by the Plant Materials Center staff or Plant Materials Specialist for this study. The format for studies is identified in the National Plant Materials Manual, sections 540.12(C) and 520.66. This number should correspond to a POMS database record if applicable

Purpose
Describe the purpose of the plant material allocation (PMC seed increase, grower increase, field planting, etc.)

Special Instructions
Describe any special instructions necessary to ensure proper plant handling and storage; this could include packaging instructions or requirements, storage environment requirements, planting instructions, etc.

REQUEST FOR PLANT MATERIALS ALLOCATION AND DISTRUBUTION

FORM INSTRUCTIONS

(Continued)

NRCS-ECS-596 (D&D #)

Once the material has been allocated in POMS, a D&D number will be generated. Enter that number here to link this allocation to the Distribution & Delivery record

Order Prepared By

Name of the individual that prepared/packaged the order

Date

Date the order was prepared

PMC

5 letter PMC code for the Center (e.g., NYPMC, AZPMC)

Accession Number and/or Variety

Accession number and/or the variety of the plant material to be allocated

Scientific Name and/or Common Name

Scientific name and/or the common name of the plant material to be allocated

Certification Class

Certification class of the plant material being allocated;

- BR = breeder
- FD = foundation
- RE = registered
- CE = certified
- CO = common

Request Amount

Amount of plant material that has been requested

Unit of Measure and/or Type

The unit of measure and/or type for the amount requested. This could include bushels, pounds, grams, rhizomes, bundles, etc. Make clear indications of quantities – for example, if 50 bundles of whips are being allocated, be sure to indicate the number of whips in a bundle. If Pure Live Seed is required indicate “lbs. PLS”

Continue filling out one row for each separate plant material allocation.

U.S. Department of Agriculture
Natural Resources Conservation Service

NRCS-ECS-596
(8/02)

DISTRIBUTION AND DELIVERY RECORD
Bridger Plant Materials Center, Bridger, MT

D&D To: **Mike Moore**
Seed Certification Service
University of Wyoming
PO Box 983
747 Road 9
Powell, WY 82435
Phone: (307) 754-9815; Fax: (307) 754-9820

Ship To: **Dwight Gilbert**
Seed Certification Service
University of Wyoming
PO Box 983
747 Road 9
Powell, WY 82435
Phone: (307) 754-9815; Fax: (307) 754-9820

Order Date: 3/1/2010 Ship Date: 3/1/2010 Number of Packages: 4

ECS-1 Number: Ship via: Delivered

D&D Number: MTPMC-10-005

Accession	Scientific Name (Symbol) / Common Name	Lot Number	Cert Class	Age	Test Date	Purity	Total Viab	Bulk Shipped	PLS Shipped	U/M
469235 \ Critana	Elymus lanceolatus ssp. lanceolatus (ELLAL) / streambank wheatgrass	SFD-09-FLD5/6E	FD		2/24/2010	99.07	96	126.1734	120	lbs

Remarks:

PLEASE SIGN AND RETURN ONE COPY TO:
Bridger Plant Materials Center
98 South River Rd.
Bridger, MT 59014-9718
Phone: **(406) 662-3579**
Fax: **(406) 662-3428**

For PMC Use
D &D By: Roger Hybner
Purpose: Grower Increase
Field Planting #:
Study #:
Ordered By: MTPMC
Ordered Filled By: Darren Zentner

Received By: _____ Approved By: _____

Name/Title: _____ Name/Title: _____

Date: _____ Date: _____

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

Worksheet to Discontinue PMC Production of a Plant Materials Release

Requesting PMC: _____ **Date:** _____

Requestors Name: _____

Species Name: _____

Release Name: _____

Reason for Discontinuing the Release (check all that apply):

_____ No or Limited Foundation Seed Requested
_____ No or Limited Commercial Production
_____ Replaced by Improved Release(s)
_____ Considered Invasive and Potentially Harmful to the Environment
_____ Other (indicate) _____

Justification for dropping the release (provide brief details):

Attach relevant documentation, such as production information, evaluation information, or the environmental evaluation

Is the germplasm in the National Plant Germplasm System for long term preservation?
_____ **Yes** _____ **No** **Explain:** _____

Have the cooperating agencies been notified and they concur with the dropping of the release?
_____ **Yes** _____ **No** **Explain:** _____

Recommended By:

_____ _____
Cooperating Agency Date Cooperating Agency Date

_____ _____
State Resource Conservationist (or equivalent) Date

Approvals:

_____ _____ Approved ☐ Not Approved ☐
State Conservationist (Chair PMC Advisory Committee) Date

_____ _____ Approved ☐ Not Approved ☐
National Program Leader, Plant Materials Date

**Once approved, the PMC should discontinue Foundation production. The PMC should also notify Certification Agencies, commercial nurseries, and NRCS S.O. in states that may recommend it as a conservation plant. All State Offices should remove the release from the all NRCS Technical Guides. Specific courses of action may vary depending on the release and the reason for which the release is being discontinued.

Revised July 2010

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

Part 541 - Information Management

Subpart A – Plant Materials Reporting

541.0 General

A. The NPL maintains overall responsibility of information management activities in the PMP. A National PM Information Steering Committee may be appointed by the NPL on an ad hoc basis and provides recommendation and assistance to the information needs of the Program. At a minimum, the committee will consist of a NTSC PM Specialist , a PMC Manager, a PM Specialist, the NPMC Manager, the PM Webmaster, and the PM Information Coordinator.

B. All information management activities will conform to agency procedures and guidelines. All hardware, software, and procedural changes that impact information management activities nationally will be cleared through the PM Information Coordinator and changes reviewed and issued by NHQ as appropriate. NRCS policy should be followed regarding computer security, passwords, etc., according to the General Manual.

541.1 Plant Materials Operations and Management System (POMS)

A. Description and Use

(1) The POMS database is the primary system for recording plant materials management, activities and accomplishments by PMCs and PM Specialists. The objective of POMS is to facilitate rapid and cost-effective accumulation, processing, and dissemination of data to assist in realizing NRCS goals and objectives. Each PMC or PM Specialist is responsible for recording data into their POMS database and for creating exports of their database to populate the National POMS database.

(2) The POMS database consists of the following components:

(i) Accessioning – records source information on seed and plant collections.

(ii) Inventory – maintains information on seed and vegetative materials; generates inventories and usage reports.

(iii) Distribution and Delivery – creates delivery records for the distribution of seed and vegetative materials; generates ECS-596 forms.

(iv) Studies, Field Plantings, and Conservation Field Trials – records basic information on each type of study and planting.

(v) Releases – includes information on past and pending conservation plant releases.

(vi) Publications – records citations and information on technical and popular documents prepared by plant materials staff.

(vii) Presentations – records information on formal presentations, tours, training sessions, and field days by plant materials staff.

(viii) Seed and Plant Production – records information on release production at the PMC and commercially, foundation seed and plant maintenance for releases at PMCs, and other seed and plant production at PMCs.

(ix) Customers Assisted – records technical assistance provided to NRCS offices, cooperators, and the general public.

(x) Address Book – used to maintain addresses for the Distribution and Delivery module and serve as a "rolodex" for the office.

(xi) PMC/ PM Specialist Operations – Includes staff information, time spent on activities, and other items relevant to PM operations.

B. Entering data into the POMS database

(1) POMS is a Microsoft Access database which utilizes forms for a user-friendly interface for data entry and reporting. Knowledge of Access is not required.

(2) PM staff should ideally update the information in POMS as it occurs to ensure completeness of the data. Data entry should also be as up-to-date as possible prior to the end of each quarter, when a POMS export is run and sent to the NPMC. All primary and secondary fields in POMS must be filled in for a complete record of activities and accomplishments. Primary fields might include a publication citation. Secondary fields, in this case, would include related species and releases, related studies, NRCS programs, resource concerns, etc.

(3) Training sessions on how to use POMS will be conducted periodically. These sessions are usually done over Internet conferencing and are conducted by the NPMC Manager, PM Information Coordinator, or NPL. Contact one of these persons if additional assistance is needed. Additional information in the form of user guides or other guidance is distributed as available or needed.

C. POMS Exports

(1) PMC staff and PM Specialists will create an export of their POMS database quarterly and send it to the PM Information Coordinator or the manager of the NPMC (or as instructed by the NPL). Instructions on the creation of exports are found within the POMS database.

(2) POMS quarterly exports copies of all new, updated and deleted records from the PMC or PM Specialist database to an export database. All records in the database are then marked as "exported." The next export will repeat this process of copying all new, updated, and deleted records. It is essential that all quarterly exports which are created are sent to the NPMC for consolidation into the national POMS database.

(3) The due date for the quarterly export is the last business day of the first, second, and third quarters of the fiscal year. The due date for the annual (and final) export of the fiscal year is the second Friday in September of each year. The exact date in September will vary each year.

(4) The PM Information Coordinator or the Manager of the NPMC will consolidate POMS exports from each PMC and PM Specialist and import data into the national POMS database.

(5) The Total Export option in POMS is used when requested by the PM Information Coordinator or the Manager of the NPMC for data maintenance purposes or for rebuilding databases.

D. Utilization of Data

POMS information gets used in many different ways and at many different levels.

(i) Locally at the PMC or PM Specialist Level – Maintenance of accessioning and seed and plant inventory data is critical for recording the maintenance and use of Government-processed seed. Information on studies, seed and plant production, and plant materials products such as releases, publications, and presentations gets recorded so there is a history of what was done by a PMC or PM Specialist. The Address Book can be used to improve efficiencies with mailings and for communicating with partners and others.

(ii) Nationally – All data is combined nationally into the national POMS database. This database is maintained by the NPMC. Information on studies, releases, and publications gets processed to populate PMCs and the national program Web sites. Several standard reports, such as the "Plant Materials Staff Directory" and the "Improved Conservation Plants Releases by NRCS and Cooperators," are generated directly from the national POMS. Data is also used to assess the performance of PMCs and to generate the Performance Index annually (see Section 541.2(C)).

(iii) By NRCS, USDA, and other groups – POMS information is used to generate reports on specific topics for NHQ and USDA, answer questions from the Office of Management and Budget (OMB) and Congress, and is used to generate reports needed to support budget requests and Congressional hearings.

(iv) Requests for custom queries or reports from individual databases or the national POMS database may be directed to the NPMC Manager or PM Information Coordinator.

E. Maintenance and Development of POMS

(1) The NPMC Manager and/or PM Information Coordinator have primary responsibility for the maintenance and development of the POMS database. Additional PM staff may be involved in the overall design for future development of POMS. The current architecture of the POMS database can be found in Section 541.10.

(2) Database or data maintenance questions or issues should be directed to the NPMC Manager or PM Information Coordinator.

541.2 Plant Materials Performance Index

A. General

The goal of the Plant Materials Performance Index is to monitor the performance of each PMC and PM Specialist to ensure they are engaged in all facets of the program.

B. Content

(1) The Index is scaled on a total of 100 and accounts for differences in full-time equivalents among PMCs. Each task or accomplishment on the Iindex is assigned a point value. There are 9 major categories of the Index which reflect the majority of activities and accomplishments by PMCs. Each of these sections is capped at a maximum value. Section 541.11 includes these categories, a description, and their maximum point value.

(2) In addition to the "capped" score out of 100, the total uncapped score will also be calculated and multiplied by the capped score to achieve a cumulative score. The cumulative score is a reflection of the overall productivity of each PMC.

(3) The content of the Index is reviewed annually by the National Plant Materials Technical Committee, and minor modification to the Index are made to ensure that it accurately and equitably captures the activities and accomplishments of the PMP.

C. Use of the Index

(1) The scores from each PMC are tallied and an average is calculated for the entire Program. This Program average is used for performance reporting to NHQ and OMB.

(2) The Index can be used by PMC Managers or by States with PMCs to identify strengths and weaknesses in a program and areas for specific improvement. Weaknesses, such as lack of written technical documents, can be addressed in future years to help strengthen a PMC's overall program. The Index can be used by the NPL to assess the effectiveness of each PMC and for determining performance-based awards or funding for the next fiscal year's budget allocations to PMCs.

541.3 NRCS Reporting through the Performance Results System

The Performance Results System (PRS) is the agency system for recording specific performance activities. PM reports the number of new release and number of technical documents developed and transferred. These numbers should be reported a minimum of each quarter and inputted into the Web-based PRS either by the PMC Manager or the State office.

541.4 Plant Materials Reports

A. Plant Materials Progress Report of Activities

(1) General

(i) It is essential that all NRCS offices and others interested in PM work be informed of progress and new developments on a frequent basis. The PM Progress Report will contain an interpretive summary of significant PM-related activities. This interpretive summary describes why the activity or study was undertaken, the progress or results of the activity or study, and the application or impact to NRCS field activities or natural resources activities.

(ii) The PMC Manager and PM Specialist prepare the report. The report provides information on new plant materials developments to NRCS field offices, cooperating agencies, and groups. The Plant Materials Progress Report of Activities should be concise, relevant to field staff (what new information was found), is typically about 4 pages long (no more than 8 pages), and should be oriented to conveying results of PMC activities. This report should be attractive and easy to read. Section 541.12 is an example of a Plant Materials Progress Report of Activities.

(2) Content

The PM Progress Report may include the following sections:

- Header – Include the USDA-NRCS logo, identify the title, office, office contact information, and date of the document.
- Summaries – Provide brief summaries of some of the major activities or findings from the previous year. Put the most significant accomplishments towards the front of the document. Utilize pictures and graphs effectively to tell the story. Emphasize new findings and information of relevance to the PMC's customers. Special consideration should be given to describe the impact that the study will have to field offices and to implementing conservation practices. If there is a technical article available on the Internet, provide a link to that document. Do not include summaries of every single PMC study or activity, especially those items which had minimal progress or are of lower importance to PMC cutomers.
- References – Provide the title for significant new documents not already referenced in the report. Provide a descriptive sentence or two on how this document might be useful and provide a URL address.
- General Information – Towards the end of the document, remind readers what the PMC does, major changes at the PMC, priorities at the PMC, staffing, etc. This section should be brief.
- Do not provide detailed explanations of experimental design, vague results of initial evaluations, complex tables or charts, and lengthy descriptions of facility upgrades. Avoid the use of study numbers and other terms which may be unfamiliar to non-PMP readers.

(3) Frequency

The Plant Materials Progress Report of Activities is to be developed and published annually. The report will be compiled on a calendar year basis and be prepared and distributed no later than January 15 of the year following the report year.

(4) Distribution

(i) Minimum distribution includes the State office(s), appropriate field offices, all other PMCs and PM Specialists, NTSC PM Specialists, and the NPL. Other suggested distribution includes: NTSCs, the National Association of Conservation Districts, Resource Conservation and Development offices, cooperators, and elected officials.

(ii) An electronic file should be sent to the PM Webmaster for archiving and for inclusion on the Internet.

(iii) The issuing PMC is to maintain file copies of each report and an electronic copy of the file.

B. PMC Annual Technical Report

(1) General

The PMC Annual Technical Report (ATR) summarizes studies and activities for a PMC in a technical format. It serves as a reference source for work done by the Center. The summary provides the basis for making needed adjustments to the study activities in the coming year and serves as a source of information for the PM Progress Report. The PMC staff, under the direction of the Manager, prepares the report with input from the PM Specialists, as appropriate.

(2) Contents

The PMC ATR will contain, at a minimum:

- Study titles, numbers, and brief description of the study;
- Summarized data presented in tabular form for each study for the reporting period; and
- A brief summary (1/2 page or less) of the tabular data for each study.

(3) Frequency

The PMC ATR is prepared annually. The technical report is compiled on a calendar year basis and is prepared by May 1 of the year following the report year.

(4) Distribution

(i) Minimum distribution includes the PM Specialists(s) which serves the PMC, other PMCs and PM Specialists with closely related activities, NTSC PM Specialists, and the NPL. Other suggested distribution includes cooperators that might have a direct interest in the technical nature of the study.

(ii) An electronic file should be sent to the PM Webmaster for archiving and for inclusion on the Internet.

(iii) The issuing PMC is to maintain file copies of each report and an electronic copy of the file.

C. Periodic Reports

(1) General

The NPL or PM Information Coordinator may be required to compile Program information periodically. PMCs or PM Specialists may also need to prepare progress reports or summaries of studies or activities.

(2) Types and Formats of Periodic Reports

(i) Examples of recurring reports which may need to be compiled include:

- Outreach Activities - support provided to underrepresented or disadvantaged groups.
- Civil Rights issues - consists of Civil Rights concerns and violations.
- Pesticide Usage and Disposal - quantities and dollars spent or projected to be spent on pesticide or chemical disposal.
- PMC Security – updates of progress made on security assessments.
- Reports or information for management or Congress - topics may include new releases, performance goals and updates, and implementation of Program Strategic Plans.
- Progress Reports - might include project or study summaries, updates on reimbursable activities, and facility upgrades.

(ii) Formats for these reports are usually determined by the person or office compiling the report, or by the person or office requesting the report.

(3) Frequency

The frequency and due dates of these reports depend on the type of report and how much information is requested.

(4) Distribution

Distribution depends on the type of report and, in part, by the person preparing the report or the person who requested the information.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

541.10 POMS Database Architecture

- POMS = Plant Materials Operations and Management System
- POMS is a MS Access 2007 database with a forms interface using VisualBasic
- Opening POMS launches a custom toolbar and startup screen. From the startup screen the user can go to different modules to enter or view data and print reports. Each Module contains Sections related to the broad module topic.
- Since POMS is modular, additional modules can be developed as needed. Modules and Sections in Italics are proposed but have not been developed.

Accessioning
Add/Edit Accessions
Accession Reports

Inventory
Add/Edit Inventory
Inventory Reports

Distribution and Delivery
Add/Edit D&D
Credit D&D
D&D Reports

Products & Technology Transfer
Releases
Publications
Presentations
Customers Assisted
Tech Transfer Reports

Seed and Plant Production
Release Production
Other Production
Production Reports

Addresses
Address Book
PM Sites
PM Staff
Reports

Studies and Plantings
National Projects (Review)
Studies
Studies - Plans, Details
Field Plantings
Plantings - Plans, Details
Conservation Field Trials
Trials - Plans, Details
Reports

PMC/PMS Operations
Staff
Time Spent on Activities
Long Range Planning
Annual Business Plan
Workload Analysis
Annual Goals
Budget Planning
Expenses
Marketing
Outreach
Training Courses
Scheduling
Reports

Database Reports and Maintenance
Data Exports
Quarterly Accomplish
Yearly Accomplishments
Data Imports

Evaluations
Plot Plans
Data and Evaluations
Evaluations - Field Offices
Reports

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

Plant Materials Performance Index									
2010 Update (11-16-09)									
				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Base measurements									
Staff FTEs	number			1	0	1.0			The FTEs of all staff, permanent and intermittent, at the PMC. For PM Specialist, the amount of FTE that the Specialist spends on PM activities related to the performance index.
Releases-#	number active releases			1					All plant releases for which the PMC is the "Prime PMC" which have not been discontinued.
Pre-Release Activities			15.00						
Collections	new acc. Entered	0.250				0.0			Number of accessions entered into POMS. It does not matter when the collection was actually made.
Active non-replicated plant studies	number of assemblies	1.50				0.0			The evaluation of the characteristics and comparative performance of an assembly of plants under controlled conditions. There are no minimum number of collections established for what constitutes an assembly, but it should include enough collections to be representative of the area the release is intended for. (Collaborative interagency studies would fit here, but not projects where we are only producing seed or plants).
Active replicated plant studies	number of assemblies	3.00				0.0			The more intensive and rigorous testing of plants May not be necessary for all types of releases. (Collaborative interagency studies would fit here, but not projects where we are only producing seed or plants).
Active Off-Center Evaluations	number of assemblies	5.00				0.0			Plantings used by PMCs to evaluate releases or technology off the center; data is collected and analyzed statistically; was previously named “field evaluation planting.”

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Field Plantings - release selection	number of plantings	1.00				0.0			Final stage of technology development or plant selection; plantings used primarily by PM Specialists to develop new methods or technology or evaluate the adaptability of new releases; data is collected.
Observational Nursery Plantings evaluated for other PMCs	number of accessions	1.00				0.0			Informal evaluations of plants (from another PMC) in advanced testing or recently released for the purpose of determining adaptation.
Inter-Center Strain Trials conducted with other PMCs	number of trials	5.00				0.0			Formal, controlled, repeatable evaluations where scientific methods and experimental designs are used to study plants and techniques from multiple PMCs where each PMC plays an equal role. Useful to determine state and regional plant performance and adaptation.
						0.0	0.0	0.0	
New Releases			0.00						This section is not adjusted for staff FTEs
Releases	points	varies				0.0	0.0		Pionts for new releases as assigned by the Regional Plant Materials Specialist
Release Maintenance			10.00						This section is not adjusted for staff FTEs
Maintain Releases	number maintained	1.00				0%	0.0	0.0	Unless releases are formally discontinued, they are still active. To qualify, there must be foundation production or adequate seed stored to meet reasonable commercial demand.
Release Production Field Size:									These values are only included in the uncapped points.
Acres		0.25				0.0	0.0		Total acres for release production
Linear Feet		0.001				0.0	0.0		Total linear feet for release production

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Technology Development			15.00						
Technology Development Studies	number	6.00				0.0			Studies which are classified in POMS under Purpose as "Technology Development", excluding Studies related to National Action Plans.
Field Plantings - technology development	number of plantings	1.25				0.0			Final stage of technology development or plant selection; plantings used primarily by PMSs to develop new methods or technology or evaluate the adaptability of new releases; data is collected.
Field Plantings - demonstrations	number of plantings	0.75				0.0			Final stage of technology development or plant selection; plantings are used primarily by PM Specialists to develop new methods or technology or evaluate the adaptability of new releases.
Conservation Field Trials	number	1.00				0.0			Identified in the NRCS General Manual 450-403 as a tool for evaluating new technology, species, or plant releases that address local soil and water resource problems; type of study used by many disciplines; in the PM program may be used to develop new technology, evaluate releases, and promote PM products to address a specific resource problem; typically coordinated by the PM Specialist; qualitative or quantitative data may be collected.
						0.0	0.0	0.0	
National Action Plan Studies			10.00						
Pollinators	number	10.00				0.0			Studies coded in POMS as related to the national project for pollinators.
Energy	number	10.00				0.0			Studies coded in POMS as related to the national project for energy.
Climate Change	number	10.00				0.0			Studies coded in POMS as related to the national project for climate change.
Air Quality	number	10.00				0.0			Studies coded in POMS as related to the national project for air quality.
Transition to Organics	number	10.00				0.0			Studies coded in POMS as related to the national project for transition to organics.

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Plant Attribute Data Collection	number	12.00				0.0			Studies coded in POMS as related to the national project for plant attribute data collection. These are formal studies organized with the NTSC Plant Materials Specialist.
						0.0	0.0	0.0	
Technical Documents			15.00						
FOTG Standards/Specs	number	2.00				0.0			FOTG Standards, Specifications, Job Sheets or other guides which have been written or significantly revised by PM staff.
Major Publications	number	20.00				0.0			Major technical publication , 90% of which is developed by PM staff, which is a comprehensive treatment of a subject, has multiple chapters, is typically in excess of 25 pages, and has been peer reviewed by NTSC PMS and others.
Miscellaneous Technical Document	number	2.00				0.0			Technical information written in general format; this category to be used when the document is not classified as another type. (e.g., propagation protocols)
Plant Fact Sheets	number	3.00				0.0			Information for a species giving an overview of plant use and characteristics; usually in a 2-page format
Plant Guides	number	6.00				0.0			Detailed information on a plant species and/or release or planting technology; longer than a Plant Fact Sheet
PMC Annual Technical Report	number	20.00				0.0			Technical report which gives details of studies and activities; usually not for general distribution; compiled annually
Scientific Poster	number	2.00				0.0			Technical Information in poster format given at a technical or professional meeting
Progress Report	number	2.00				0.0			Reports compiled to update others on the status of cooperative agreement projects. Does not include annual updates of regular PMC studies.
Published Abstracts	number	1.00				0.0			Abstract or a paper or poster which is published in a program or proceedings of a professional meeting

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Published Symposium Proceedings	number	4.00				0.0			Paper which is published in the proceedings from a technical or professional meeting
Refereed Journal Articles	number	4.00/8.00				0.0			Articles which has had NTSC and peer-review and been published in a professional journal; co-author = 4 pts. and principal author = 8 pts.
Release Brochure	number	2.00				0.0			A brochure or flyer describing the characteristics, uses, establishment and management of a plant release.
Technical Notes	number	6.00				0.0			New or major revision; used to convey technical information; conforms to NRCS or state guidelines for preparing and issuing the information and has had NTSC review.
						0.0	0.0	0.0	
Popular Documents			10.00						
Information Brochures and Flyers	number	3.00				0.0			Information developed by PM staff to promote or explain PM programs or activities. (e.g., general PMC brochure)
Newsletters	number	5.00				0.0			Newsletter-type written materials prepared by the PMC and/or PM Specialist on a regular basis
Plant Materials Progress Report of Activities	number	8.00				0.0			Report giving highlights of some of the studies and activities at the PMC; compiled and distributed widely annually; typically 4-6 pages long.
Popular Journal or Magazine Articles	number	8.00				0.0			Article written by PM staff published in a popular journal or magazine which has not been peer-reviewed
Video/Media Production	number	5.00				0.0			A video, TV, or radio production developed by PM staff or made with major contribution of PM staff.
						0.0	0.0	0.0	

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Training			10.00						
Training Session	number of hours	2.00				0.0	0.0	0.0	Training must be technical in nature, i.e., provide new technical information or update trainees on plant science information in a formal training session. If a session is coordinated by the PMC, then include the total hours for the session. If the session is coordinated by someone else and PMC staff delivers some of the training, include only the amount of PMC presentation time. Preparation time for the presentation is not to be included in the number of hours. If it does not meet these qualifications, then session may be classified as a presentation (state, regional, or national) to get credit under Other Presentations. Tours and general presentations do not qualify as formal training.
Presentations			10.00						
Tour	number	3.00				0.0			Organized tour (minimum of 1.5 hours) to highlight programs, activities, and technology of the PMC or the Plant Materials Program.
Field Day	number	7.00				0.0			A formal, advertised field day, open house, or similar type of event involving a minimum of 20 people and lasting a minimum of 4 hours to highlight programs, activities, and technology of the PMC or the Plant Materials Program.
Presentation-State	number	4.00				0.0			Formal presentations made to groups at a local or statewide meeting, workshop or conference.
Presentation-Regional	number	5.00				0.0			Formal presentations made to groups at a regional meeting, workshop or conference.
Presentation-National	number	5.00				0.0			Formal presentations made to groups at a national (or international) meeting, workshop or conference.
Exhibit Set-Up & Staff	number	2.00				0.0			Setting up an exhibit at a conference or workshop to advertise the programs, activities, or technology of the PMC or the Plant Materials Program.
						0.0	0.0	0.0	

				Your PMC					
Area/ Activity	**Unit of Measure**	**Points per unit**	**Max Points**	Center Data	Specialist Data	Total Points	Adjusted Uncapped Points	Adjusted Capped Points	**Definition**
Other Seed and Plant Production			5.00						
Seed	bulk pounds	0.01				0.0			The total amount of seed produced and processed at the PMC which is not for Release Maintenance production.
Plants or Vegetative Material	each unit	0.001				0.0			The total number of vegetative plant usits produced and processed at the PMC which is not for Release Maintenance production. All units regardless of type have equal weight.
						0.0	0.0	0.0	
							0.0		Total measured product output of the program, no maximum.
								0.0	Score which indicates the balance of the program, maximum score is 100.
	Total Productivity Score = (Uncapped x (Capped/100))							**0**	Indicates the true balance and productivity of the PMC program.

Staff Calculator for the Performance Index

Instructions:
- fill in categories below as requested.
- ALL staff, regardless of funding or employment, should be included.
- Estimate the FTE for seasonal, WAE and volunteer staff

Staff	**FTE (Full Time Equivalent)**
Plant Materials Center	
Manager	
Professioanl Staff/ Assistant Manager	
Technicians	
Secretary/Administrative	
Non-NRCS funded Year-round Staff	
Seasonal/WAE/Student/Temporary Staff	
Volunteers	
Total for PMC FTEs	**0.00**
Plant Materials Specialist	
Total for PMS FTE	**0.00**

James E. "Bud" Smith Plant Materials Center

2009 Progress Report of Activities

3950 FM 1292
Knox City, TX 79529
Phone: 940-658-3526
Fax: 940-658-3095
http://plant-materials.nrcs.usda.gov/txpmc/

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Evaluating Warm Season Grasses for Biofuel

A great deal of emphasis is being placed on finding native plants that can be used in biofuel production. Crops are grown for direct combustion or gasification to generate electricity; ethanol production for transportation fuel; or thermochemical conversion into other by products. Time and frequency of harvest play a major role in biofuels quality.

Preliminary data has shown that from the end of the growing season through the winter there is no statistical difference between harvest dates of the same variety for biomass production. While the yield may not change throughout the winter, the quality of the biomass will. Analysis to date has shown that the biomass looses minerals the longer it remains in the field and is subjected to the elements. A special thank you to Michelle Auger and David Hinojosa for their help with clipping plots and processing plant materials.

Growth Curve Study of Warm Season Forage Grasses Under Low and High Fertility Management

This year we completed a three year study which evaluated different warm season grasses with different fertility levels. Results from this study provide important information to livestock producers and NRCS conservationists when making pasture and grazing management decisions. Warm season grass cultivars investigated in this study can provide the nutritional needs to meet the physiological and performance demands of various classes of beef cattle.

Data showed that 'Selection 75' Kleingrass (*Panicum coloratum*) and San Marcos Germplasm eastern gamagrass (*Tripsacum dactyloides*) provided all the digestibility and crude protein requirements for a 1,200 lb. lactating cow. The two varieties also produced considerable amounts of biomass. A special thank you again to Michelle Auger and David Hinojosa for helping perform forage clippings. For more information, see tech note at http://www.plant-materials.nrcs.usda.gov/pubs/txpmctn9139.pdf

Adaptability of 'Tropic Sun' Sunn Hemp

Our PMC is a participant in a nation wide test to determine the adaptability of sunn hemp as an alternative leguminous cover crop and potential biofuels plant. Sunn hemp is a tropical or sub-tropic plant that can produce from 5,000-6,000 pounds of biomass per acre. It is an annual plant when grown in the continental United States, and can produce 120-140 pounds of nitrogen in 60-90 days. Plants at the PMC averaged 11½ feet tall (under supplemental irrigation) when the growing season was complete. The plots did produce seed pods, but no viable seed was harvested.

New Collections

The PMC is collecting five native, perennial plant species for evaluation for various conservation uses. The species are blue grama (*Bouteloua* gracilis), Indian ricegrass (*Achnatherum* hymenoides), three-flower melicgrass (*Melica nitens)*, vine-mesquite (*Panicum obtusum*), and showy menodora (*Menodora longiflora*). For more information on these plant species, see the website at http://www.tx.nrcs.usda.gov/ technical/pmc and click on James E. "Bud" Smith PMC. These plant species will be evaluated for potential use in conservation practices such as Range Planting, Upland Wildlife Habitat Management, Conservation Cover Riparian Herbaceous Cover, and others. ,

Plant Collection and Equipment Training

The staff at the James E. "Bud" Smith PMC conducted trainings on plant collection and equipment and tillage practices. Forty-seven NRCS employees from throughout Texas traveled to attend the training. Gary Rea opened the day by welcoming everyone and discussing center activities. Brandon Carr gave a presentation explaining different tillage practices and different types of equipment used on farms, ranches, and in urban areas. Dale Carroll

followed the equipment presentation with a tour of the equipment used here at the center. He discussed the differences in size compared to a normal farming and ranching operation. He also showed how the equipment at the center was modified to meet the research needs of the center. After a brief break for lunch, Rob Ziehr discussed the history of the center and explained the importance of plant collections from Field Office staff. Rudy Esquivel gave a presentation on how to determine seed maturity, and how to make a successful seed and vegetative plant material collection. Following the presentations, the group participated in a tour of the center which highlighted research tests and PMC plant productions. The day provided NRCS Field Office employees the opportunity to meet one another and discuss ways we could work together to facilitate the needs of our customers and the public.

Prescribed Burn Training

On August 12th and 13th, the PMC hosted a prescribed burning training course. Lem Creswell coordinated the training which provided initial and continual credits for thirty NRCS employees. Attendees were educated on the laws and procedures for conducting safe and beneficial burns for customers.

Seed Production

The PMC is responsible for producing breeder, foundation, and germplasm select seed which is sold by the Texas Foundation Seed Service to area seed companies. Currently, the PMC supplies the seed service with twelve releases. A full list can be obtained from their website at http://tfss.tamu.edu or by calling them at (940) 552-6226. The PMC also maintains another seventeen releases by storage and breeder blocks. These releases include grasses, legumes, forbs, and woody plants. A complete list of plant releases can be found at our website at http://Plant-Materials.nrcs.usda.gov/txpmc/.

New Soil Conservationist Added to the USDA-NRCS James E. "Bud" Smith Plant Materials Center

Brandon Carr has been selected to join the staff as a Soil Conservationist at the USDA Natural Resources Conservation Service's James E. "Bud" Smith Plant Material Center (PMC). Brandon graduated from Petersburg, TX in 1997. He received a BS degree in Environmental Science with an emphasis in Agriculture and a BS degree in Plant Science with an emphasis in Integrated Pest Management. Both degrees were received from Lubbock Christian University in 2002. Brandon has six years of experience as an assistant cotton breeder. He resides in Haskell, TX with his wife and new baby girl.

Program Emphasis

The mission of the James E. “Bud” Smith PMC is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The PMC conducts plantings and studies at the Center and off center with cooperating partners. Plant and technology development objectives of the PMC include:

- Erosion Control - wind and water
- Range and Pasture Improvement
- Wildlife Habitat Improvement
- Water Quality Improvement on Agricultural Land
- Biofuels
- Saline Site Restoration

James E. “Bud” Smith Plant Materials Center

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) James E. “Bud” Smith Plant Materials Center (PMC) located near Knox City, Texas, was establish in 1965. It is one of the 27 Centers located throughout the United States. The Center is responsible for developing conservation plants and cultural techniques for use within targeted Major Land Resource Areas (MLRA) in Texas, Oklahoma, Kansas, Colorado, and New Mexico. The Center is also responsible for producing Breeder and Foundation seed of plant releases and assisting in commercial development and promoting their use in natural resource conservation. The PMC serves all or portions of 136 counties in Texas that comprises parts of 25 MLRAs, and the areas served in all or portions of 39 counties in southwestern Oklahoma comprising parts of thirteen MLRAs. The PMC also serves a portion of seven counties in southwestern Kansas including parts of four MLRAs, a portion of one county in the southeastern corner of Colorado comprising parts of three MLRAs, and a portion of seven counties in eastern New Mexico comprising parts of seven MLRAs. The PMC is located approximately four and a half miles northwest of Knox City, Texas, in the Rolling Red Plains MLRA.

James E. “Bud” Smith PMC Personnel

- Dr. Gary Rea- Manager
- Rudy G. Esquivel- Soil Conservationist
- Brandon Carr- Soil Conservationist
- Billy (Dale) Carroll- Biological Science Technician (Plants)
- Mark S. Bennett- Biological Science Aid (part-time, summer only)

Visit the PMC website for more information and publications:
http://Plant-Materials.nrcs.usda.gov/txpmc/

542.0 Acronyms Found in the NPMM

Acronym	Meaning
AC	Area Conservationist
AgNIC	Agriculture Network Information Center
AGRICOLA	AGRICultural Online Access
AMS	Agriculture Marketing Services
AOSCA	Association of Official Seed Certifying Agencies
APHIS	Agricultural and Plant Health Inspections Service
APO	Annual Plan of Operations (now referred to as 'Business Plan')
ARS	Agricultural Research Service
ATR	Annual Technical Report
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFT	Conservation Field Trials
CPAIS	Corporate Property Automated Information System
CRIS	Current Research Information System
CRA	Common Resource Area
CRP	Conservation Reserve Program
CSP	Conservation Security Program
D&D	Distribution and Delivery
DC	District Conservationist
EEO	Equal Employment Opportunity
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program

Acronym	Meaning
ESCOP	Experiment Station Committee on Organization and Policy
FAR	Federal Acquisition Regulations
FEP	Federal Employee Program
FEP	Field Evaluation Planting
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FO	Field Office
FOTG	Field Office Technical Guides
FTTA	Federal Technology Transfer Act
GRIN	Germplasm Resources Information Network
GS	General Schedule
HWM	Hazardous Waste Management
ICST	Intercenter Strain Trials
IRM	Information Resources Management
IRT	Interdisciplinary Resource Team
IT	Information Technology
KSA	Knowledge, Skills, and Abilities
LRP	Long Range Plan
MLRA	Major Land Resource Areas
NACD	National Association of Conservation Districts
NAL	National Agricultural Library
NCP	National Conservation Program
NEDC	National Employee Development Center
NEPA	National Environmental Policy Act
NHQ	National Headquarters
NPGS	National Plant Germplasm System

Acronym	Meaning
NPJ	Native Plants Journal
NPL	National Program Leader, Plant Materials
NPGRC	National Plant Genetic Resources Center
NPMC	National Plant Materials Center
NPMM	National Plant Materials Manual
NPMS	National Plant Materials Specialist (now referred to as NPL)
NRCS	Natural Resources Conservation Service
NSSL	National Seed Storage Laboratory (now the NPGRC)
NTSC	National Technology Support Center
OGC	Office of General Council
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
OTT	Office of Technology Transfer
PAS	Public Affairs Specialist
PCB	Polychlorinated Biphenyls
PI	Plant Introduction
PLANTS	Plant List of Accepted Nomenclature, Taxonomy and Symbols
PM	Plant Materials
PMAAA	Plant Materials Annual Activities and Accomplishments
PMC	Plant Materials Center
PMCM	Plant Materials Center Manager
PMP	Plant Materials Program
PMS	Plant Materials Specialist
PO	Plan of Operations (now referred to as 'Business Plan')
POMS	Plant Materials Operations and Management System

Acronym	Meaning
PRP	Potentially Responsible Party
PRS	Performance Reporting System
PVP	Plant Variety Protection
PVPA	Plant Variety Protection Act
RC	Regional Conservationist
RC&D	Resource Conservation and Development
RCRA	Resource Conservation and Recovery Act
RFO	Responsible Federal Officer
SCS	Soil Conservation Service (now called the NRCS)
SO	State Office
SRC	State Resource Conservationist
STC	State Conservationist
SWAPA	Soil, Water, Air, Plant and Animals
SWCD	Soil Water Conservation District
TSCA	Toxic Substances Control Act
USDA	United States Department of Agriculture
WHIP	Wildlife Habitat Incentive Program
WRP	Wetlands Reserve Program

GLOSSARY OF TERMS FOR USE IN PLANT MATERIALS

Abiotic – Non-living components of an ecosystem; basic elements and compounds of the environment.

Absorption – The process by which a solution passes from one system to another.

Accession – Plant material (plant, seed, or vegetative part) collected and assigned a number to maintain its identity during evaluation, increase, and storage.

> **9 million numbers –** NRCS numbers used to identify plant accessions; i.e., 9056783
>
> **900 numbers –** NRCS numbers used to identify plant accessions, now referred to as 9 million numbers; i.e., 9056783

Achene – Small, dry, one-seeded fruit.

Acid equivalent - The theoretical yield of parent acid from an active ingredient.

Acid mine drainage - Water mixed with sulfuric acid and having a pH of less than 6.0. This mixture can be discharging from an active mine or abandoned mine. Ore or other minerals containing sulfides (iron pyrite) oxidate (when exposed to water, air, or other weathering processes) and form sulfuric acid. The sulfuric acid mixes with water and flows out of the mine into surrounding areas as acid mine drainage.

Acid spoil/waste - Spoil material containing sufficient pyrite so that weathering produces acid water, and the pH of the soil determined by standard methods of soil analysis is between 4.0 and 6.9.

Acid soil – Soil that has a pH below 6.6.

Acid tolerance – Ability of a plant to tolerate acid soil.

Active ingredient - The chemical compound in a product that is responsible for the chemical (i.e., herbicidal) affect.

Acuminate – Having a leaf tip whose sides are concave and tapering to an elongated point.

Acute – Leaf shape having margins tapered to a point.

Ad libitum feeding - Daily feed offerings that allow free-will consumption, generally fed to have a daily excess of 15% of feed remaining.

Adsorption – The process by which an ion in a solution bonds to a charged surface.

Advanced evaluation - The more intensive testing of plants that have been selected as being superior in one or more attributes to the initial evaluation.

Adventitious bud – A bud that develops at the base of a needle cluster on a root or on a woody tissue on a branch or leader, when the end of the branch or leader is injured or cut off.

Aftermath – Crop residue and/or regrowth of forage crops, including growth of volunteer plants, used for grazing after a machine harvest.

Age-class – A descriptive term to indicate the relative age of plants.

Aggressiveness - Seedling vigor related to ease of establishment. Also, capacity of well-established plants to compete with or out-compete associated grasses, legumes, or woody species.

Air-dry weight – The weight of a substance, usually vegetation, after it has been allowed to dry to equilibrium with the atmosphere, usually without artificial heat.

Alien species - A species introduced and occurring in locations beyond its known historical range. This includes introductions from other continents, bioregions, and also those not native to the local geographic region. Executive Order (E.O.), Invasive Species, February 3, 1999, more narrowly defines an alien species and ties the definition to an occurrence outside a native.

Alkaline soil – A soil that has a pH above 7.3.

Alkaloids – Bitter tasting organic compounds of plant origin that have alkaline properties and a complex molecular structure containing nitrogen. They reduce dry matter intake and interfere with digestion of grazing animals.

Allele - One member of a pair or series of genes occupying a specific position (locus) in a specific chromosome; one of the alternative forms of a gene. Normally an individual has only two alleles for any trait - one gene derived from its male parent, the other from its female parent.

Allelopathy – Chemical inhibition of one organism by another.

Allopolyploid - A polyploid containing genetically different sets of chromosomes; for example, sets from two or more species.

Alternate – Bud or leaf arrangement (singly) along a stem at spiraled intervals.

Alternate grazing - Repeated grazing and resting of two or more pastures in succession.

Amphidiploid - A polyploid whose chromosome compliment is made up of the entire somatic complements of two species.

Aneuploid - An organism whose somatic number is not an even multiple of the haploid number.

Angle of repose – The greatest angle to the horizontal that any loose or fragmented solid material will stand without sliding or come to rest when poured or dumped in a pile or on a slope.

Animal day - One day's tenure upon a pasture by one animal. Not synonymous with animal unit day.

Animal unit (AU) - One mature, non-lactating cow weighing 1,100 pounds and fed at the maintenance level, or the equivalent, expressed as $(\text{body weight})^{0.75}$; in other kinds or classes of animals, based on the average daily consumption of 25 pounds dry matter per day. The AU is often used by public land management agencies when referring to a 1,100 lb cow with calf, 1.4 yearling cattle, or 5 dry ewes.

Animal unit day (AUD) - The forage required to feed an AU for one day. Generally considered to be about 25 pounds of forage dry matter. A lactating cow with calf would need about 33 pounds forage dry matter per day.

Animal unit equivalent (AUE) – The amount of forage consumed by the different kind and class of animals expresses as a portion of an AU.

Domestic Animal Kind-Class	AUE	Wildlife Animal Kind-Class	AUE
Cow – dry	1.00	Antelope	0.10
Cow with calf	1.00	Bison	1.00
Bull – mature	1.25	Deer – whitetail	0.13
Calf – weaned	0.60	Deer – mule	0.17
Steer/Heifer - 2 years	0.80	Elk	0.48
Sheep – mature ewe or ram	0.20	Goat – mountain	0.14
Sheep – yearling	0.15	Moose	0.83
Goat	0.17	Sheep – bighorn (ewe)	0.14
Horse – mature	1.25- 2.00	Sheep – bighorn (ram)	0.18

Animal unit month (AUM) - The forage required to feed an AU for one month (30 days). Not synonymous with animal month. The term AUM is commonly used in three ways: (a) stocking rate, as in "X acres per AUM;" (b) forage allocations, as in "X AUMs in Allotment A;" and (c) utilization, as in "X AUMs taken from Unit B."

Annual plant - A plant that completes its life cycle from seed in a single year or growing season.

Annual ring – The growth layer of one year, as viewed on the cross section of a stem, branches, or roots.

Anther – The pollen containing part of a stamen.

Apical dominance – Domination and control of meristematic leaves or buds located on the lower stem, roots, or rhizomes by hormones produced by apical meristem located on the tips and upper branches of plants, particularly woody plants.

Apiculate – Ending abruptly in a short pointed leaf tip.

Apomixis - Reproduction in which sexual organs or related structures take part but fertilization does not occur, so that the resulting seed is vegetatively reproduced. Only a single parent contributes genes to the offspring.

Apparent trend - An interpretation of a trend based on a single observation. Apparent trend is described in the same terms as measured trend except that when no trend is apparent, it shall be described as "not apparent." See “Trend.”

Appressed – Lying close and flattened against.

Approximate Original Contour - Backfilling and grading previously mined areas so that the mined area resembles the general surface configuration of the land and surrounding area prior to mining.

Arcuate venation – To arch or curve like veins in dogwood (*Cornus*).

Ascending – Rising somewhat obliquely and curving upward.

Aspect – The predominate direction (north, south, east, west) of slope of the land.

Assembly - A systematic collection of plants (seed or vegetative material) of one or more species to be evaluated for a planned purpose.

Astringent – Pungent, strong odor or taste.

Autecology – A subdivision of ecology that deals with the relationship of individuals of a species to their environment.

Autopolyploid - A polyploid arising through multiplication of the complete haploid set of one species.

Autotoxicity – A specific type of allelopathy where the presence of adult plants of a species interferes with the germination and development of seedlings from that species.

Auxin – A plant hormone promoting or regulating growth.

Available forage - That portion of the forage, expressed as weight of forage per unit land area, accessible for consumption by a specified kind, class, sex, age, size, and physiological status of a grazing animal. Calculated as: (lbs DM/paddock) = total forage (lbs DM/A) * paddock area (A/paddock) * desired utilization (%).

Available soil water - The portion of water in a soil that can be absorbed by plant roots.

Awl-shaped – Oval shaped, with a sharp pointed end (e.g., juniper leaves).

Axillary – Pertaining to the area where the leaf petiole and stem are connected (the axil).

Backcross - The crossing of a hybrid with either of its parents. In genetics, the crossing of a heterozygote with a homozygous recessive.

Band-seeding - The placement of seed in rows directly above, but not in contact with, a band of fertilizer.

Band treatment - An application to a continuous restricted area such as in or along a crop row, rather than over the entire field area.

Bare ground – All land surface not covered by vegetation, rock, litter, or crytogam.

Bare-root - A plant harvested from a field without any soil on its roots.

Basal area – The cross sectional area of the stem, or stems of a plant, or of all plants in a stand. Herbaceous and small woody plants are measured at or near ground level; larger woody plants are measured at breast or other designated height.

Basal treatment - Herbicide applied to the stems of woody plants at or just above the ground.

Biennial - A plant that completes its life cycle in 2 years. The first year it produces leaves and stores food. The second year it produces fruits and seed.

Biodiversity – (1) The total variability within and among species of living organisms and the ecological complexes that they inhabit. Biodiversity has three levels - ecosystem, species, and genetic diversity - reflected in the number of different species, the different combination of species, and the different combinations of genes within each species. (2) The totality of genes, species, and ecosystems in a region or the world.

Bioengineering – See soil bioengineering.

Biological control – The use of organisms or viruses to control parasites, weeds, or other pests.

Biomass – The total amount of living plants and animals above/or below ground in an area at a given time.

Biotype - A group of individuals within a population occurring in nature, all with essentially the same genetic constitution. A species usually consists of many biotypes. See also "ecotype."

Bipinnate – Twice pinnate (as in honey locust leaves).

Blade – The broad, flat, green part of the leaf.

Blend - A mixture of seed of known proportions of two or more lots or variation of the same species.

Blind cultivation - Cultivating before a seeded or planted crop emerges.

Bloat - Excessive accumulation of gases in the rumen of animals because loss through the esophagus is impaired, causing distension of the rumen.

Bole – The main trunk of a tree.

Boot stage – Growth stage when the sheath of the upper most leaf encloses a grass reproductive seedhead.

Botanical variety - The botanical nomenclature division consisting of more or less recognizable entities within species that are not genetically isolated from each other, below the level of subspecies, and is indicated by the abbreviation "var." in the scientific name. Usage: the abbreviation in roman type; the name in italics; no capitals. See also "variety."

Bract – A modified leaf from the axil of which a flower or flower cluster arises.

Branching density – The amount of branching per unit area often described in percentage.

Branching pattern – The pattern secondary woody limbs and stems grow from the main trunk or stem of a tree or shrub.

Breeder seed - Seed or vegetative propagating material which is directly controlled by the originating or, in some cases, the sponsoring plant breeder, institution, or firm, and which supplies the source for initial and recurring increase of foundation seed. See seed certification classes.

Breeder's rights - The assurance that the owner of a crop variety has exclusive control over the increase, distribution, and merchandising of a variety. The protection may be afforded by legislation and regulatory control by agreement among individuals

concerned, or by biological factors inherent in the variety. The breeder is assured that his/her authorization must be obtained before the variety can be reproduced or sold by anyone else. See “Plant Variety Protection Act."

Breeding system - A system of usage to select or modify a plant to yield new progeny with desired characteristics.

Broadcast seeding – Process of scattering seed on the soil surface prior to natural or artificial means of covering seed with soil.

Browse – That part of leaf and twig growth of shrubs, woody vines, and trees available for forage consumption.

Browseline – The uppermost limit on trees and tall shrubs to which livestock and/or wildlife graze.

Brush – Various species of shrubs or small trees usually considered undesirable for livestock or timber management. The same species may have value for browse, wildlife habitat, or watershed protection.

Brush layering – A soil bioengineering terracing technique using unrooted willow cuttings placed in layers with the ends buried going up the slope. These willow cuttings will sprout branches and roots to help stabilize the slope or bank. The technique can be used for upland or streambank erosion control.

Brush mattress – A soil bioengineering technique that uses a wall or mat of willow cuttings placed vertically up the slope of an eroding bank. This mat will sprout branches and roots to help stabilize the bank. This technique is equal to rock riprap in terms of streambank protection.

Brush trench – A soil bioengineering technique using unrooted branches of willows and other woody material buried upright in a trench placed along the top of an eroding bank. The willow cuttings will sprout branches and roots to help decrease rill, gully, and concentrated flow erosion.

Bunchgrass – A grass so-called because of its characteristic growth habit of forming a bunch.

Business Plan - A document to indicate how the PMC resources are to be used and action items to be completed. It should be brief, flexible, realistic, and open-ended. It should be consistent with NRCS guidelines.

Buttressed – Broadened base or arched root flare of the tree trunk.

C-3 plants - Species having a photosynthetic pathway that results in 3-carbon compounds as initial products of photosynthesis. Includes most legumes, forbs, and cool

season grasses, as well as most trees and shrubs. Usually significantly less efficient users of soil and water nitrogen than are C-4 plants. Optimum temperature for photosynthesis and growth is 18 to 25° Celsius (64 to 77° Fahrenheit). See also "photosynthesis."

C-4 plants - Species having a photosynthetic pathway which results in 4-carbon compounds as initial products of photosynthesis. Includes most warm season grasses, tropical grasses, a few forbs, and at least one shrub. Usually significantly more efficient users of soil nitrogen and water than are C-3 plants. Total biomass production is generally substantially greater than plants with other photosynthetic pathways. Optimum temperature for photosynthesis and growth is in the range of 27 to 35° Celsius (84 to 100° Fahrenheit). See also "photosynthesis."

Cactus – A spiny, succulent plant of the Cactaceae family.

Calcareous soil – Soil containing sufficient free calcium carbonate (lime) or calcium magnesium carbonate (dolomite) to effervesce visibly when treated with cold 0.1 M HCl in water. Excess level may affect plant growth and/or which plants may grow.

Calyx – Outermost whorl of modified leaves in a flower, usually green, but sometimes showy colors.

CAM plants - Abbreviation for "Crassulacean Acid Metabolism." Species whose photosynthetic pathway primarily involves fixation of carbon dioxide during the dark period. Includes desert succulent plants such as cactus. Under good moisture and temperature conditions, carbon fixation may occur in the light via either C-3 or C-4 pathways. Generally the least productive of the three photosynthetic pathways. See also "photosynthesis."

Cambium – The layer of cells between the inner bark and wood of a tree or shrub where cell division takes place.

Candle – The new bright green and tender shoot growth all conifers produce in the spring.

Canopy – The vertical projection downward of the aerial portion of vegetation, usually expressed as a percent of the ground so occupied. A generic term referring to the aerial portion of vegetation.

Canopy cover – The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included.

Capsule – A fruit structure consisting of two or more chambers.

Carbohydrates, nonstructural - Products of photosynthesis in the plant in the form of solute or stored material as in sugars, starch, fructosans, and hemicellulose. These

function as readily metabolizeable compounds and excludes structural compounds such as cellulose, lignin.

Carrier - A liquid or solid material added to a chemical compound or seed to facilitate its application in the field.

Carrying capacity - The maximum stocking rate that will achieve a target level of animal performance, in a specified grazing method, that can be applied over a defined time period without deterioration of the ecosystem. (See seasonal carrying capacity.)

Catkin – A scaly-bracted spike of unisexual flowers.

Center of diversity - The geographic region in which the greatest variability of a species occurs. A primary center of diversity is the region of true origin and secondary centers of diversity are regions of subsequent spread of a species.

Center of origin - The geographic region containing a concentration of genetic diversity of one or more species; also called a gene center.

Certified seed - The progeny of Breeder, Foundation, or Registered seed that is handled to maintain satisfactory genetic identity and purity, and that has been approved and certified by the certifying agency. Certified tree seed is defined as seed from trees of proven genetic superiority, as defined by the certifying agency, produced to ensure genetic identity. See also "seed certification classes."

Chaining (Cabling) - The use of a large cable or chain pulled between two large tractors (usually crawler tractors) to pull down or uproot brush. Chaining uses a large ship anchor chain, with each chain link weighing 80 to 100 pounds.

Chasmogamous – Plant type in which the perianth of flowers opens for pollination to occur. See also "cleistogamous."

Chlorosis – A leaf symptom due to mineral deficiencies where the leaf will remain green next to the veins and become yellow from the margins inward.

Chlorophyll – The green photosynthetic substance in plants which allows the capture of solar energy.

Ciliate – Fringed with hairs on the margin.

Cleistogamous – Plant type in which flowers self-pollinate inside the closed buds.

Climax (climax plant community) – (1) The final or stable biotic community in a successional series that is self-perpetuating and in dynamic equilibrium with the physical habitat; (2) the assumed end in succession. See also "historic climax plant community."

Cline – A gradual morphological or physiological change in a group of related organisms across their range, usually associated with environmental or geographic transition.

Clone - A group of genetically identical plants produced by vegetatively propagating a single plant over one or more vegetative generations.

Clump planting – A soil bioengineering technique commonly using large equipment to dig and transplant both root clump and top growth of willow and other live woody plants from one location to another to protect an eroding bank.

Cold stratification – Keeping seed in a cool, moist environment for a period of time to simulate over-wintering, thereby reducing dormancy and increasing seed germination.

Combining ability – In general, the average performance of a strain in a series of crosses. More specifically, deviation from performance predicted on the basis of general combining ability.

Commercial seed - Seed produced by commercial industry; may or may not be recognized as improved varieties of seed.

Common seed - Non-certified seed. Such seed may be a named variety but are not grown under the certification program. Also, a term applied to seed that cannot be identified as to variety; sometimes used to denote local strains resulting from natural selection.

Community (plant community) - An assemblage of one or more populations of plants and/or animals in a common spatial arrangement. An assemblage of plants occurring together at any point in time, while denoting no particular ecological status. A unit of vegetation.

Community type - An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. A unit of vegetation within a classification.

Companion crop - A crop sown along with another crop; used particularly for small grain with which a forage crop is sown. Companion crop is preferred to the term “nurse crop.”

Compatible - Compounds or formulations that can be mixed and applied together without undesirably altering their separate effects. This term can be applied also to species mixtures.

Competition – A process of struggling between organisms of the same species (intraspecific) or different species (interspecific) for light, water, essential elements, or space within a trophic level, resulting in a shortage of essential needs for some individuals or groups.

Composite - The combining of genetic material from several sources. This is one of the alternatives of the mass selection technique and should not be confused with a polycross. See also "mass selection" and "polycross."

Compound – A leaf that is made up of more than one leaf blade, termed leaflets.

Concentration - The amount of active ingredient or acid equivalent in a given volume of liquid or in a given weight of dry material.

Conical – Cone shaped.

Conifer – A tree belonging to the order *Coniferales*, which is usually evergreen, cone-bearing and with needle, awl, or scale-like leaves such as pine, spruce, fir, and cedar. Often referred to as "softwood."

Coniferous – Cone bearing trees and shrubs.

Conservation District – A public organization created under State-enabling law as a special purpose district to develop and carry out a program of soil, water, and related resource conservation, uses, and development within its boundaries. Often called Soil Conservation District, Soil and Water Conservation District, or Resource Conservation District.

Conservation Field Trial - Identified in General Manual 450-403 as a tool for evaluating new technology, species, or plant releases that address local soil and water resource problems; type of study used by many disciplines; in the Plant Materials Program (PMP) may be used to develop new technology, evaluate releases, and promote plant materials (PM) products; typically coordinated by the Plant Materials Specialist (PMS); qualitative or quantitative data may be collected.

Constructed wetland system – A series of wetland cells designed and constructed to remove pollutants such as sediment and nutrients from surface water using wetland plants. Cells may include a sediment basin, primary vegetative filter, shallow wetland, deep-water pond, and/or vegetative polishing filter.

Contact herbicide - A herbicide that kills a plant primarily by contact with plant tissue rather than by translocation.

Containerized stock - Plant materials grown in containers.

Continuous grazing - Commonly used as the unrestricted grazing of an entire grazing unit throughout a large portion of the growing season – not desirable. However, since no animal grazes continuously, a better term is **continuous stocking.**

Convex – Curved like the outer surface of a sphere.

Cool-season plant - A plant that makes its major growth during the cool part of the year, mainly in spring but in some localities in the fall or winter (C-3 plant). They have temperature optimums of 59 to 77°F (15 to 25°C), and exhibit C_3 photosynthesis.

Cooperative Agreement - A written document evidencing the intent of two or more parties to cooperate in an undertaking that will result in mutual benefit to the parties concerned. The parties work jointly in the undertaking – not each working within its own sphere of work and authority as under a memorandum of understanding relationship. The cooperative agreement is a fiscal document, and the period of time covered must not exceed the period for which funds are available for obligation.

Coppice – To regrowth wholly or mainly from sprouts.

Corymb – Flat-topped or convex flower cluster, outer flowers opening first.

Cover crop – Close-growing crop grown primarily for the purpose of protecting and improving soil between periods of regular crop production.

Cover type - The existing vegetation of an area.

Crenate – Toothed with round, shallow teeth.

Critical area – (1) An area to be treated with special consideration because of inherent site factors both physical and chemical, size, location, condition, values, or significant potential conflicts among uses. (2) A severely eroded sediment producing area that requires special management to establish and maintain vegetation in order to stabilize soil conditions.

Cross pollination - The transfer of pollen from one flower (artificially or naturally) to the stigma of another; may occur on the same plants or on different plants, depending on the species and other conditions.

Crossing-over - The exchange of corresponding segments between chromatids of homologous chromosomes during meiotic prophase. The genetic consequence is the recombination of linked genes.

Crown – The branches and foliage of a tree, the upper portion of a tree; the base of stems where roots attach.

Crown Cover – The canopy of green leaves and branches formed by the crowns of all trees present in a forest.

Crude fiber (CF) – Fiber made up primarily of plant structural carbohydrates, such as cellulose and hemicellulose, but also contains some lignin.

Crude protein (CP) - Total protein in a feed. To calculate the protein percentage, a feed is first chemically analyzed for nitrogen content. Since proteins average approximately 16 percent nitrogen, the percentage of nitrogen in the analysis is multiplied by 6.25 to give the percent CP.

Cryptogam – A plant in any of the groups Thallophytes, Byophytes, Pteridiophytes – mosses, lichens, and ferns.

Culm – The stem of a grass that has elongated internodes between nodes (joints).

Culmless – A vegetative tiller of some grasses that holds its growing point close to the ground by not elongating internodes until it is ready to initiate reproductive growth.

Cultivar - The international term cultivar denotes an assemblage of cultivated plants that is clearly distinguished by any characters (morphological, physiological, cytological, chemical, or others) and when reproduced (sexually or asexually), retains its distinguishing characters. The term is derived from "cultivated variety," or their etymological equivalents in other languages. For cultivated plants**,** the term cultivar is the equivalent of a botanical variety, in accordance with the International Code of Nomenclature of Cultivated Plants 1980. Usage: cultivar names are not italicized and are indicated by single quotes at first use, or the word cultivar (but not both). The abbreviation cv. is properly used only with a binomial name: Genus species cv. cultivar name. Omit the abbreviation if single quotes are used: Genus species 'cultivar name.'

Cultural evaluation - Studies designed to obtain information regarding the establishment, management, and production of plant materials. They may be conducted on or off the Center at any stage of the evaluation process.

Cultural practices – The practices commonly performed to prepare a site for seeding or planting.

Cuneate – Wedge shaped.

Cured forage – Forage, either standing or harvested, that has been naturally or artificially dried and preserved for future use.

Cutting – A soil bioengineering technique using unrooted branches from 18-70 inches (or longer) long of live willow, cottonwood, dogwood, or other species. These cuttings are placed into the soil, resulting in sprouting and rooting of the material to stabilize a bank.

Cyme – Flat-topped flower cluster; central flower opens first.

Damping off – The rapid rotting of seed or seedlings before they emerge from the soil, or the rapid rotting of the stem bases and toppling of seedlings after emergence.

DBH – Abbreviation of diameter-at-breast-height, a common tree measurement.

Deciduous – A plant whose parts, particularly leaves, are shed at regular intervals or a given stage of development.

Decurrent – Spreading branches, lacking a central leader.

Deferred grazing - The delay of livestock grazing on an area for an adequate period of time to provide for plant reproduction, establishment of new plants, or restoration of vigor.

Defoliation – The removal of plant leaves, i.e., by grazing or browsing, cutting, chemical defoliant, or natural phenomena such as hail, fire, or frost.

Defoliant - A compound that causes the leaves or foliage to drop from a plant.

Dehiscent – Splitting open along a seed capsule or pod to emit individual seeds.

Demonstration planting - A planting used primarily to promote use and acceptance of new technology or releases; commonly no evaluations are completed and no data is collected.

Dentate – Teeth along leaf margins are pointed outward.

Den tree – A hollow tree used as a home by a mammal.

Deposition tolerance – A plant's ability to tolerate burying by soil, commonly silt via flooding or sand via wind deposition.

Desertification - The process by which an area or region becomes more arid through loss of soil and vegetative cover. The process is often accelerated by excessive, continuous overstocking and drought.

Desiccant - A compound that promotes dehydration or removal of moisture from plant tissue.

Desired plant community - A plant community which produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the minimum quality criteria for the soil, water, air, plant, and animal resources, and the land use plan/activity plan objectives established for an ecological site(s). The desired plant community must be consistent with the site's capability to produce the desired vegetation through management, land treatment, or a combination of the two.

Dicotyledon (dicot) – A member of the *Dicotyledonae*; one of two classes of angiosperms usually characterized by the following: two seed leaves (cotyledons), leaves with net venation.

Dieback – The progressive dying, from tip downward, of twigs, branches, or tops.

Digestible dry matter (DDM) - Estimates the percentage of forage that is digestible. It is calculated from acid detergent fiber (ADF) values and is similar to total digestible nutrient (TDN). The more ADF a feed contains, the lower the DDM value will be. DDM values are calculated using the equation DDM% = 88.9 – (ADF% x 0.779).

Diluent - Any liquid or solid material serving to dilute an active ingredient in the preparation of a formulation.

Dioecious - Having staminate and pistillate flowers occurring on different plants that have distinct male and female plants (e.g., buffalograss). Male and female flowers on separate plants.

Diploid - Having two chromosomes of each kind. Having the basic chromosome number doubled.

Direct application - Method of applying chemicals or fertilizers directly to a restricted area, such as a row or a bed, at the base of plants.

District Seed Increase (DSI) – Providing Plant Material Center (PMC) foundation seed through a conservation district to a district cooperator for the increase of that seed. Commonly used for new releases to speed the availability of seed on the commercial market.

Disturbed area - An area that has been disturbed by mining or other activities. This includes the area from which overburden, vegetation, topsoil, tailings, waste materials, minerals, or coal have been removed and placed. It also includes tailings ponds, waste dumps, roads, conveyor systems, leach dumps and all similar excavations or coverings that have resulted from mining operations.

Diversity - The distribution and abundance of different plants and animal communities within an area. Also a measure of the number of species and their relative abundance within a given association of organisms. Areas of high diversity are characterized by a great variety of species; usually relatively few individuals represent any one species. Areas with low diversity are characterized by a few species; often relatively large numbers of individuals represent each species.

Dominant vegetation – Plant species or species groups that, by means of their number, coverage, or size, have considerable influence or control upon the conditions of an existence of associated species.

Dormancy – (1) An internal condition of the chemistry or stage of development of a viable seed that prevents its germination, although temperature and moisture are adequate for growth; (2) A living plant that is not actively growing aerial shoots.

Dormant seeding - Planting seed during late fall or early winter after temperatures become too low so that seed germination occurs the following spring.

Doubly serrate – Many large and small serrations along the leaf margin.

Drift – Vegetative material moved and deposited by wind and water.

Drill seeding – Planting directly into the soil with a machine in rows, spacing is usually 6 to 48 inches apart. cf. *broadcast seeding*.

Drought - A period of dryness causing extensive damage to plant production.

Drought tolerance – The ability of a plant to withstand lack of rainfall for a portion of the year or for extended periods, sometimes multiple years.

Drupe – Fleshy fruit with a pit or stone.

Dry matter (DM) - That part of feed which is not water. Percent DM = 100% - moisture %. Feed values and nutrient requirements for ruminants are expressed on a dry matter or moisture-free basis to compensate for the large variation in moisture content of feeds commonly fed to cattle. To convert "as fed" nutrient values to a dry matter basis, simply divide the "as fed" nutrient value by the percent dry matter and multiply by 100.

Dry matter intake (DMI) - Estimates the maximum amount of forage dry matter a cow will eat. It is expressed as a percent of body weight and is calculated from neutral detergent fiber (NDF) by: DMI (% of body weight) = 120/NDF%.

Early head – Flower head (seedhead) of a grass is emerging or emerged from the flag leaf sheath, but not shedding pollen.

Ecesis - Establishment and development of a plant in the plant community.

Ecocline - Series of biotypes within a species that shows a genetic gradient correlated with a gradual environmental gradient.

Ecological niche - Role of an organism in an ecological system. Includes the physical space in a habitat occupied by an organism; its functional role in the community (e.g., its trophic position); and its position in environmental gradients of temperature, moisture, pH, soil, and other conditions of existence.

Ecological optimum - The most favorable conditions in the environment for the growth and reproduction of an organism.

Ecological race - Group of local populations within a species in which individuals have similar environmental tolerances. Wide-ranging species may consist of many ecological races.

Ecological response unit - A unit of land that is homogeneous in character such that similar units will respond in the same way to disturbance or manipulation. Synonyms: ecological site, ecological type.

Ecological site - A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in ability to produce vegetation and to respond to management. Synonyms: ecological type, ecological response unit.

Ecological status - (1) The present state of vegetation and soil protection of an ecological site in relation to the potential natural community for the site. Vegetation status is the expression of the relative degree of which the kinds, proportions, and amounts of plants in a community resemble that of the potential natural community. If classes or ratings are used, they should be described in ecological rather than utilization terms. For example, some agencies are utilizing four classes of ecological status ratings (early seral, midseral, late-seral, potential natural community) of vegetation corresponding to 0-25%, 26-50%, 51-75%, and 76-100% of the potential natural community standard. Soil status is a measure of present vegetation and litter cover relative to the amount of cover needed on the site to prevent accelerated erosion. This term is not used by all agencies. (2) The present state of vegetation and soil protection of an ecological site in relation to the historic climax plant community for the site. Vegetation status is the expression of the relative degree of which the kinds, proportions, and amounts of plants in a community resemble that of the historic climax plant community. If classes or ratings are used, they should be described in ecological rather than utilization terms.

Ecological system - See "ecosystem."

Ecological type - A land classification category that is more specific than a phase of a habitat type. Ecological types are commonly used to differentiate habitat phases into categories of land, which differ in their ability to produce vegetation or their response to management. Synonyms: ecological response unit, ecological site.

Ecophene - Plants differing in appearance, especially in the size of vegetative parts, numbers of stems, erectness, and reproductive vigor but belonging to essentially homogeneous genetic stock. Their distinctness is due entirely to environmental influences, for when different ecophenes are transplanted into the same habitat these differences disappear.

Ecosystem – (1) Energy-driven complex of one or more organisms and their environment. (2) Organisms, together with their abiotic environment, forming an interacting system, inhabiting an identifiable space. (3) The whole system, in the sense of physics, including not only the organism complex but also the whole complex of physical factors, forming what we call the environment. (4) The complex of living and nonliving components in a specified location that comprise a stable system in which the exchange of material follows a circular path such as a biome. (5) A community of organisms and the environment in which they live. (6) A system of ecological

relationships in a local environment, including relationships between organisms, and between the organisms and the environment itself. Synonym: ecological system.

Ecotone – (1) Transitional zone between two vegetation types or vegetation regions. (2) A transition area of vegetation between two communities, having characteristics of both kinds of neighboring vegetation and characteristics of its own. Varies width depending on site and climatic factors. (3) A transition line or strip of vegetation between two communities, having characteristics of both kinds of neighboring vegetation and characteristics of its own.

Ecotype - (1) A population of plants that has become genetically differentiated in response to the conditions of a particular habitat. The plants may vary in growth habit, maturity, and other characteristics such as pubescence and flower color. Sometimes referred to as a geographical race. (2) A transition area of vegetation between two communities, having characteristics of both kinds of neighboring vegetation and characteristics of its own. Width varies depending on site and climatic factors. Transition zone between two vegetation types or vegetation-type regions. (3) A transition line or strip of vegetation between two communities, having characteristics of both kinds of neighboring vegetation and characteristics of its own. (4) A locally adapted population within a species which has certain genetically determined characteristics; interbreeding between ecotypes in not restricted. (5) A variety or strain within a given species that maintains its distinct identity by adaptation to a specific environment. (6) A locally adapted population of a species which has a distinctive limit of tolerance to environmental factors. (7) A variant type within an ecospecies.

Ecovar - The offspring of native species that have been developed from original plant material collected from a specific ecological region. Selection is done with minor emphasis on improving agronomic characteristics and major emphasis on maintaining genetic diversity. See also “ecotype.”

Educational plantings – Plantings designed to introduce the establishment and uses of new or potential releases to the public. Educational plantings show one or more conservation practice uses for the plant material, possibly in comparison to a standard cultivar or species; plantings may be established on or off-center. See also “demonstration plantings.”

Edge effect – (1) The influence of one adjoining plant community upon the margin of another, affecting the composition and density of the populations. (2) The effect executed by the adjoining communities on the population structure within the margin zone.

Elliptic – Longer than wide, with rounded ends.

Emulsifying agent - A surface-active material that facilitates the suspension of one liquid in another.

Emulsion - The suspension of one liquid as minute globules in another liquid; for example, oil dispersed in water.

Endemic – Native to or restricted to a particular area, region, or country.

Endocarp – The inner layer of the pericarp of a seed, e.g. stone fruit.

Entire margin – Unbroken, without teeth or lobes.

Environment - The sum of all external conditions that affect an organism or community to influence its development or existence.

Environmental range - Range of environmental conditions in which, at a given time, the members of a species live.

Epicormic branching – Branches which grow out of the main stem of a tree, arising from buds under the bark. Increases knottiness, thus reducing the quality of sawn lumber.

Epinasty - Increased growth on the upper surface of a plant organ or part (especially leaves) that causes it to head downward.

Epithet - The final word or combination of words in a name that denotes an individual taxon.

Erose – Irregularly toothed or eroded.

Evapotranspiration - The total soil moisture lost to the air by plant transpiration (evaporation from the plant surface) and evaporation from the soil surface.

Evergreen plant – A plant that has leaves all year round and sheds them more or less regularly through all seasons, commonly on a 2-3 year cycle.

Excurrent – Tree growth is pyramidal, similar to a spruce tree; central leader.

Exfoliate – The natural habit of trees for the bark to peel off in shreds or thin layers.

Exotic – (1) A term describing an organism introduced from another country or continent. (2) An organism or species that is not native to the region in which it is found.

Exposure – See “aspect.”

Facine – See “willow bundle.”

Facultative weed - Weed found growing both wild and in association with human activity.

Fascicle – A small bundle, e.g., 2 to 5 needles per cluster in pines.

Fertilizer - Any organic or inorganic material of natural or synthetic origins (excluding liming materials) that is added to a soil to supply one or more elements essential to the growth of plants.

Fiber - The cell wall portion of roughages (forages) that is low in TDN and hard to digest by monogastric animals.

Fiberschine – A soil bioengineering technique using coconut-fiber filled rolls that are planted with wetland plant plugs and hardwood cuttings. The fiberschine is placed at the toe of the slope to protect and stabilize an eroding.

Fibrous root system – A plant root system having a large number of small, finely divided, widely spreading roots but no taproots. Typified by grass roots.

Field Evaluation Planting (FEP) - Old name for off-center evaluations; term not currently used by the PMP. See "off-center evaluations."

Field Plantings (FP) - Final stage of technology development or plant selection; plantings used primarily by PMS' to develop new methods or technology or evaluate the adaptability of new releases; data is collected and analyzed statistically.

Field-scale increase - The reproduction of plant materials for use in field plantings and by cooperating agencies to obtain the final data needed to determine the feasibility of a variety release.

Filament – Portion of the stamen composing the stalk.

Fireblight – Bacterial disease causing leaves of susceptible plants to blacken but remain attached to the twigs. Affects pear, apple, crabapple, cotoneaster, and mountain ash.

Firm seed - Seed, other than hard seed, that neither germinates nor decays during a prescribed test period under prescribed test conditions. Firm ungerminated seed may be alive or dead.

Fissures – Pertains to furrows created in bark as the tree grows.

Fixation – A soil process that renders available plant nutrients unavailable or fixed in the soil.

Flood tolerance – A plant's ability to withstand water inundation for periods ranging from days to months.

Flora – (1) The plant species of an area. (2) A simple list of plant species or a taxonomic manual.

Fodder - Coarse grass such as corn and sorghum harvested with the seed and leaves and cured for animal feeding.

Foliage – The green or live leaves of plants.

Foliar cover – The percentage of ground covered by the vertical projection of the aerial portion of plants. Small openings in the canopy and intraspecific overlap are excluded. Foliar cover is always less than canopy cover, either may exceed 100 percent.

Follicle – A dry, dehiscent fruit developed from a simple ovary and splitting along one suture.

Food reserves – The excess carbohydrates in plants produced during photosynthesis and stored in a readily available form in the various plant parts. Depending on forage species, they may be stored in the roots, stem bases, stolons, or rhizomes. Often erroneously called root reserves.

Forage – (1) The vegetative portion of plants in a fresh, dried, or ensiled state which is fed to livestock. (2) Grasses and legumes cut at the proper stage of maturity and stored to preserve quality. (3) All browse and herbage that is available and acceptable to grazing animals or that may be harvested for feed purposes.

Forage allowance - The mass of forage dry matter available per animal or AU at a particular point in time; the inverse of grazing pressure.

Forage production - The weight of forage that is produced within a designated period of time on a given area. The weight may be expressed as either green, air-dry, or oven-dry. The term may also be modified as to time of production such as annual, current year, or seasonal forage production.

Forb - Any non-woody plant that is not a grass, sedge, or rush.

Forestland – Land on which the historic climax plant community is dominated by trees.

Foundation seed – The progeny of breeder seed that is handled to most nearly maintain specific genetic identity and purity. Production may be carefully supervised by the originating agency and approved by the certifying agency, the agricultural experiment station, or both. See also “seed certification classes.”

Fresh weight - The weight of plant materials at the time of harvest. Synonym: green weight.

Frost crack – A vertical split in the wood of a tree, generally near the base of the bole, from internal stresses and low temperatures.

Frost-free period - The period, number of days, or both between the last frost in spring and the first frost in fall.

Fruit – The ripened ovary or ovaries of a seed-bearing plant, along with its accessory parts, containing the seeds and occurring in numerous forms.

Furrowed – Having longitudinal grooves or fissures.

Gall – A pronounced swelling or outgrowth on a plant.

Gene bank - A storage facility where germplasm is stored in the form of seeds, pollen, or in vitro culture, or in the case of a field gene bank, as plants growing in the field.

Gene flow - The transfer of genes from one population to another. See also "genetic flow."

Gene frequency - The relative frequency with which a particular gene is present in a particular population of a species or other group.

Gene pool - The total stock of genes in a breeding population, with each gene representing a number of alleles. See also "genetic pool."

Genetic diversity – (1) The total amount of genetic variation present in a population or species. (2) Having a heterogeneous constitution, reacting differently to diverse external condition. (Applied to a breeding population, variety, or species.) (3) The genetic constitution of an individual or group.

Genetic drift – (1) Chance occurrences in small populations which lead to changes in gene frequencies from generation to generation. (2) The tendency, within small interbreeding populations, for heterozygous gene pairs to become homozygous for one allele or the other by chance, rather than by selection. (3) A change in gene frequency that occurs in small populations as a result of random sampling error during reproduction. (4) The fluctuation in gene frequency occurring in an isolated population, presumably due to random variations from generation to generation.

Genetic engineering - The use of in vitro techniques to produce DNA molecules containing novel combinations of genes, or other sequences in living cells, that make them capable of producing new substances or performing new functions. Usage: A popular term for such technologies as a whole.

Genetic erosion - The loss of genetic diversity between and within populations of the same species over time; or a reduction of the genetic base of a species due to human intervention, environmental changes, etc.

Genetic flow - The exchange of genes between different populations. Also termed migration, it is considered to be a source of genetic variation. A single introduction of

genes into a new population is known as gene exchange. If gene migration is constant and recurrent, it is known as gene flow. The closer populations are related spatially and genetically, the more likely the chances of gene flow.

Genetic pool – (1) The totality of genes and gene complexes of a given population at a given time. (2) The sum of all genetic information carried by all individuals of an interbreeding population. (3) All of the alleles of all the genes in a population.

Genetic shift - A change in the germplasm balance of a cross-pollinated variety, usually caused by environmental selection pressures.

Genetic vulnerability - Having a narrow range of genetic diversity and reacting uniformly to diverse external conditions. (Applied to breeding populations of varieties or species.)

Genotype – (1) The genetic constitution of an individual or group of plants. Individual plants may vary in appearance (phenotypically), but they must have the genetic characteristics of the genotype. (2) The genetic constitution, latent or expressed, of an organism, as contrasted with the phenotype. (3) The sum total of all genes present in an individual.

Geographic range - Geographic limits of the ecological range; geographic extent of actual occurrences of a species.

Germination - The initiation of growth by the embryo which results in rupturing the seed coat and the emergence of the radical and development of a young plant from seed.

Germplasm – Genetic material that determines the morphological and physiological characteristics of a species.

Glabrescent – Becoming hairless at maturity.

Glabrate – Nearly glabrous or becoming glabrous with age.

Glabrous – Without hair, smooth.

Glandular – Small, usually shiny bumps on the surface.

Glaucescent – Slightly glaucous.

Glaucous – Covered with a waxy bloom or whitish material that rubs off readily.

Globose – Spherical.

Graminoid – Grass or grass-like plants.

Grass – A member of the family Poaceae (Gramineae).

Grassland – Land on which the vegetation is dominated by grasses, grass-like plants, and/or forbs.

Grass-like plant – A plant of the Cyperaceae or Juncaceae families that vegetatively resembles a true grass of the Gramineae family.

Grass tetany (hypomagnesemia) - A malady or condition of cattle and sheep with the symptoms of staggering, convulsions, coma, and death. This is a nutritional imbalance of rations resulting from a low level of blood magnesium.

Graze - The partial defoliation of a plant by livestock.

Grazier - One who pastures (grazes) livestock.

Grazing cell - An area of pasture which a specific group of animals are confined to for the grazing season.

Grazing cycle – (1) The time elapsed between the beginning of one grazing period and the beginning of the next grazing period in the same paddock where the forage is regularly grazed and rested. One grazing cycle includes one grazing period plus one rest period. (2) The combined time animals are permitted to graze the paddock forage and the time that the paddock forage is permitted to recover.

Grazing period - The time that the animals are exposed to the paddock.

Grazing pressure - The relationship between the number of AUs or forage intake units and the weight of forage dry matter per unit area at any one point in time; an animal-to-forage relationship.

Grazing season - The total period of time during which animals may harvest standing forage from pasture. It is composed of the "**growing season**," when temperature and moisture are conducive to plant growth, and the "**non-growing season,**" when animals may harvest any forage remaining after the growing season.

Grazing system - A specialization of grazing management which defines the periods of grazing and non-grazing. Descriptive common names may be used; however, the first usage of a grazing system name in a publication should be followed by a description using a standard format. This format should consist of at least the following: the number of pastures (or units); number of herds; length of grazing periods; length of non-grazing periods for any given unit in the system followed by an abbreviation of the unit of time used. cf. *deferred grazing, deferred-rotation, rotation, rest-rotation,* and *short duration grazing*.

Grex - A collective term applies to the progeny of an artificial cross from known parents; each and every crossing of any two parents belonging to different taxa that bear the same pair of specific, intraspecific, interspecific, grex, or cultivar epithets.

Green chop – Mechanically harvested forage fed to animals while still fresh.

Green manure crop – A crop that is plowed under while still living to increase organic matter in soil.

Ground cover – The percentage of material, other than bare ground, covering the land surface. It may include live and dead standing vegetation, litter, cobble, gravel, stones, bedrock, and cryptogams. Ground cover plus bare ground would total 100 percent.

Growing season - (1) The period, number of days, or both between the last frost in spring and the first freeze threshold temperature of the crop or other designated temperature threshold. (2) The amount of time a plant is able to actively grow.

Growth form – The characteristic shape or appearance of a plant.

Growth rate – The volume, value, or other types of increase in plants, e.g., trees and shrubs expressed in terms of number of rings per inch.

Growth rings – The layers of wood laid down each growing season (annual rings).

Habitat type - The collective area which one plant association occupies or will come to occupy as succession advances. The habitat type is defined and described on the basis of the vegetation and its associated environment.

Half-shrub – A perennial plant with a woody base whose annually produced stems die each year.

Hardiness – The ability to survive exposure to harsh conditions.

Hard wood – A term used to describe broadleaf, usually deciduous, trees such as oaks, maples, ashes, elms, etc. It does not necessarily refer to the hardness of the wood.

Hard seed – See Seed, hard.

Hay - Dried forage (grasses, alfalfa, clovers) used for feeding farm animals.

Heartwood – The inner core of a woody stem wholly composed of nonliving cells and usually differentiated from the outer enveloping layer (sapwood) by its darker color.

Hedging – The persistent browsing of terminal buds of browse species causing excessive lateral branching and a reduction in main stem growth. Also resulting in highlining in

some species where buds no longer grow and are above the level available to browsing animals.

Heel-in – To store young trees prior to planting by placing them in a trench and covering the roots or rooting portions with soil.

Herb – Any flowering plant, except those developing persistent woody stems, above ground.

Herbaceous - A vascular plant that does not develop woody tissue.

Herbage – (1) Total above ground biomass of plants, including shrubs, regardless of grazing preference or availability. (2) Leaves, stems, and other succulent parts of plants upon which animals feed or forage.

Herbage allowance - Weight of forage available per AU on the land at any instant.

Herbicide – (1) A phytotoxic chemical used for killing or inhibiting the growth of plants. (2) A chemical which kills herbaceous (non-woody) plants.

Herbivore - An animal, insect, or other higher animal that subsists principally or entirely on plants or plant materials.

Herbivory - The act of animals eating plants or their seeds and fruits; defoliation. In most cases, the plants do not die.

Heritability - The proportion of observed variability due to heredity; the remainder is due to environmental causes.

Heterosis - Hybrid vigor such that the F_1 hybrid falls outside the range of the parents with respect to some character or characters.

Heterozygous - Having unlike alleles at one or more corresponding loci (such as Yy).

Hispid – Covered with bristly hairs.

Historic climax plant community – (1) The original natural plant community that represents the final or highest stable level in a successional series that is in dynamic equilibrium with ecosystem components - soils, vegetation, climate, etc. The assumed end point in primary as well as secondary succession. (2) The plant community that was best adapted to the unique combination of factors associated with the ecological site. It was in a natural dynamic equilibrium with the historic biotic, abiotic, climatic factors on its ecological site in North America at the time of European immigration and settlement. Synonym: climax plant community. See “climax.”

Homozygous - Having alike alleles (such as YY). An organism may be described as homozygous at one, several, or all loci.

Horizontal bundles – A soil bioengineering technique using bundles of willow cuttings placed in a horizontal trench along the toe of an eroding slope. Approximately half of the bundle is placed in the ground and the other half is exposed to the water and air. These bundles will protect the toe of the streambank and, if planted properly, sprout branches and roots to help stabilize the bank.

Horticultural annual - A biennial or perennial which may be treated as an annual in parts of the country where the usually persistent plant parts do not survive more than one growing season.

Humus layer – The top portion of the soil that owes its characteristic features to its content of organic matter.

Hybrid – (1) Offspring of a cross between genetically dissimilar individuals. (2) First-generation progeny resulting from the controlled cross-fertilization between individuals that differ in one or more genes.

Hybrid vigor – The increased performance (rate of growth/gain) associated with F1 cross-breeding.

Ice-cream species (plant) – A slang term used to indicate obvious grazing preference by grazing animals. Such species are the first grazed and are often over-utilized by a grazing animal.

Imbricate – Overlapping, like shingles on a roof.

Imperfect flower type – Lacking stamens or pistols, but not both.

Impressed – Bent inward, furrowed as if by pressure.

Improved pasture – Grazing land permanently producing introduced or domesticated native, forage species that receives varying degrees of cultural treatment to enhance forage quality and yields.

Inconspicuous – Small, not readily noticed by the naked eye.

Increase plantings – Production of seed or other reproductive parts of plant material to be made available for use in evaluations, field plantings, demonstration plantings, educational plantings, or for distribution. See also “initial increase.”

Incurved – Curved inward.

Indicator species - (1) Species that indicate the presence of certain environmental conditions, range condition, previous treatment, or soil type. (2) One or more plant species selected to indicate a certain level of grazing use.

Indigenous - Born, growing, or produced naturally (native) in a specified area, region, or country.

Infestation – Invasion by large numbers of parasites, pests, weeds, or other unwanted species.

Infiltration – The downward entry of water into the soil. This is distinct from percolation, which is movement of water through soil layers or material.

Initial Evaluation (IE) - The evaluation of the characteristics and comparative performance of an assembly of plants under controlled conditions so that promising plants can be selected for further evaluation.

Initial increase - The production of small quantities of seed or other reproductive parts of materials selected from initial or advanced evaluations to be used for further evaluation and exchange.

Insecticide – Any chemical used to destroy insects and other small invertebrates.

Insipid – Lacking taste, smell, or quality; dull.

Intake – The quantity of forage or feed consumed by an animal during a specified period; usually expressed in units of lb/day.

Inter-Center Strain Trial (ICST) - Controlled, repeatable evaluations where scientific methods and experimental designs are used to study plants and techniques, and to determine State and regional plant performance and adaptation.

Internode – Part of a stem between two nodes.

Interplant – To set young trees among existing forest growth of similar age and/or size, planted naturally, to bring the stand to a fully stocked condition.

Interseeding - Seeding into established vegetation cover. Often involves planting seeds into the center of narrow seedbed strips, commonly of variable spacing prepared by mechanical or chemical methods.

Introduced - A species not part of the original fauna or flora of the area in question, but introduced from another geographical region through human activity. Synonym: exotic. Introduced is <u>not</u> synonymous and should <u>not</u> be confused with the term “invasive species.”

In vitro - In glass; in test tubes, as in *in vitro* digestion.

In vitro digestible dry matter (IVDDM) - The weight of dry matter lost upon filtration following incubation of forage in test tubes with rumen microflora, usually expressed as a percentage: (weight dry matter sample-weight residue)/weight dry matter sample.

In vivo - In a living organism.

Invader - (1) Plants not a part of the original plant community that invade an area due to disturbance and/or plant community deterioration. (2) Plant species that were absent in undisturbed portions of the original vegetation of a specific range site and will invade or increase following disturbance or continued heavy grazing.

Invasion - The migration of organisms from one area to another area and their establishment in the latter.

Invasive plants – Plants that reproduce rapidly and spread aggressively from the area in which they originally occurred or were planted, posing a threat to natural area diversity or managed/agricultural area productivity. See also "invasive species."

Invasive species – (1) A species that demonstrates rapid growth and spread, invades habitats, and displaces other species. (2) Species that are prolific seed producers, have high seed germination rates, easily propagated asexually by root or stem fragments, and/or rapidly mature predispose a plant to being an invasive. For example: The hybrid cattail (*Typha* x *glauca*), a cross between native cattails, is extremely aggressive and out-competes its parents and other native species when established. Introduced species that are predisposed to invasiveness have the added advantage of being relatively free from predators (herbivores, parasites, and disease) and can, therefore, expand more energy for growth and reproduction. Invasive species should <u>not</u> be confused with "introduced species."

Jointed – A grass stem that has distinct, elongated internodes between nodes.

Killing frost - A temperature that affects the shoot apex enough to stop growth but does not kill all the leaves; generally considered to be about 24° F for upright legumes that have the apices near the top of the canopy.

Kind - One or more related species or subspecies that singly or collectively is known by one common name; for example, wheat, vetch, and sweetclover.

Lanceolate – Lance shaped, broadest at the base of a leaf blade. Much longer than broad, tapers to the leaf tip.

Lateral bud – Those buds below the terminal buds where side branches arise.

Layering – A method of propagation in which adventitious roots form on a stem while still attached to the parent plant. Occurs naturally with some species, i.e., dogwood species.

Leader – A terminal leader is the uppermost branch or vertical tip of the tree. It eventually becomes the tree stem or trunk.

Leaf area index – Sum of leaf area expressed as a percentage of ground surface. Leaf area index may exceed 100 percent.

Leaflet – A single segment of a compound leaf.

Leaf margin – Refers to the leaf edge.

Leaf scar – The mark that remains where a leaf falls off a twig.

Leggy – Pertains to overgrowth of trees or shrubs where stem growth is lengthened and weak. Devoid of lateral branches.

Legume - Plant member of the family Fabaceae (Leguminosae), including clovers, alfalfa, and similar crops with the characteristic of forming nitrogen-fixing nodules on its roots. Rhizobia bacteria in the nodules use atmospheric nitrogen and allow the plant to use it as a source.

Lenticel – A breathing pore in young bark, appearing as a light colored, often lens shaped dot, e.g., birch.

Life form – Characteristic form or appearance of a species at maturity, e.g., tree, shrub, forb, grass, etc.

Lignin - A compound which, with cellulose, forms the cell walls of plants. It is practically indigestible.

Limited generations - A restriction placed by the developer on the number of generations through which a variety may be sold by variety name.

Line - A group of individuals of common ancestry. Genetically, a more narrowly defined group than a strain or a variety.

Liner - Plant material which is grown in one location and then "lined-out" in another location for finishing off. Plants may be started in seedbeds and lifted bare-root or grown in containers. Either type of these liners may finish their production cycle in the ground or in containers.

Linkage - Association of genetic factors; the genes are in the same chromosome.

Litter – The upper most layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.

Local native - A genetically local source that originated at or within the same seed zone and elevation band as the project site (planned planting). See also "range site" and "woodland site."

Local population - Group of individuals of the same species growing near enough to each other to interbreed and exchange genes.

Lodging - The falling down of a crop due to either stalk breakage or uprooting.

Long Range Plan (LRP) - A plan which directs plant materials activities of the PMC, or within a State, or the PMC service area.

Main stem – The portion of a tree between ground level and the division into major branches, usually referred to as the bole.

Major Land Resource Area(s) (MLRA) – A system of land classification composed of geographically associated land resource units; MLRAs are important in agricultural and other types of regional planning. Land resource units are geographic areas, usually several thousand acres that are characterized by a particular pattern of soils, climate, water resources, and land uses.

Management-intensive grazing (MiG) - A goal-driven approach to grazing management with emphasis on intensive management. It is characterized by balancing animal demand with forage supply through the grazing season, and allocating forage based on animal requirements.

Management site potential - The kinds of levels of productivity or values of a range site that can be achieved under various management prescriptions.

Marsh – A flat, wet, treeless area usually covered by standing water at least part of the year and supporting grasses and grass-like, water loving forbs.

Mast – Nuts, acorns, fruit, and similar plant products that may be consumed by animals.

Mass selection - Selection of individual plants and propagation of the next generation from the aggregates of that seed.

Meadow – An area of perennial herbaceous vegetation, usually grasses or grass-like, used primarily for hay production and grazing.

Mesa – A flat-topped mountain or other elevation bounded on at least one side by a steep cliff.

Memorandum of Understanding - A written instrument evidencing the intent of two or more parties to cooperate in carrying out an undertaking that will result in mutual benefit to the parties concerned. Each party works within its own sphere of work and authority. It is not a fiscal document used as a basis for obligating funds, and may run for an indefinite time or be limited.

Mineral - Any ore, rock, or substance (other than oil, gas, or uranium) that is taken from below the surface or from the surface of the earth for the purpose of milling, concentration, refinement, smelting, manufacturing, or other use, or for stockpiling for future use. Calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), and sulfur (S) are normally expressed as a percentage of each in the feed.

Miscible liquids - Two or more liquids capable of being mixed; they will remain mixed under normal conditions.

Mixture - More than one kind of seed or variety; each is present in excess of 3 percent of the whole.

Mixed grazing - Grazing by two or more species of grazing animals on the same land unit, not necessarily at the same time, but within the same grazing season.

Moisture, wet basis - The weight of water in a forage sample divided by the total weight of water and dry matter.

Monocotyledon (monocot) – A member of Monocotyledonae; one of two classes of angiosperms, usually characterized by: one seed leaf (cotyledon), leaves with parallel venation, and root systems arising adventitiously and usually diffuse (fibrous).

Monoecious - Staminate and pistillate flowers borne separately on the same plant.

Morphology - A branch of biology dealing with the form and structure of organisms.

Mott – A group of trees and/or shrubs.

Mottled – An irregular spotting or alternating color on leaves, stems, and other plant parts.

Mucronate – Abruptly terminated by a short, sharp leaf tip.

Mulch – (1) A layer of dead plant material on the soil surface. (2) An artificial layer of material, such as plastic or paper, on the ground surface. (3) Cultural practice of placing rock, straw, paper, plastic, or other material on the soil surface. Commonly used to improve surface conditions to establish desired vegetation.

Native grazing land - Land used primarily for the production of native forage plants maintained or manipulated primarily through grazing management. Native grazing land

includes grazed rangeland, grazed forestland, and native and naturalized pasture, individually or collectively.

Native plant - A plant species indigenous to an area; not introduced from another environment or area. See "native species."

Native species – (1) A species which is a part of the original fauna or flora of the area in question. (2) A native plant species is one that occurs naturally in a particular region, State, ecosystem, and habitat without direct or indirect human actions. Climate, soil, and biotic factors determine its presence and evolution in an area. Synonyms of native species include indigenous, endemic, and aboriginal.

Natural potential - Occasionally used as synonym for climax with reference to range vegetation.

Naturalized plant - A plant introduced from other areas that has become established in, and more or less adapted to, a region by long, continued growth. See also "naturalized species."

Naturalized species - A species introduced from other areas that has become established in, and more or less adapted to, a region by long, continued growth there. Does not require artificial inputs for survival and reproduction, and has established a stable or expanding population. Examples: cheatgrass, Kentucky bluegrass, starling, etc.

Near infrared reflectance spectroscopy (NIRS) - A method of forage quality analysis based on the measurement of light energy in the near infrared region absorbed by the sample.

Needle – Elongate, linear, sharp-pointed leaf.

Neutral detergent fiber (NDF) - A measurement of fiber after digesting in a nonacidic, nonalkaline detergent as an aid in determining quality of forages. Contains the fibers in ADF plus hemicellulose. Measures the structural part of the plant, the plant cell wall which consists of lignin, cellulose, and hemicellulose. NDF gives bulk or fill to the diet and is negatively correlated with feed intake. Because NDF can be used to predict intake, it is one of the most valuable analysis to have conducted on forages for dairy rations. Low NDF is usually desired. As maturity of the plant at harvest increases, cell wall content of the plant increases and NDF increases.

Nitrate poisoning - A serious condition resulting when an animal ingests forage containing a high nitrate concentration. Rumen bacteria convert nitrate to nitrite; nitrites usually are converted to other forms of nitrogen but, if not, will compete with the oxygen-carrying mechanism in the blood, resulting in suffocation.

Nitrogen (N) - A fertilizer element needed in large amounts by growing forages. It promotes the growth of leaves and stems and increases plant vigor. It ensures a dark, healthy, green color in grass. An important component of protein.

Nodule - A tubercle formed on legume roots by the symbiotic nitrogen-fixing bacteria of the genius *Rhizobium*.

Non-protein nitrogen (NPN) - Nitrogen which is not in the protein form. It can be used by rumen microorganisms to synthesize protein if adequate carbohydrates are available.

Node – Joint on a stem, represented by point of origin of a leaf or bud.

Nonselective herbicide - A chemical that is toxic to plants, generally without regard to species.

Noxious species – A plant species that is undesirable because it conflicts, restricts, or otherwise causes problems under management objectives. Not to be confused with species declared noxious by laws (see "noxious weed").

Noxious weed - A weed arbitrarily defined by law as being especially undesirable, troublesome, and difficult to control. It grows and spreads in places where it interferes with the growth and production of the desired crop. Definition varies according to legal interpretations.

Nurse crops - See "companion crop."

Oblique – Lop-sided; one side of leaf base is larger, wider, or more rounded than the other.

Oblong – Two to three times longer than broad.

Obovate – Inversely ovate.

Obovoid – Leaf shape that is inversely egg-shaped or obovate.

Obtuse – Rounded, approaching semi-circular.

Off-Center Evaluations - Plantings used by PMCs to evaluate releases or technology off-site; data is collected and analyzed statistically; was previously named "field evaluation planting."

On-Center Evaluations - Plantings done on the PMC to evaluate new technology or new plant selections; data is collected and analyzed statistically.

Open pollination - Natural, as opposed to controlled, pollination. Open pollinated seed contrasts with hybrid seed.

Opposite – Buds or leaves growing in pairs but separated by a stem.

Oval – Twice as long as broad, widest at the middle, both ends rounded.

Ovate – Egg shaped in outline, narrower at the tip.

Overgrazing - The grazing of animals on a given area that, if continued to the end of the planned grazing period, will result in less than satisfactory animal performance and/or less than satisfactory pasture forage production.

Over-seeding - The practice of spreading seed over an existing pasture without prior seedbed preparation.

Overstory – The canopy in a stand of trees. In contrast to the understory, which is low growing woody or herbaceous vegetation, forming a layer beneath the overstory.

Ovoid – Three dimensional, egg shaped.

Paddock - A subdivision of the cell in which the animals are confined for a grazing period. A paddock may be of a fixed or variable size depending on the system selected.

Palatability – (1) The relish with which a particular species or plant part is consumed by an animal. (2) The animal preference based on plant characteristics eliciting a choice between two or more forages or parts of the same forage, conditioned by the animal and environmental factors that stimulate a selective intake response.

Palmate – With 3 or more lobes, veins, or leaflets arising from 1 point, often 5-7.

Panicles – Loose, irregular compound flower clusters.

Pasture – Grazing land comprised of introduced or domesticated native forage species that is used primarily for the production of livestock. Receives periodic renovation and/or cultural treatment such as tillage, fertilization, mowing, and weed control, and may be irrigated.

Pasture carrying capacity - Number of animals a given pasture will support at a given time or for a given period of time.

Pasture planting – Establishing adapted herbaceous species on land to be treated and grazed as pasture.

Pasture renovation - Improvement of a pasture by the partial or complete destruction of the sod, plus liming, fertilizing, seeding, and weed control as may be required to establish desirable forage plants.

Pectinate – Like a comb, with many or few narrow pinnate divisions.

Pedestaled – A condition where soil has eroded from around individual plants or objects, such as small rocks, leaving them on small pedestals of soil. Sometimes the result of frost heaving.

Peduncle – Primary flower stalk.

Pendulous – Hanging down, drooping.

Perennial - A plant that lives more than 2 years.

Perfect (flower type) – Having both functional stamens and pistils.

Performance Trial – A planting designed to test a potential plant release for reliability in a particular conservation application. May require multiple plantings and/or off-center sites. Standards for comparison are to be included if available.

Pericarp – Sometimes used to designate a fruit; technically the ovary wall.

Persistent – Hanging on through winter or a long period of time, e.g., plant parts: fruit, seeds, leaves, etc.

Petiole – The stalk of a leaf.

pH – The measure of the acidity or alkalinity of soil. Descriptive terms commonly associated with certain ranges in pH are: extremely acid <4.5; very strongly acid 4.5-5.0; strongly acid 5.1-5.5; moderately acid 5.6-6.0; slightly acid 6.1-6.5; neutral 6.6-7.3; slightly alkaline 7.4-7.8; moderately alkaline 7.9-8.4; strongly alkaline 8.5-9.0; and very strongly alkaline >9.1.

Phenology - A branch of science dealing with the relationship between climate and periodic biological phenomena. Also dates or sequence of occurrence of different growth stages of plants.

Phenotype - (1) The external appearance or discernible characteristics of an organism, resulting from interaction between an organism's genetic makeup (genotype) and the environment. A group of individual plants may appear alike (phenotypically) but not have the same genotype, or they may vary in appearance and have the same genotype. (2) Observable characteristics.

Phloem – The tissue in higher plants which transports organic nutrients manufactured in leaves to other portions of the plant.

Phosphorus (P) - Designated as P205, phosphoric oxide, in fertilizer. It is an element that promotes rapid growth, hastens maturity, and stimulates flower, seed, and fruit production. Absolutely necessary in every plant cell.

Photosynthesis – (1) The process which produces carbohydrates from carbon dioxide and water, chloroplasts or chlorophyll-bearing cell granules, and the energy from sunlight. (2) The metabolic pathway by which plants produce food. See also “C-3 plants,” “C-4 plants,” and “CAM plants.”

Phytomass – Total amount of plants, including dead attached parts, above and below ground in an area at a given time. See "biomass.”

Pilose – Long, soft hairs.

Pinnate – Compound leaf with leaflets on either side of the central axis.

Pioneer species - The first species or community to colonize or recolonize a barren or disturbed area in primary or secondary succession.

Pith – Spongy center of a twig; if it has crosswalls, it is called chambered.

Pitting - Making shallow pits or basins of suitable capacity and distribution on range to reduce overland flow from rainfall and snowmelt. Also used in seedbed preparation to aid in collecting water to aid in seed germination and plant establishment.

Plain – A broad stretch of relatively level treeless land.

Plan of Operations (PO) - See “Business Plan.”

Plantation – An artificially reforested area established by planting or direct seeding.

Plant association - A kind of climax plant community consisting of stands with essentially the same dominant species in corresponding layers.

Plant code or symbol – A 4 or more character code system for identifying either the plant common or scientific name.

Plant community type - Each of the existing plant communities that can occupy an ecological site. Several plant community types will typically be found on an ecological site, including the historic climax plant community for that site.

Plant growth curve – The percent growth occurring at a specific location expressed as a monthly percent of total annual production. Growth curves reflect differences in ecological condition.

Plant growth regulator - A substance used for controlling or modifying plant growth processes without severe phytotoxicity.

Plant moisture content – The percent of plant weight that is water.

Plant Variety Protection Act (PVPA) - Approved on December 23, 1970, the PVPA offers legal protection to developers of new releases or varieties of plants that reproduce sexually, that is, through seed. Developers of plants that reproduce asexually have received protection from the U.S. Patent Office since 1930. The law states that protection will be extended to a "novel variety" if it has these three qualifications: Distinctness - The variety must differ from all known prior varieties by one or more identifiable morphological, physiological, or other characteristic; Uniformity - If any variations exist in the variety, they must be describable, predictable, and commercially acceptable; and Stability - When sexually reproduced, the variety must remain unchanged in its essential and distinctive characteristics to a degree expected of similarly developed varieties.

Plant vigor – See "vigor."

Plumed – Feathery.

Poisonous plant – A plant containing or producing substances that cause sickness, death, or a deviation from the normal state of health of animals.

Polycross - Open-pollination of a group of genotypes (generally selected) in isolation from other compatible genotypes in such a way that each of the original selections has an equal opportunity at pollinating, or being pollinated by, any of the others.

Polygamo-dioecious – Part of flowers are perfect and part are unisexual with male and female flowers on separate plants.

Polygamo-monoecious – Sexual condition in which some perfect and staminate flowers are on the same plant.

Pome – Fleshy fruit with a core, such as an apple.

Population - (1) The aggregate of organisms which inhabit a particular area or region. (2) A (specified) portion of such an aggregate, usually a group of organisms of the same kind occupying an area small enough to allow interbreeding.

Population genetics - A branch of genetics dealing with the frequency and distribution of genes, mutants, genotypes, etc., among populations of organisms. Population genetics is now based upon an increasing input of laboratory and field observations under an array of environments; much of this work involves the documentation and interpretation of genetic variability in natural populations.

Post-emergence - After the emergence of a specified weed or crop.

Post planting – A soil bioengineering technique using large diameter cuttings, normally cottonwood or willow species, to revegetate an eroding bank. These cuttings are placed into the soil resulting in sprouting and rooting of the material to stabilize the bank.

Potash (K_20) - A term designating potassium oxide (K_20) and often used interchangeably with the word "potassium" (K). Potassium stimulates root growth and the growth of strong stems, imparts resistance to disease, and improves winter survival and persistence of legumes.

Potential natural community - The biotic community that would become established on an ecological site if all successional sequences were completed without interference by humans under the present environmental conditions. Natural disturbances are inherent in its development.

Precipitation – Rainfall including snow, hail, and sleet.

Pre-emergence - Before the emergence of a specified weed or crop.

Pre-planting - Any time before the crop is planted.

Pristine - A state of ecological stability or condition existing in the absence of direct disturbances by modern man. See also “relict.”

Project - A national PM activity that is broad in nature and serves as an umbrella for PMC studies. Refer to Part 540.51 of the NPMM for more information on PM projects.

Project statement - A document that outlines the details of a national PM project. Refer to Part 540.51 of the NPMM for more information on PM project statements.

Propagule – Any part of an organism produced sexually or asexually that is capable of giving rise to a new individual.

Proper use – A degree of utilization of current year’s growth that, if continued, will achieve management objectives and maintain or improve the long-term productivity of a site. Proper use varies with time and system of grazing.

Protein, crude (CP) - An estimate of protein content based on determination of total nitrogen (N). All nitrogenous substances contained in feed stuffs (% crude protein = % N x 6.25).

Pruning – The removal of live or dead branches from standing trees.

Prussic acid – A poisonous, hydrocyanic acid released when forages contain cyanogenic glysosides, and the proper enzymes are chewed by a grazing animal.

Pubescent – Covered with short, soft hairs.

Pure line - Succession of generations of organisms homozygous for all genes.

Pure Live Seed (PLS) - The product of the percentage of germination plus the hard seed and the percentage of pure seed divided by 100.

Purity - (1) The name or names of the kind, type, or varieties, and the percentage or percentages thereof. (2) The percentage of other agricultural seed or crop seed; the percentage of inert matters. (3) The percentage of weed seed, including noxious weed seed, and the names of the noxious weed seed and the rate of occurrence of each. **Seed** p**urity** is the percentage of the desired species in relation to the total quantity, including other species, weed seed, and foreign matter.

Quiescence – A temporary resting phase characterized by reduced activity, inactivity, or cessation of development.

Race - A term sometimes used to denote ecotypes.

Racemes – Pedicled flowers along one stem.

Range or rangeland – (1) Land supporting indigenous vegetation (predominately grasses, grass-like plants, forbs, or shrubs) that is grazed or that has the potential to be grazed, and is managed as a natural ecosystem. Not a use but a type of land. (2) Lands, native and naturalized pasture, forest, and riparian areas that support an understory or periodic cover of herbaceous or shrubby vegetation useful for grazing or browsing by wildlife or livestock, and that are amenable to management principles or practices.

Range condition - A generic term relating to present status of a unit of range in terms of specific values or potentials. Specific values or potentials must be stated. Some agencies define range condition as follows: the present state of vegetation of a range site in relation to the climax (natural potential) plant community for that site. It is an expression of the relative degree to which the kinds, proportions, and amounts of plants in a plant community resemble that of the climax plant community for the site.

Range condition class - Confusion has existed regarding both definition and use of this term. The following fits the thinking expressed in the definition **range condition**: one of a series of arbitrary categories used to either classify the ecological status of a specific range site in relation to its potential (early, mid, late, or potential natural community) or classify management-oriented value categories for specific potentials, e.g., good condition spring cattle range.

Range degradation - The degeneration of a site caused by biotic or abiotic factors which results in a lowered successional status to the point that ecological potential is changed. See also "range site degeneration."

Range retrogression - The degradation of a site caused by biotic or abiotic factors which results in movement of the site to a lower successional status within the same ecological potential.

Range seeding – (1) The process of establishing vegetation by the artificial dissemination of seed. (2) Establishing adapted plant species on ranges by means other than natural revegetation. See also "reseeding."

Range site - An area of rangeland having the potential to produce distinctive kinds and amounts of vegetation, resulting in a characteristic plant community under its particular combination of environmental factors, especially soils and climate. Each range site is typified by an association of species that differ from that of other range sites in the kind or proportions of species, or in total production. Synonymous with ecological site when referring to rangeland. Some agencies use range site based on the climax concept, not potential natural community. Synonym: ecological site.

Range site degeneration - The degradation of a site caused by biotic or abiotic factors which results in an ecological shift to a lower successional status and possibly a lower ecological potential for production. Synonym: retrogression. See also "range degradation."

Ration - The amount of feed supplied to an animal for a definite period, usually 24 hours.

Reciprocal cross - A second cross involving the same characters as the first but with the sex of the parents interchanged.

Reclaim - To make a site usable again for a particular land use or crop.

Reclamation – (1) Restoration of a site or resource to a desired condition to achieve management objectives or stated goals. (2) The construction of plant, soil, and topographic conditions, after disturbance, which permits the disturbed site to function adequately within its ecosystem. However, the constructed conditions may not be identical to predisturbance conditions. (3) The process of reconverting disturbed lands to their former uses or other productive uses.

Recovery - The rate or amount of regrowth following harvesting of a forage species or a dormant season.

Recurrent selection - A method of breeding designed to concentrate favorable genes scattered among a number of individuals by selecting, in each generation, among the progeny produced by intermating of the selected individuals of the previous generation.

Registered seed - The progeny of foundation seed that is handled to maintain satisfactory genetic identity and purity, and that has been approved and certified by the certifying agency. This class of seed should be of a quality suitable for production of certified seed. See also "seed certification classes."

Registered variety - (1) For grasses and agricultural species: A variety accepted, numbered, and registered as a recognized improved variety by the Committee on Varietal Standardization and Registration of the Crop Science Society of America. (2) For other

species: A variety, which has been registered with the appropriate International Species Registrar.

Rehabilitation – (1) Return of land to a form and productivity that conforms to a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values. (2) Improving a site to a more desired condition than previously existed, usually as result of a major disturbance. Implies that the land will be returned to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values. Synonymous with reclamation.

Rejuvenation – Restore to a healthy vigorous growth, often through weed control, pruning, fertilization, irrigation, or treatment for insects and diseases.

Relative feed value (RFV) - Developed primarily for use with legume or legume/grass forages, RFV combines digestibility and intake estimates into one number for an easy and effective way to identify and market quality hay. RFV is expressed as a percent compared to full bloom alfalfa at 100 percent RFV. RFV above 130 are considered good dairy quality hay. The higher the value the better, RFV in the range of 150 is desirable. RFV is calculated by: RFV% = DDM (%) x DMI (% of body weight)/ 1.29.

Release – To free trees from competition by cutting or otherwise removing or killing nearby vegetation and branches.

Released variety - A new variety of proved value that is made available to the public, according to ESCOP standards, for a conservation purpose. See also “variety.”

Relict - A remnant or fragment of the climax plant community that remains from a former period when it was more widely distributed. See also “pristine.”

Reseeding – (1) A crop variety or inbred line that has been evaluated and made available to the public. (2) To make available to the public. (3) To seed again, usually soon after an initial seeding has failed to achieve satisfactory turf establishment.

Resinous – Sticky with resin.

Resistance - (1) The ability of a plant or crop to grow and produce even though infected or infested with a pest. (2) The ability of a plant to survive a period of stress such as drought, cold, or heat.

Respiration - The process in which tissues and organisms exchange gases with their environment; generally associated with oxidation of sugars to release energy for the plant to grow and reproduce.

Rest - To leave an area of grazing land ungrazed or unharvested for a specific time.

Rest period. The grazing cycle time minus the grazing period.

Restoration – (1) The process of restoring site conditions as they were before land disturbance. Returning a disturbed site to precisely the same state it was prior to the disturbance. This may require rebuilding the soil, precise placement of trees and rocks, and use of only native plants and animals to repopulate the site. (2) The process of restoring site conditions as they were before the land disturbance. Note: restoration involves restoring a site to a specific point in time.

Reticulate – Like a net, netted venation.

Revegetation – (1) Establishing or re-establishing desirable plants in areas where desirable plants are absent or of inadequate density, by management alone (natural revegetation) or by seeding or transplanting (artificial revegetation). Planting reclaimed land with grasses, flowers, shrubs, and trees. (2) The reestablishment or improvement of vegetation through management practices or chemical or mechanical means. (3) To provide a site with vegetation again. Implies that original amounts and types of vegetation of the site are not required. (4) Plants or growth, which replaces original ground cover, following land disturbance. (5) Establishing or re-establishing desirable plants in areas where the plant community is not adequate to meet management objectives by management techniques alone. A general term for renewing the vegetation on a project site. Refers to the vegetation construction phase of reclamation.

Revolute – Stem or leaf rolled lengthwise to expose the top side and conceal the bottom side.

Rhizobia - A species of bacteria that live in symbiotic relationship with leguminous plants within nodules on their roots, are able to fix nitrogen from the atmosphere, and make it available to the plant.

Rhizome – A horizontal underground stem that usually sends out roots and above ground shoots from the nodes.

Rhombic – With 4 nearly equal sides, but unequal angles.

Riparian – Area, zone, and/or habitat adjacent to streams, lakes, or other natural free water which have a predominant influence on associated vegetation or biotic communities.

Riparian community type - A recurring, classified, defined, and recognizable assemblage of riparian plant species.

Riparian ecosystems - (1) Those assemblages of plants, animals, and aquatic communities whose presence can be either directly or indirectly attributed to factors that are water influenced or related. (2) Interacting system between aquatic and terrestrial

situations, identified by soil characteristics and distinctive vegetation, which requires or tolerates free or unbound water.

Riparian species - Plant species occurring within the riparian zone. Obligate species require the environmental conditions within the riparian zone; facultative species tolerate the environmental conditions, therefore, may also occur away from the riparian zone.

Roots – The portion of a plant which is generally underground and functions in nutrient absorption, anchorage, and storage of food and waste products.

Root wad – A mass of roots with a 12-20 feet length of trunk that is placed into a streambank perpendicular to the flow of the stream with roots in the water. A series of root wads are placed adjacent to each other around a bend to reduce stream velocity and bank erosion and to provide fish habitat. Generally, the root wads are dead materials and will not sprout.

Rotational grazing - System of pasture utilization embracing periods of heavy stocking followed by periods of rest for herbage growth recovery during the same season.

Roughage - Consists of pasture, silage, hay, or other dry fodder. It may be of high or low quality. Roughages are usually high in crude fiber (more than 18 percent) and relatively low in NFE (approximately 40 percent).

Rufous – Reddish brown.

Rugose – Rough, covered with wrinkles.

Rumen - The first compartment of the stomach of a ruminant or cud-chewing animal, i.e., cow, sheep, deer, elk, etc.

Saline soil – A soil condition in which soluble salts are present in the soil in sufficient quantities to affect the ability of plants to absorb water from the soil. Measured in deciSiemens per meter (dS/M) or millimhos per centimeter (mmhos/cm) the following quantifies the ranges of salinity: <2 not saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; and >16 strongly saline.

Salt tolerance - Relative ability of a plant to reproduce and grow under saline conditions.

Samara – Dry, one-seeded fruit with a membranous wing.

Scale – Bud covering or tiny, blunt leaf.

Scalping - Removal of vegetation before mining.

Schizocarp – Winged, paired samara-like fruits, e.g., maples.

Scurfy – Scaly or flaky on the surface.

Seasonal carrying capacity - The stocking rate that is economically and environmentally sustainable for a particular grazing unit for the entire grazing season.

Seasonal utilization rate - The fraction of the annual forage production that will be harvested by the grazing livestock.

Seed – A fertilized ripened ovule of a flowering plant.

Seed, certified - The progeny of foundation, registered, or certified seed that is handled to maintain satisfactory purity, as certified by a certifying agency, e.g., the Idaho Crop Improvement Association, Incorporation. A system whereby the seed of plant cultivars (and pre-varietal releases) is produced, harvested, and marketed under authorized regulation to ensure seed of high quality and genetic purity.

Seed certification classes - Classes of seed produced by a grower to ensure the purity of the genetic material. Seed, which undergoes the certification process, is typically inspected during the growing season or at harvest and is tested. Certification classes include: Breeder, Foundation, Registered, Certified, and Common. See also "Breeder seed," Foundation seed," "Registered seed," "Certified seed," and "common seed."

Seed certifying agency - General term for the State or other agency responsible for the release and certification of crop varieties, and for inspecting and approving seed produced under one of the seed certification classes. Most seed certification agencies are members of the Association of Official Seed Certifying Agencies (AOSCA).

Seed, dormant – Live seed in a non-germinative condition because of internal inhibitions in the seed; i.e., hard seed, or unfavorable environmental conditions.

Seed, hard – Live seed in a physiological condition that prevents or delays germination, even when a favorable environment exists.

Seed inoculation - The addition of effective *Rhizobia* bacteria on a culture to legume seed prior to planting. Treatment of legume seed with rhizobium bacteria before planting to enhance subsequent nitrogen fixation. This promotes N fixation.

Seed lot - A definite quantity of seed identified by a lot number, every portion or bag of which is uniform, within permitted tolerances, for the factors that appear on the labeling.

Seed purity – The percentage of the desired species in relation to the total quality, including other species, weed seed, and foreign matter. See "Ppure Llive Sseed."

Seed scarification – Mechanical or acid treatment of seed coats to improve moisture absorption and enhance germination.

Seedbank – Seed stored in the soil, generally as hard or dormant seed, which are viable and will germinate given proper conditions. This seedbank is principally built up by seed-producing plants growing on or adjacent to the site over many years. Species long gone may still be represented if their seed is especially long-lived.

Seedbed preparation – Soil treatment prior to seeding to: enhance the soil surface layer for seed deposition and optimum opportunity for germination and seedling growth; reduce or eliminate existing vegetation; reduce the effective supply of weed seed; modify physical soil characteristics; and enhance temperature and water characteristics of the microenvironment.

Seedhead – The inflorescence (flowering part) of a grass where the seed will develop.

Selected class release - (1) Seed that is the progeny of rigidly selected seed or stands of untested parentage that has promise but not proof of genetic superiority, and for which geographic source and elevation shall be stated on the certification label. (2) One of the classes of pre-varietal releases recognized by AOSCA.

Selection - Selecting an accession or accessions from an assembly, or individuals from within an accession, to obtain the plants having the best characteristics for a particular conservation use.

Selective herbicide - A chemical that is more toxic to some plant species than to others.

Self pollination - The transfer of pollen from the anther of a flower to the stigma of the same flower, or different flowers on the same plant.

Senesce – The yellowing and withering of older, lower leaves of plants as higher, younger leaves shade them. Nutrients in the older leaves are translocated to younger tissue.

Senescence – Refers to old age, decline in health.

Seral - Refers to species or communities that are eventually replaced by other species or communities within a sere.

Seral community - One of a series of biotic communities that follow one another in time on any given area. Synonym: successional community.

Seral stages - The developmental stages of an ecological succession.

Sere - All temporary communities in a successional sequence. The complete series of ecological communities occupying a given area over hundreds or thousands of years from the initial to the final or climax stage.

Serrate – Fine, sharp teeth that point upward or forward along the leaf margin.

Serrulate – Finely saw-toothed leaf margin.

Sessile – With no stalk or petiole.

Setose – Leaf margins are covered with bristles.

Shade tolerance – Relative ability of a plant to reproduce and grow under shade.

Showy – Attractive, pertaining to aesthetic value.

Shrub – A plant that has persistent, woody stems, a relatively low growth habit, and generally produces several basal shoots instead of a single bole. It differs from a tree by its low stature and non-arborescent form.

Sinus – The space between lobes.

Slope – A term of measurement in percentage indicating the increase in height over distance measured. An increase of 1 foot over a distance of 5 feet is expressed as a 20 percent slope.

Snag – A standing dead tree used by many species of birds and mammals for feeding, nesting, and cover.

Sod – Vegetation that grows to form a mat of soil and vegetation, i.e., turf.

Sod grass – Stoloniferous or rhizomatous grasses that form a sod or turf.

Sod seeding - Direct drilling of seed into sod of existing vegetation with no mechanical seedbed preparation.

Sodic soil – A soil with pH >8.5 that contains sufficient sodium to adversely affect plant growth, plant production, and soil structure. Sodic soils may be associated with saline soils.

Softwood – Generally, one of the botanical groups of trees that, in most cases, have needle or scale-like leaves; the conifers; also, the wood produced by such trees.

Soil application - Chemical applied mainly to the soil surface rather than to vegetation.

Soil bioengineering – Integrating living woody and herbaceous materials with organic and inorganic materials to increase the strength and structure of the soil.

Soil incorporation - Mechanical mixing of a chemical with the soil.

Soil injection - Mechanical placement of a chemical beneath the soil surface with a minimum of mixing or stirring.

Soil sterilant - A biocide that prevents the growth of plants and kills all living organisms when present in the soil. Soil sterilization effects may be temporary or permanent.

Soil texture – The relative portion of sand, silt, and clay in the soil.

Source-identified seed - (1) Source identified propagating materials are seed, seedlings, or other propagating materials collected from natural stands, seed production areas, seed fields, or orchards where no selection or testing of the parent population has been made. (2) One of the classes of pre-varietal releases recognized by AOSCA.

Species composition – The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

Spoil - Overburden material disturbed or removed from its natural state, or non-ore material removed in gaining access to the ore or mineral material during the mining process. Spoil and mining waste materials are disposed of or piled in waste dumps and/or spoil piles.

Sprout – A tree or shrub that grows from the stump or root sucker of a parent plant (not of seed origin).

Spur – A saclike or tubular projection on a sepal or petal, or a very short fruiting branchlet on apple, pear, or other woody plants.

Stage of maturity – The development of a forage used to describe a point in time in its progress toward maturity and readiness for harvest of forage, hay, or seed.

Stalked bud - Bud whose outer scales are attached to stalk above the base of the bud axis.

Stamen – Male organ in the flower, pollen bearing.

Stand - (1) A population of plants. (2) Density of population or number of individuals per unit area.

Standard plant - (1) A commonly used species or, if available, variety for which an evaluation is being made. (2) A plant which serves as the standard for comparison.

Stem – The portion of a plant that supports the branches; in trees, also called the bole.

Stocking rate - The total number of animals or live weight assigned to the cell for the grazing season.

Stocking density - The total number of animals or live weight assigned to a specific paddock for the grazing period.

Stockpiling – Allowing standing forage to accumulate for grazing at a later period, often for fall and winter grazing after dormancy.

Stolon – A horizontal stem which grows along the surface of the soil and roots at the nodes.

Stomata – Minute openings on the surface of leaves and stems through which gases (e.g., oxygen, carbon dioxide, water vapor) and some dissolved minerals pass into and out of plants.

Stomatiferous – Many pores on the epidermis of a leaf and appearing as many white dots or nodes.

Stone – A hard, one-seeded endocarp of a drupe.

Strain - (1) A group of organisms of common origin having one or more definite morphological or physiological characteristics that are heritable. (2) A term to include breed differences within a species, or as a group of plants differing little, if any, in morphology yet physiologically distinct in some additional quality such as yield or vigor: i.e., the northern and southern strains of smooth brome. Strain also means variety, ecotype, biotype, type, or a group of these.

Striate – With fine longitudinal lines or ridges.

Strip grazing - Confining animals to an area of forage to be consumed in a short period of time, usually a day.

Strobili – Inflorescence marked by scales, as in a cone.

Stubble – The basal portion of herbaceous plants remaining after the top portion has been harvested either mechanically or by grazing.

Study - An activity at a PMC that develops a product to address a conservation need identified in the PMC LRP. A PMC study must be outlined in a study plan and be identified in the PMC Business Plan and Workload Analysis. Refer to Part 540.12 of the NPMM for more information on PMC studies.

Study plan - A comprehensive document that outlines the details of a PMC study. Refer to Part 540.12 of the NPMM for more information on PMC study plans.

Subcordate – Nearly heart shaped.

Subglobose – Somewhat or nearly round.

Subopposite – A bud/leaf arrangement in which they are close to being opposite from each other, but one is slightly lower than the other.

Subsessile – Nearly stalkless.

Subshrub – A woody or somewhat woody, perennial, winter hardy plant. The stems annually die back partially or wholly to ground level. Resprouts every spring.

Subspecies - A grouping within a species used to describe geographically isolated variants, a category above "variety," and is indicated by the abbreviation "ssp." in the scientific name.

Succession - (1) The progressive replacement of plant communities on a site which leads to the potential natural plant community, i.e., attaining stability. Primary succession entails simultaneous successions of soil from parent material and vegetation. Secondary succession occurs following disturbances on sites that previously supported vegetation, and entails plant succession on a more mature soil. (2) The progressive development of vegetation toward its highest ecological expression, the climax replacement of one plant community by another.

Sucker (suckering) – A shoot arising from a root or lower part of the stem of a plant. Synonymous with sprout.

Sulfate - A chemical compound containing the sulfate (SO4) radical. Sulfates are salts or esters of sulfuric acid formed by replacing one or both of the hydrogens with a metal (e.g., sodium) or a radical (e.g., ammonium or ethyl). Sulfates are widely distributed in nature. Barium sulfate occurs as barite; calcium sulfate is found as gypsum, alabaster, and selenite; and Epsom salts is magnesium sulfate.

Sulfide - A mineral compound characterized by the linkage of sulfur with a metal. Some examples of sulfides include galena (with lead), chalcopyrite (with copper), and pyrite (with iron).

Sunscald – A type of winter injury in which the bark on the southwest side of a stem, branch, or trunk is killed.

Suppressed – The condition of a plant characterized by low growth rate and low vigor due to competition.

Surfactant - A material that facilitates and accentuates the emulsifying, dispersing, spreading, wetting, and other surface-modifying properties of herbicide formulation.

Suspension - A system consisting of very finely divided solid particles dispersed in a solid, liquid, or gas.

Sward - The grassy canopy of a pasture.

Swath – A strip of cut herbage lying on the stubble left by a cutter bar, blade, flail, rotary drum, mower, mower-conditioner, binder, swather, or small grain head on a combine. Swaths are wider than windrows and have not been subjected to raking.

Symbiotic nitrogen fixation - The fixation of atmospheric N by Rhizobia growing in nodules on roots of legumes.

Synergism - Cooperative action of different chemicals or organisms such that the total effect is greater than the sum of the independent effects.

Synthetic variety - Advanced generation progenies of a number of clones or lines (or of hybrids among them) obtained by open pollination.

Tacking/Tackifying - The process of binding mulch fibers together by the addition of a sprayed natural or artificial chemical agent.

Tailings/tailing impoundment - The refuse material resulting from washing, concentrating, or treating ground/crushed ore that is discharged from a mill.

Tailing pond/tailing dam - A pond of water with a constraining wall or dam into which mill effluents (tailings) are deposited.

Taproot – A plant root system dominated by a large primary root, normally growing straight downward, from which most of the smaller roots spread out laterally.

Terminal bud – Bud at the tip or distal end.

Testcross - A cross of a double or multiple heterozygote to the corresponding multiple recessive to test for homozygosity or linkage.

Tested Seed - (1) Seeds or plants that have been through additional testing on more than one generation and, will include testing on multiple sites with replicated plots to verify performance and heritability of desirable traits. The material has proven genetic superiority or possesses distinctive traits for which heritability is stable as defined by the certifying agency. (2) One of the classes of pre-varietal releases recognized by AOSCA.

Tetraploid - An organism having 4 basic sets of chromosomes.

Tiller – (1) An erect shoot that arises from the crown of a grass. (2) A grass that is growing tillers. (3) The asexual development of a new plant from a meristematic region of the parent plant. (4) A branch or shoot originating at a basal node in a grass.

Tomentose – Densely wooly, soft hairs; matted.

Topcross progeny - Progeny from outcrossed seed of selections, clones, or lines crossed with a single variety or line that serves as a common pollen parent.

Topsoil - The upper surface lay of soil, usually darker and richer than the subsoil, that is naturally present and necessary for the growth and regeneration of vegetation on the surface of the earth.

Total annual production – The annual production of a single species or all plant species of a plant community.

Total digestible nutrients (TDN) - The sum of the digestible crude protein, digestible nitrogen-free extract, digestible crude fiber, and 2.25 times the digestible ether extract (fat). This value is often calculated from ADF. It is less accurate than NE for formulating diets containing both forage and grain. Most rations are now formulated using NE; however, TDN is still used to calculate beef cow rations where the diet is primarily forage.

Toxic Spoil/Waste - See "acid spoil". Includes acid spoil with pH below 4.0. Also refers to soil or water having amounts of toxic, heavy metals in excess of Environmental Protection Agency standards and usually have adverse effects on plant growth. Heavy metals include aluminum, arsenic, copper, lead, iron, and manganese.

Translocated herbicide - A herbicide that is distributed throughout the plant from the point of entry. Synonymous with systemic herbicide.

Transplant – A plant which has been removed from its original seedbed and replanted one or more times (common in nurseries).

Tree – A woody perennial, usually a single stemmed plant, which has a definite crown shape and reaches a mature height of at least 4 meters. The distinction between woody plants known as trees and those called shrubs is gradual. Some plants grow as either trees or shrubs.

Tree or brush revetment – A soil bioengineering technique using whole trees or shrubs attached together to form a porous barrier to the toe of an eroding bank. The revetment slows the stream's current, diverts the current away from the bank, traps sediment from the stream, and reduces sloughing of the eroding bank. Generally, the trees or shrubs are dead and will not sprout.

Trend - The direction of change in ecological status or resource value rating observed over time. Trend in ecological status should be described as toward, or away from the potential natural community, or as not apparent. Trend in a resource value rating for a specific use should be described as up, down, or not apparent. Trends in resource value ratings for several uses on the same site at a given time may be in different directions, and there is no necessary correlation between trends in resource value ratings and trend in ecological status. Some agencies use trend only in the context of ecological status. Synonym: range condition trend. See "apparent trend."

Trifoliate - Three leaflets per leaf.

Trilobed – Three-lobed, e.g., leaves or fruits.

Truncate – Shape of leaf base that attaches to the petiole, ends abruptly, as if cut off.

Trunk – Main stem or bole of a tree.

Tuber – A short, thickened organ; e.g., potato.

Two ranked – Appearing to come from only two sides of a twig; not equally distributed around the twig, e.g., elm.

Type - A group of varieties so nearly similar that the individual varieties cannot be clearly differentiated except under special conditions. For further information, refer to the Federal Seed Act Rules and Regulations.

Umbel – Flower cluster with peduncles springing from the same point.

Understory – Plants growing beneath the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or tall shrub canopy.

Undesirable species – (1) Species that are not readily eaten by animals. (2) Species that conflict with, or do not contribute to, the management objectives.

Usable forage – The portion of the standing forage crop that can be grazed without damage to the forage plant. It varies by species, season of use, and companion plant species.

Use groups - The artificial grouping for the comparative testing of plant materials having similar uses.

Valvate – Edges coming together without overlapping.

Variety - (1a) The botanical nomenclature division consisting of more or less recognizable entities within a species that are not genetically isolated from each other, below the level of subspecies, and is indicated by the abbreviation “var.” in the scientific name (see “botanical variety”); (1b) The rank of taxa below subspecies but above forma; a plant which retains most of the characteristics of the species, but differs in some way such as flower or leaf color, size of mature plant, etc. A variety is added to the specific binomial and preceded by "var.," such as *saxatilis* in the epithet *Juniperus communis* var. *saxatilis*. (2) Term used in some national and international legislation to denominate one clearly distinguishable taxon from another; equivalent to “cultivar.” (Note: the PMP does not recognize the terms “variety” and “cultivar” as equivalent.)

Vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates the aspect or physiognomy of the area. Synonym: type.

Vegetative - A term designating stem and leaf development in contrast to flower and seed development.

Venation – Pertaining to the vein pattern in the leaf blades.

Vertical bundle – A soil bioengineering technique using bundles of willow cuttings, placed in vertical trenches along an eroding bank. These cutting bundles extend from the streambed to the top of the bank, are covered with soil, and staked into the bank. The bundles will sprout branches and roots that will help stabilize the bank. This technique allows the planting of woody plant materials in areas where digging is difficult or impractical.

Vesicular – Arbuscular Mycorrhizae Fungi (VAM) or Vesicular Mycorrhizae (VM): These are symbiotic fungi that live within a plant's root system. The term "mycorrhiza" means fungus-root. Mycorrhizal fungi produce hyphae (small filament-like tubes) that grow within plant roots and extend out into the soil. Also, the fungi produce spores that function as dispersal mechanisms and long-term survival agents. The plant provides carbohydrates and other essential nutrients to the fungus that the fungus cannot produce, and the fungus provides immobile nutrients such as phosphorus, iron, zinc, and copper, and mobile nutrients such as nitrogen and calcium to the plant.

Vigor – Relates to the relative robustness of a plant in comparison to other individuals of the same or similar species. Primarily the size and, perhaps, color of a plant and its parts in relation to its age and the environment in which it is growing reflect it.

Warm-season plant - A plant that completes most of its growth during the warm part of the year, generally late in spring and summer (C-4 plant).

Water table – The highest point in a soil profile where water continually saturates the soil on a seasonal or permanent basis.

Water tolerance - Relative ability of a plant to reproduce and grow under saturated or flooded conditions.

Wattle – See "willow bundle."

Weed – (1) Any growing unwanted plant. (2) A plant having a negative value within a given management system.

Weed barrier material – A weaved carbon-based material commonly used in windbreak and shelterbelt applications to retard or reduce weed growth, weed competition, and to enhance moist retention through reduction in evaporation and competitive use by other plants.

Wetland communities - Plant communities that occur on sites with soils typically saturated with, or covered with, water most of the growing season.

Wetlands – Areas characterized by soils that are usually saturated or ponded; i.e., hydric soils, and that support mostly water-loving plants; i.e., hydrophytic plants.

Whorl – A group of three or more leaves at a node.

Wildlife habitat – The environment of an animal, ideally providing all elements required for life and growth; food, water, cover, and space.

Wildlife value – A rating value of woody plants to wildlife species.

Willow bundle – A bundle of willows used in a number of soil bioengineering techniques. When the bundles are placed in the soil, they will sprout branches and roots to help stabilize the bank. See "horizontal bundle" and "vertical bundle."

Windbreak – One or more wind barrier rows of living trees and shrubs maintained for the purpose of protecting fields, crops, feedlots, roadways, homes, gardens, orchards, etc.

Windbreak suitability group – A guide for selecting the species best suited for different types of soil and for predicting height growth and performance on those soils.

Windrow – (1) Curing herbage dropped or raked into a narrow swath sized to be picked up easily by the head of a baler, combine, or forage harvester. (2) To cut or rake into windrows.

Wolf plant – (1) An individual plant that is generally considered palatable, but is not grazed by livestock. (2) An isolated plant growing to extraordinary sizes, usually from lack of competition or utilization.

Woody – A term used in reference to trees, shrubs, or browse that characteristically contain persistent ligneous material.

Xeric – Having very little moisture; tolerating or adapted to dry conditions.

Xylem – The tissue in higher plants which transports water, dissolved salts, minerals, and other materials (e.g., pesticides) from roots to aerial portions of the plant.

Yield – (1) The quantity of a product in a given space and/or time. (2) The harvested portion of a product.

References

A Glossary of Terms Used in Range Management. SRM. 3rd Edition. 1989.

Association of Seed Certifying Agencies, 1993.

Bentrup, G., and J.C. Hoag, The Practical Streambank Bioengineering Guide, USDA-NRCS, Aberdeen Plant Materials Center, May 1998.

Biodiversity of Rangelands, Neil E. West, Journal of Range Management 46:1, January 1993.

Biology, C.A. Villee, 1977.

Biology of Plants, P.H. Raven, R.F. Evert, and H. Curtis, 1981.

Federal Native Plant Conservation MOU, 1994

Forest Ecology, S.H. Spurr and B.V. Barnes, 1980.

Genetics: Its Concepts and Implications, A.C. Pai and H. Marcus-Roberts, 1981.

Genetics, Elseth and Baumgardner, 1984.

Glossary of Crop Science Terms, Crop Science Society of America, July 1992.

Glossary of Genetics and Cytogenetics-Classical and Molecular, R. Rieger, A. Michaelis and M.M. Green, 1976)

Glossary, Natural Resources Conservation Service, National Handbook of Grazing Land Ecology and Management, draft, 12/93.

Glossary of Terms Used in Range Management, Society for Range Management, 1989.

International Plant Genetic Resources Institute, 1995.

North Dakota Tree Handbook, NDSU-USDA (NRCS), 300+, 1996.

Practical Handbook of Disturbed Land Revegetation, Frank F. Munshower, 1994.

Policy on the Use of Native Plant Materials in Restoration and other Revegetation Projects, Pacific Southwest Region, USFS, Draft 1994.

Resource Conservation Glossary, Soil Conservation Society of America, Third Edition, 1982.

A.G. Tansley, Ecology, 1935 as reprinted in The Fundamentals of Ecology and Field Biology, R.L. Smith, 1977).

The American Heritage Dictionary of Science, Houghton Mifflin Company, Boston, 1986.

The North Dakota Tree Handbook, NDSU, USDA-NRCS, NDSSCC, 1996.

The Fundamentals of Ecology and Field Biology, R.L. Smith, 1977.

USDA-NRCS, California native plant policy, 1994.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

542.2 Plant Nomenclature

The scientific, or Latin, names of plants, both wild and cultivated are formulated and written according to rules governed by the *International Code of Botanical Nomenclature,* July 2005 (Vienna Code). Distinguishable groups of cultivated plants, whose origin or selection is due primarily to mankind, are given epithets (i.e., names, such as cultivar names) formed according to the rules and provisions of the *International Code of Nomenclature for Cultivated Plants*, February 2004. The aim of these codes is to promote uniformity, accuracy and stability in formulating the scientific names of all plants (Botanical Code) and in formulating the cultivar names of agricultural, forestry, and horticultural plants (Cultivated Plant Code). The following text is adapted from these two Codes.

Genus and Species Names

Plant names may include a genus, specific epithet, a name rank below species (such as a subspecies and/or botanical variety), Latin name authorities, and the cultivar or release name. The genus, species, and variety or subspecies names are always italicized or underlined. Authorities should always be included with the Latin name the first time the plant name is used. A scientific plant name may be written in either of the following ways:

Ammophila breviligulata Fern. OR <u>Ammophila breviligulata</u> Fern.

Hybrid Names

Validly published hybrid names are signified by the symbol "x" and are not italicized. Hybrids at the generic level are written with an "x" immediately prior to the genus name, such as in the following example:

xElyleymus colvillensis (Lepage) Barkworth

For a hybrid at the species level an "x" is placed immediately prior to the specific epithet, as in this example:

Quercus xdeamii Trel.

(Quercus xdeamii was found to be a product of the cross Quercus macrocarpa Michx. x Quercus muehlenbergii Engelm.)

Subspecific and Varietal Names

The terms "subspecies" and "variety" are used to designate the first and second divisions of a species. A "subspecies" is a grouping within a species used to describe geographically isolated variants, a category above "variety", and is indicated by the abbreviation "subsp." in the scientific name. A "variety" consists of more or less recognizable entities within species that are not genetically isolated from each other, below the level of subspecies, and are indicated by the abbreviation "var." in the scientific name. These terms are not italicized.

When the subspecies or variety name is the same as the specific epithet (this is called a typical expression), then the authority is included only after the species name, as in the following example:

Cornus sericea L. subsp. sericea

When the subspecies name or variety is different than the species name, then both the species authority and the subspecies or variety authority are used, as in the following example:

Cornus sericea L. subsp. occidentalis (Torr. & Gary) Fosberg

Abbreviating Scientific Names

When a scientific name is used more than once, it is acceptable to abbreviate the genus name as long as the abbreviated name cannot be confused with other scientific names used in the same text. The authority name does not need to be included in the scientific name after the first time the scientific name is used. For example:

> Use Panicum virgatum L. the first time, then use Panicum virgatum OR P. virgatum thereafter.

Plant Cultivars

A "cultivar" is a taxon that has been selected for a particular attribute or combination of attributes, and this is clearly distinct, uniform, and stable in its characteristics that when propagated by appropriate means, retains those characteristics. The cultivated plants covered by the International Code of Nomenclature for Cultivated Plants may arise by deliberate hybridization or by accidental hybridization in cultivation, by selection from existing cultivated stock, or may be a selection from variants within a wild population and maintained as a recognizable entity solely by continued propagation. Cultivar names may be given to the following types of propagated materials: clones, graft-chimeras, seed (as long as the propagated material retains the unique characteristics of the parents), line, multi-line, F1 hybrids, and genetically modified plants.

The words "variety" and "form" are not synonyms for the word cultivars according to the International Code of Nomenclature for Cultivated Plants. The Code considers these terms botanical classifications. The Association of Official Seed Certifying Agencies (AOSCA) considers the terms "cultivar" and "variety" equivalent. Because of the confusion with using the term variety to describe a cultivar, the Plant Materials Program does not consider variety and cultivar synonymous.

Formulating Cultivar Names

The following rules will be used when formulating cultivar names according to the International Code of Nomenclature for Cultivated Plants, 2004:

- Cultivar epithets must be a word or words in the modern English language. Latin word or words which may be considered Latin may not be used unless they are the classical name or an ancient Roman person, or of a place.
- Cultivar epithets may not be repeated within a genus, species or denomination class. A denomination class is a grouping of similar genera. For example, the same cultivar name may not be applied to a species of both Festuca and Lolium. [Note: the NPMC has lists of denomination classes that are checked when clearing names for new cultivar releases.]
- Cultivar epithets must consist of no more than 10 syllables and no more that 30 letters or characters, excluding spaces and demarcation marks. [Note: the Plant Materials Program limits the length to 30 characters, including spaces and excluding demarcation marks, because of database restrictions.]
- Cultivar epithets may not consist solely of common descriptive words (such as 'Large' or 'Variegated') in a modern language unless the descriptive word is used with a non-descriptive word (such as 'Velvet Cream'), or unless the epithet is a recognized name of a color (such as 'Indigo' or 'Majestic Red').
- Cultivar epithets may not contain the following words: variety, var., cross hybrid, grex, group, maintenance, mutant, seedling, selection, sport, strain, improved, and transformed.

- Cultivar epithets may not contain punctuation marks except for the apostrophe (‘), the comma (,), a single exclamation mark (!), the hyphen (-), and the period (.).

Writing Cultivar Names

The full name of a cultivar is the accepted botanical name in Latin form, followed by the cultivar name. Each word of a cultivar epithet must start with an initial capital letter unless it is a word after a hyphen or a conjunction or preposition which is not the first word of the epithet. Cultivar names are indicated by enclosing the name within demarcation single quotation marks (‘…’).

The following are examples of the proper method to write a cultivar name”

Spartina patens ‘Sharp’

Panicum virgatum ‘Cave-in-Rock’

Double quotation marks and the abbreviations “cv.” and “var.” are not to be used within a name to distinguish cultivar epithets. Note that past usage of the abbreviation “cv.” is no longer acceptable. The following methods must **not** be used when writing cultivar names:

Spartina patens “Sharp”

Spartina patens cv. Sharp

Common Names

There is no authority on writing common names for plant species. The commonly accepted convention for common names is all letters in lowercase except for capitalizing the first letter of the parts of a common name which are proper nouns. The following are correct methods of writing common names:

bitter panicum

eastern gamagrass

Utah sweetvetch

Sargent crabapple

References

J. McNeill, F. R. Barrie, H. M. Burdet, V. Demoulin, D. L. Hawksworth, K. Marhold, D. H. Nicolson, J. Prado, P. C. Silva, J. E. Skog, J. H. Wiersema, N. J. Turland (eds.). 2006. International Code of Botanical Nomenclature (Vienna Code) adopted by the Seventeenth International Botanical Congress, Vienna, Austria, July 2005. Regnum Vegetabile 146.

C.D. Brickell (Commission Chairman), B.R. Baum, W.L.A. Hetterscheid, A.C. Leslie, J. McNeill, P. Trehane, F. Vrugtman, J.H. Wiersema (eds.). 2005. International Code of Nomenclature for Cultivated Plants. 7th Edition, adopted by the IUBS Commission for the Nomenclature of Cultivated Plants February 2004. Regnum Vegetabile, 144.

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

542.3 Guidelines for Preparing Botanical Specimens

Preparing Botanical Specimens

The collection and pressing of plant materials that are to be released by a PMC is an important part of the formal release process. Plant mounts need to be prepared for all of the five release types recognized by NRCS. Botanical specimens prepared for cultivars or varieties should include a "standard" specimen. The standard is the official botanical mount which identifies the unique features of the cultivar release, and can be used to differentiate one cultivar from another. Standards are usually deposited with the registrar for a species or in the National Arboretum's standards collection.

Plant mounts can assist in supporting the identification of superior phenotypic characteristics that may be present in a plant release (e.g., leaf width, color, etc.). Desirable specimens may only be available during a particular season of the year. If a large number of plants are collected and pressed when the opportunity occurs, they can be identified later when more time is available. Another reason for collecting plants is so that the identification may be checked by submitting the specimen to an authority. Most experts are willing to check material if the specimen is well collected and pressed and has complete and accurate data attached. (Harrington 1985)

Collection

The first consideration when starting a plant collection is to ensure that representative specimens of the species are collected and that the specimen includes all the plant parts needed for proper identification. Select an average plant or collect several specimens to show the range in variation. Collect a plant with both flowers and fruits if possible, or make collections of different plant parts over the growing season. Whenever possible, the entire plant should be collected, including the roots if the plant is herbaceous. The roots may contain important identifying features, such as bulbs, corms, and rhizomes, and give clues as to whether the plant is an annual or perennial, or is a bunch-type or rhizomatous.

Appropriate tools are necessary in order to conduct field collections. A digging tool such as a pick, shovel, hand trowel, or a strong hunting knife is necessary for digging the roots of some species. A pair of clippers or a sharp knife is needed to cut off twigs and other parts of woody plants. If plants are not being pressed immediately in the field, then a container is necessary to prevent desiccation. The most convenient method is to place specimens into Ziploc™ type plastic bags. A special container called a vasculum, which is specifically made for this purpose, can be purchased from forestry or herbarium supply catalogues. Another option is to place the plant at once into a temporary press called a hand press. A hand press consists of many single sheets of paper within a stiff cover, supported by straps, attached to a handle for convenience in carrying. Once the specimens are brought back to the laboratory, they may be transferred to a full size press until ready for mounting. (Harrington 1985)

Field Preparation

Large plants may be folded to fit the press, or representative portions can be selected when dealing with very large plants. For instance, when preparing woody specimens such as Pinus, a representative sample would include the leafy branches, seed-producing and pollen-producing cones, and bark (Benson 1979). Another important point to make is that the plant be placed in the press immediately upon collection because it is impossible to make a good specimen from a wilted plant. Accurate collection information needs to be kept about each plant, preferably with the plant specimen, as most of this information will appear on the label.

If a label is misplaced or its information is inaccurate, it can cause a great deal of trouble and confusion later on. (Harrington 1985)

Mounting Permanent Specimens

To prepare for permanent mounting, the plant specimen should be arranged to show distinguishing features and thoroughly dried. To start, the specimen should be placed in a once-folded newspaper sheet approximately 16.5 x 11.5 inches in size. The accession number or other identifier for the plant should be noted on this sheet. The plant should be arranged so that the floral parts and other distinguishing features are well displayed. If necessary, you may bend the stem one or more times and/or remove some leaves. Place the folded newspaper sheet containing the pressed specimen between two more sheets of folded newspaper, which act as blotters to soak up moisture from the plant. Replace these blotters with dry ones as needed. If the specimens are needed in a hurry or if the air is humid, then it is necessary to use artificial heat to dry the fresh specimens. Although more expensive than newspapers, some botanists prefer to use soft felt blotters, which can be ordered from a herbarium supply store, such as Pacific Papers™.

When the plant has been pressed flat and is completely dry, it is placed onto a thin cardboard sheet 11.5 x 16.5 inches in size and mounted. The pressed specimen is then glued or taped to the sheet to hold it in place, leaving space in the bottom right-hand corner for the label. Herbarium supply stores sell acid free mounting paper and acid free herbarium glue and tape. These materials allow specimens to be preserved indefinitely, but they can be expensive and are generally only used in a herbarium setting. (Harrington 1985)

Labeling

Having accurate and complete information on the label is essential. The following information **must** be on the permanent label:

- Scientific name;
- Common name;
- Cultivar name (if applicable);
- The NRCS accession or Plant Introduction number;
- Collection location information, such as State, county, city/town, road names, and landmarks so that the original site may be relocated if needed;
- Details of the collection site including latitude and longitude, elevation, aspect, and soil conditions at the site;
- Date collection was made; and
- Collector's name and address.

The following information may be optional depending on the species being collected:

- Color of the flowers, as they may be partially or completely obscured in the pressing;
- Height of the plant if only a portion of the plant was collected;
- The location of the plant the sample collected from, such as whether from decumbent, prostrate, or ascending branches; and
- Any technical information that is needed to identify the plants but does not show up well on pressed specimens. This may be floral characteristics such as the depth of indentation in the lobes of the calyx or the relative lengths of the stamens.

Storage

The pressed and mounted specimens should be stored in a place that is easily accessible and away from excessive heat and moisture and potential insect damage. Specimens should be deposited in a herbarium for long-term preservation.

The most common practice of arranging specimens in a herbarium is to place the species of a genus in a folded cardboard cover and to arrange the genera by families. These folders can be stored in cabinets or cases, but they should be monitored to prevent damage from insects. (Harrington 1985)

Literature Cited

Benson, L. D. 1979. Plant Classification. Lexington, Mass.: Heath.

Harrington, H. D. 1985. How to Identify Plants. Athens, Ohio: Swallow Press.

Prepared by:

Travis M. Bean

Tucson PMC, Tucson, Arizona

August, 1999

Detailed information for preparing herbarium specimens, and for preparing "hard to prepare" herbarium specimens may be found in:

USDA Agriculture Information Bulletin No. 348

Washington D.C.

Issued September 1971

Prepared by: C. Earle Smith, Jr., Botanist, USDA-ARS, Beltsville, Maryland

This publication may be obtained from the National Plant Materials Center or from the Southern Illinois University, Carbondale Web site at:

"http://www.siu.edu/~ebl/prepare.htm"

Title 190 – National Plant Materials Manual

INTENTIONALLY LEFT BLANK

(190-V-NPMM, Fourth Edition, July 2010)

542.4 Photographing Plant Materials

United States
Department of Agriculture

Natural Resources
Conservation
Service

Plant Materials Photography –
A Basic Overview

Making effective photographs of plants on location or in a controlled environment is demanding. It requires patience, planning, and an understanding of photographic processes, lighting, and composition. Always remember that you are making photographs, not just taking pictures. The difference can readily be seen and is determined by your effort and skill. The following guidelines will help provide a basic understanding of the equipment, techniques, and effort needed to help make your photography of plant materials successful.

The Plant as Subject

Success in photographing plant materials requires time and careful study. Many plants are delicate, colorful, highly detailed, and must be observed for a period of time to determine their best and most visible attributes. Plants are individuals-each species has its own "personality." And, it's the photographer's responsibility to depict each plant in a way that portrays its best visual qualities while also providing appropriate technical information about the plant for the viewer.

Much of the photographer's time in working with plant materials involves searching. Photographs don't just happen, they're made! So the time one spends viewing a single plant or a landscape filled with a variety of plants will greatly improve the photographer's understanding.

Grasses that are slender, tall (10 inches and up) or generally found in small bunches (switchgrass, for example) may perhaps best be photographed as individuals rather than in bunches. This may help highlight details such as seed heads or leaf blades. Grasses that are used for lawns or other carpet-like purposes may best be photographed in mass.

Plants that flower or produce berries may best be photographed while in one of these stages whenever possible. The photographer has the choice of an overall view of the subject or a close up of a branch or stem in flower. Consider how the image will be used (slide show, color magazine layout) and the subject's most important features when determining the best view.

Before making any photographs look at the areas around, behind, or under plants. Dead stems, leaves or foreign material may degrade the subject and should be removed. Remember, the plant material is the subject and all other elements in the photograph will compete for attention. Some careful cleaning before you make the photograph will help eliminate distractions and greatly improve the image and interest for the viewer.

Equipment

Ideally, the photographer should not consider cost when choosing equipment. With photographic equipment, you usually get what you pay for. However, the following list is geared to the advanced amateur and should not be a problem for most budgets.

Cameras: Most digital cameras or 35mm single lens reflex (SLR) cameras with interchangable lenses on the market today are acceptable for plant materials photography. Nikon, Minolta, Canon, and Pentax are all excellent choices and offer a variety of lenses and features suitable for plant materials photography. You may wish to consider purchasing a camera whose maximum flash syncronization shutter speed is above the standard 1/60th of a second. Synchronization speeds of 1/125th and 1/250th are very useful when using a strobe to fill in shadow areas under daylight conditions. I generally do not suggest the use of fully automated cameras (auto exposure only) for plant materials photography. The photographer must have the capability to adjust exposures manually as lighting conditions change. Meters in many fully automated cameras under or over-compensate for some lighting conditions found in the practice of plant materials photography. And the photographer must be able to manually adjust exposures as each situation presents itself.

Lenses: A macro lens in the 50 - 60min range that accommodates one-to-one reproduction is a must. Purchase the fastest (f2.8 or faster) macro lens available. For close-ups of flowers, small grasses, small branches with leaves/flowers/berries the macro lens is indispensable. You will find a use for other lenses in the 20 - 135mm range as well. A good basic lens outfit should consist of the 50 60mm macro, 28mm, and a lens in the 85 - 105mm range. Most lenses in focal lengths above 135min would generally not be used in plant materials photography.

Tripod: Like the macro lens, a tripod is a necessary piece of equipment. I strongly recommend the Gitzo line of tripods. They are rugged, versatile, available in a wide variety of sizes, and can be purchased through most retail photographic shops.

When choosing a tripod (especially for plant materials photography) look for the following features:

- Tripod legs that will allow the photographer to obtain a firm set-up on uneven ground. This means having legs that are not braced by extensions to the center column. Legs that swing out at a variety of angles from the center are the most useful.

- A center column that will invert and allow the photographer to position the camera from below, extending toward the ground (upside down). This will help the photographer obtain angles of view that might not be possible otherwise.

- A center column that is elevated via a crank may prove useful for small adjustments in angle and position. This feature is often undesirable, but in photographing plant materials, it can be an advantage.

- Tripod legs whose leg extensions are tightened via a screw collar are preferable. Legs that are tightened via a locking lever have a tendency to slip when wet and when worn due to heavy use.

Cable Release: The use of a cable release is highly suggested any time the exposure involves shutter speeds below 1/60th of a second. Many beginning photographers think that a tripod alone will provide a stable platform. This is true in most cases. However, many situations will involve very slow shutter speeds and a tripod alone will not always guarantee that the image will be sharp.

Technique and Composition

Photographic composition of plant materials may be handled using many of the basic techniques employed with other subjects. You may not wish to "frame" your subject with another plant (like using a tree in scenic photography). But the standard rule of thirds and leading lines techniques should all be used as each situation presents itself.

When making a picture of a low growing plant mass (grasses, for example) try placing the horizon line high in the frame and move in as close as possible (with a wide-angle lens). And fill the frame with as much of the subject as possible while keeping what is on the horizon line visible. This will provide the viewer with a sense of "place" while still focusing upon the plants. It is often important for the viewer to understand how a particular plant species "fits" into the environment as well as to have a close view of the plant.

The treatment of plant materials in photography can become very subjective. I subscribe to a literal depiction in most situations. Other photographers may desire a more poetic rendering with soft focus or some type of distortion. However, the treatment applied to most images used in USDA and other government publications tend toward a literal interpretation of the subject. In short, this means well composed, properly exposed, and tack sharp!

Depth-of-field: Many beginning photographers have a difficult time understanding depth-of-field and how to control it. Simply stated, it is the area within a photograph that is of acceptable sharpness to the viewer. It is controlled by the lens opening (f-stop), the exact point of critical focus, the focal length of the lens, and the camera's proximity to the subject. Two general guidelines will help the photographer to determine the focal length of lens and lens opening when making photographs. First, the smaller the lens opening, the

greater the depth-of-field is. Second, the longer (higher focal length) the lens, the shallower the depth-of-field is. Experience is the best teacher in gaining a full understanding of which combination of factors produce the most desirable effects.

The depth-of-field used when making a picture depends upon how much of the subject the photographer wishes to be in focus and/or whether the photographer wishes to have background or foreground objects in or out of focus.

When photographing plant materials that are large or perhaps bushy (trees and shrubs) the photographer may wish (for composition purposes) to show only a tip of a branch instead of the entire subject. In this situation a relatively shallow depth-of-field may also be desired to allow the background to go out of focus. However, the degree to which this will occur will depend upon the three factors. The depth-of-field will become a function of the camera's proximity to the subject as well as lens opening and lens focal length. In some situations even an exposure at f16 may only render a part of the branch in focus.

For overall views of plant materials, a wide-angle lens may be appropriate. The photographer will want enough depth-of-field so that the entire subject is in focus. It is also important to observe the foreground and background carefully. The angle of view may require study in order to eliminate objects that compete for attention with the subject (like telephone poles, street lamps, wires, cars, and signs).

When photographing subjects that are carpet-like (legumes, grasses, and other ground covers) the photographer may wish to present the subject as a large expanse of interlaced stems. In this case the depth-of-field should be measured and coordinated with a proper point of critical focus . Generally, the photographer will want to focus about 1/3 the distance into the picture and use a small f-stop (f-11 or f-l 6). This will help insure that most of the subject is in focus at the time of exposure. To calculate the depth-of-field, examine the distance indicator marks on the lens barrel. It will show the distance to which the depth of focus will extend based on the exact point of critical focus and f-stop used (refer to your camera's manual for a diagram explaining lens depth-of-field indicators).

Lighting: Three lighting factors should be observed when determining when to photograph plant materials on location - the angle of the sun above the horizon and its direction, the quality of the light (harsh, soft, hazy, clear, overcast, etc.), and the light's color.

The angle of the sun determines the photographer's ability to create "depth" (the third dimension) in a photograph. Low sun angles (45° or less) allow the photographer to photograph the subject with strong side highlights and shadows in most cases. Therefore, the ability to create depth is great.

To view a clear example of this factor, look at a silo, or similar large, round object under two different lighting conditions. First, examine a silo (from a distance) with strong side lighting by viewing it with the sun at a 90° angle to your position. You will see the side of the silo closest to the sun in strong highlight. The opposite side will be in shadow. The visual relationship of highlight to shadow makes the silo appear round to the viewer.

Next, change your position so that the sun is at your back. The sun will cast full light upon the silo and the silo will appear flat.

Now, apply this same principle to plant materials. Trees, shrubs, even close views of grasses all have round stems, branches or general shapes and are effected the same as a silo by light. By placing the sun at the side and at a low angle, the shapes of many plant materials will be delineated by a highlight to shadow relationship and the appearance of depth will be created.

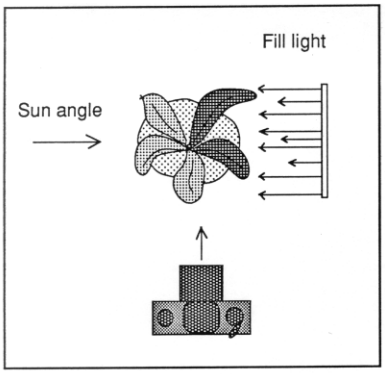
The color of light also directly affects how the plant materials will appear to the viewer. Strong low angle light in early morning or late afternoon is often very warm in color. The hours before sunset or just after sunrise are called the "Golden Hours" because they are warm and often very flattering to subjects.

Overcast days produce little or no shadows and often render a bluish cast in color photographs. Knowing how the color of light will affect the appearance of a particular subject will determine if the kind of condition and time of day chosen to make the photograph is appropriate.

The third factor to consider is timing and the light's quality. There are conditions that cause light to be soft (overcast or haze) and to be strong or harsh (clear mornings). Quality varies, so the photographer may wish to postpone a photograph if a desired effect does not exist at the time planned for making the picture. If a strong intensity is desired, this usually means shooting in the early morning or late afternoon, but varies depending upon the time of year. From April through September this means being in the field just after sunrise until about 10:00 AM and from about 3:30 PM until sunset. The period from October through March generally allows for shooting all day, as the sun is always low angle and often warm in color during this time of year.

Many of the Audubon Society, National Geographic, and general garden plant references contain photographs of high quality and will serve as excellent examples. The point is that all photographers learn from examining their own pictures and those examples around them to learn which qualities make photographs good or bad.

Lighting Aids: Even on the most beautiful days a subject may not be lighted appropriately. Deep shadows may exist or areas that should be well lit are not. The photographer has a number of aids available that will reflect light into areas that need extra illumination. Often a white piece of illustration board will add just the needed amount of light into shadow areas. A dull white card provides soft, even reflected light. Mirrors, aluminum foil, polished metal and other highly reflective materials provide direct and often harsh reflected light. These kinds of reflectors should be used with caution. The object is to add just enough light to provide added detail. This does not mean to flood a dark area to the point it overpowers the natural highlight areas. The photographer will need to experiment with a variety of reflectors to see what works in a given situation. Portable flash equipment can also be used to add light to subjects. I have often found this added equipment to be a burden rather than a help. And I prefer to work with the above kinds of reflectors because one can observe the reflected light much more easily. However, a small flash unit, properly adjusted, may be just the thing when reflected light is low or absent. I suggest that the photographer test the flash equipment in a variety of situations to learn how much and at what angles it will be able to provide assistance. A set of notes concerning the use of a particular flash-fill system will be valuable when in the field.



In this illustration, light bounced from a white card will improve the shadow detail in the subject. This technique is easily done and will help improve the photography of subjects lit by strong cross or back light.

Environmental Problems: Problems associated with wind, rain or poor sun angle cause difficulties for all photographers at times. The effort one takes to remedy the situation often is rewarded with a pleasing photograph. The point is that the photographer must often take some action or the photograph becomes impossible to salvage. There is no such thing as "focus fluid" to improve image sharpness despite the many wishes of many photographers. And excuses serve only to point out one's laziness or lack of imagination.

Wind may become a problem when photographing plant materials. When a close up of a branch or plant stem moves even just a bit, it can often result in a blurred picture. Fast shutter speeds may be used to counteract this problem. However, this may result in too shallow of a depth-of-field.

Two remedies are available for this problem. If the subject is not an endangered species, the photographer may move it to a wind-free location. This may mean cutting a stem or moving the whole plant (if possible). An alternative is to construct a wind shield that eliminates the problem. Often a person's jacket or small piece of cloth are effective. I often carry a piece of 4 ft. cloth and clothes pins on assignments for just such occasions. One other choice is to use the vehicle you are travelling in as a wind screen. This may not be practical in many situations, however. Do not be afraid to invent a remedy. I've used old fertilizer bags, the shirt off my back (but not my pants), and large pieces of plywood on occasion. And, do not shy away from asking your traveling companion to hold the screen.

Exposure: Exposure readings of plant subjects can be very deceiving. The beginning photographer may point the camera at the subject, expose the film according to what the camera's meter says is correct, and then wonder why the picture is too light or too dark. This could account for improperly made readings of subjects that are back lit or cross lit. The photographer must learn how to correctly make exposure readings for these situations. Back lit subjects (subjects that are photographed with the main light source behind the subject) with opaque leaves should be treated like any other back lit subject. Make the reading by excluding the bright sun from the viewfinder and filling the frame with just the subject (move in or back up accordingly).

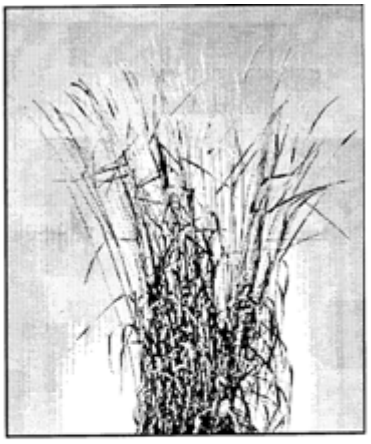
Back lit subjects with leaves that transmit some light require experimentation, but can generally be rendered well by using the camera meter reading and bracketing at least one full stop above and below. Cross lit subjects require interpretation of just how much light is falling on the subject and from what angle the photo will be made. I suggest that the photographer begin by filling the frame with half the subject in light and the other half in shadow. Then bracket exposures at least one full stop above and below the reading provided by the camera meter.

Two aids will assist photographers with exposure readings. The first is a good quality incident meter like the Minolta IIIR Incident meters read light falling upon subjects rather than reflected from the subject. Meter readings must be made from the subject at the angle from which the camera will be pointed.

An 18% gray card may also provide some assistance. This card is used to calibrate all camera meters and represents the average amount of reflected light in an average scene. It can be used to make readings in situations where the camera meter reading is in doubt. If the subject is light in value against a light background (or vice versa), the light reading may be taken off the gray card, rather than the subject. This serves little use in cross lit situations and no use for back lighting, however.

Plant Cultivar Release Photos

Use the following guidelines for making and submitting photographs for plant cultivar release brochures.



The best cultivar release cover photos are simple, sharp, and have plain backgrounds.

Cover:

Compose the photo using a vertical format.

Isolate a stem, seed head, or branch that best provides plant details. Or isolate a small bunch or grouping if shooting grasses, but be sure that stems in the immediate foreground are in sharp focus, and don't cut off the seed heads.

- Shoot during the early morning or late afternoon when the wind doesn't blow the plant(s) and the light is warm and provides depth.
- Shoot from a low angle (same height as plant or lower).
- It's OK to clip and move single stems, branches, leaves, to another location for better lighting, background, or to avoid the wind (provided the plant is not an endangered one).
- Observe the background and adjust your angle if necessary to avoid distracting elements.
- The best backgrounds are out of focus and simple (blue sky or other pleasing color - black is OK),
- Insure that you use enough depth-of-field to render the subject sharply but shallow enough to provide an out of focus background.

Supporting Photos:

- Rather than isolating plant details, show the plant in a natural environment.
- Shoot either horizontal or vertical format as appropriate.
- Fill the frame using good composition tech

Glossary

This glossary is composed of general photography related terms. Not all of the terms directly apply to plant materials photography.

Available Light - The light condition that the photographer finds existing at the subject position. The term usually implies an in door or outdoor light condition of low intensity requiring fast film, large lens opening, and slow shutter speed.

Back Light - Illumination from a source behind the subject, as seen from the camera position, which tends to silhouette the subject.

Blocked - Refers to an area of the negative image so overexposed, and therefore dense, as to obscure details and texture.

Bounce Light - Reflected light; specifically, light directed away from the subject toward some near-by light toned surface so as to reach the subject diffused by reflection.

Bracket - To make a series of exposures (some greater and some less than what is considered to be "normal") in addition to the "normal" one, with the intent of getting one near-perfect exposure.

CC Filters - Color compensating filters, intended for use in color photography to modify the overall color balance of the image. They are available in six colors and several degrees of saturation.

Click Stops - Detents in the diaphragm or shutter scale of a lens which produce a tactile indication and an audible click to mark the significant scale settings.

Contrast - Density difference, usually of adjacent areas of the image.

Coverage - The area of the image (formed by a lens) which is of useful quality. Also, the area of the subject which the lens can record as an image of useful quality.

Crop - To trim, or sometimes to cover, the boarders of an image for any reason, but usually to improve the composition.

Cross Light - Light striking the subject from one side.

Daylight - Sunlight or skylight or any mixture of the two. For the purpose of color photography, daylight is considered to have a color temperature of from about 5500 degrees K to 6000 degrees K.

Depth-of-field - The area of acceptably sharp focus around the subject position, extending toward the camera and away from it, from the plane of sharpest focus (critical focus point). The boundaries of the depth-of-field are referred to as the near limit and the far limit.

Depth of Focus - The little zone including the focal plane of the lens through which the film can be moved, toward, and away from the lens, and still record an acceptably sharp image.

Diffusion - Of light, the random scattering of rays as by transmission through a turbid medium or by reflection from a matte surface.

Dispersion - The separation of a light ray into its component colors as by a prism.

Fast - A term used to describe a lens of relative large aperture or a film of high light sensitivity.

Fill Light - Light directed into the shadow areas of a subject to improve detail lighting or reduce lighting contrast.

Flash Synchronization - The adjustment of the timing of the application of a firing current to a flashbulb and the actuation of the shutter release so that the peak flash intensity occurs while the shutter is open.

Focal Length - The distance from a lens' rear nodal point to the image plane when the lens is focused on infinity. Loosely, the "length" or "size" of a lens as expressed in millimeters.

Frame - (1) The adjustment of the position and angle of the camera with respect to the subject for the

purpose of composing the image within the boundaries of the viewfinder. (2) The useful area and shape of the film image.

Gradation - Variation in tone. Tonal range or scale.

Gray Card - A card of known reflectance, usually 18 percent, intended to be placed in the subject area and used as a meter target in the determination of exposure.

Harsh - Implies an unpleasant lack of subtlety of gradation or light distribution. Contrasty, glaring.

Highlights - The brightest light accents in the subject. In the negative, the areas of greatest density.

Incident Light - The light reaching the subject from any and all sources.

Incident Meter - A light meter used to measure incident light. The meter is placed at the subject position and pointed in the direction of the camera so as to measure light intensity from sources directing light upon the subject.

Lens Hood - A device for shading the front element of a lens from direct light outside the subject area so as to reduce flare.

Long Lens - The description of a lens of longer than-normal focal length.

Luminance - Light reflected from, or produced by, a surface.

Macro-Lens - A term used to describe lenses especially corrected for use at short subject distances.

Matte - Dull, non-glossy; referring to surface or texture.

Opening - Refers to lens opening and is used, loosely, to mean either lens aperture or relative aperture.

Overexposed - Refers to a photographic image which has received too much light.

Plane - Refers to the position of elements within an image in space. Actually, the term can be misleading since objects (and elements of a picture) are three-dimensional and have at least one plane that is closer to the camera than another.

Reflection - The rebounding of light from a surface, especially a polished surface.

Reflector - A surface used to bounce light. For photographic purposes, usually, cardboard, fabrics, or polished surfaces.

Rim Light - Back light that illuminates the edges of a subject, producing a bright outline.

Sensitivity - In photography, the level of a film's susceptibility to alteration by light energy.

Shadow Area - Any area of a photographic image that corresponds to areas of shade in the original subject. Loosely, any dark area in a positive or light area in a negative.

Stop - The aperture or f-number of a lens.

Stop Down - To reduce the size of the lens aperture.

Washed Out - A term to describe a pale, lifeless, gray print image, usually implying loss of highlight detail, such as might typically result from underexposure of a negative or overexposure of a positive.

Wide-Angle - Describes a lens whose angular coverage is substantially greater than that of a 11normal" lens.

Zoom Lens - A very complex lens can be adjusted in focal length to provide a continuous range within its design limits.

Suggested Reading:

Landscape Photography - A Kodak Guide available from Eastman Kodak and many photo shops.

The Art of Seeing, a publication in the Kodak Workshop Series available from Eastman Kodak and many photo shops.

Photographic Composition by Tom Grill & Mark Scanlon available from AMPHOTO, New York and many photo shops.

Art and Visual Perception-A Psychology of the Creative Eye by Rudolf Arnheim, published by the University of California Press.

The Nature Photographer's Complete Guide to Professional Field Techniques, by John Shaw, published by AMPHOTO, New York.

Product names that appear in this handout do not constitute an endorsement by the Natural Resources Conservation Service.

Tim McCabe
National Photographic Specialist
United States Department of Agriculture
Natural Resources Conservation Service
P.O. Box 2890
Washington, D.C. 20013
Revised: 5/91