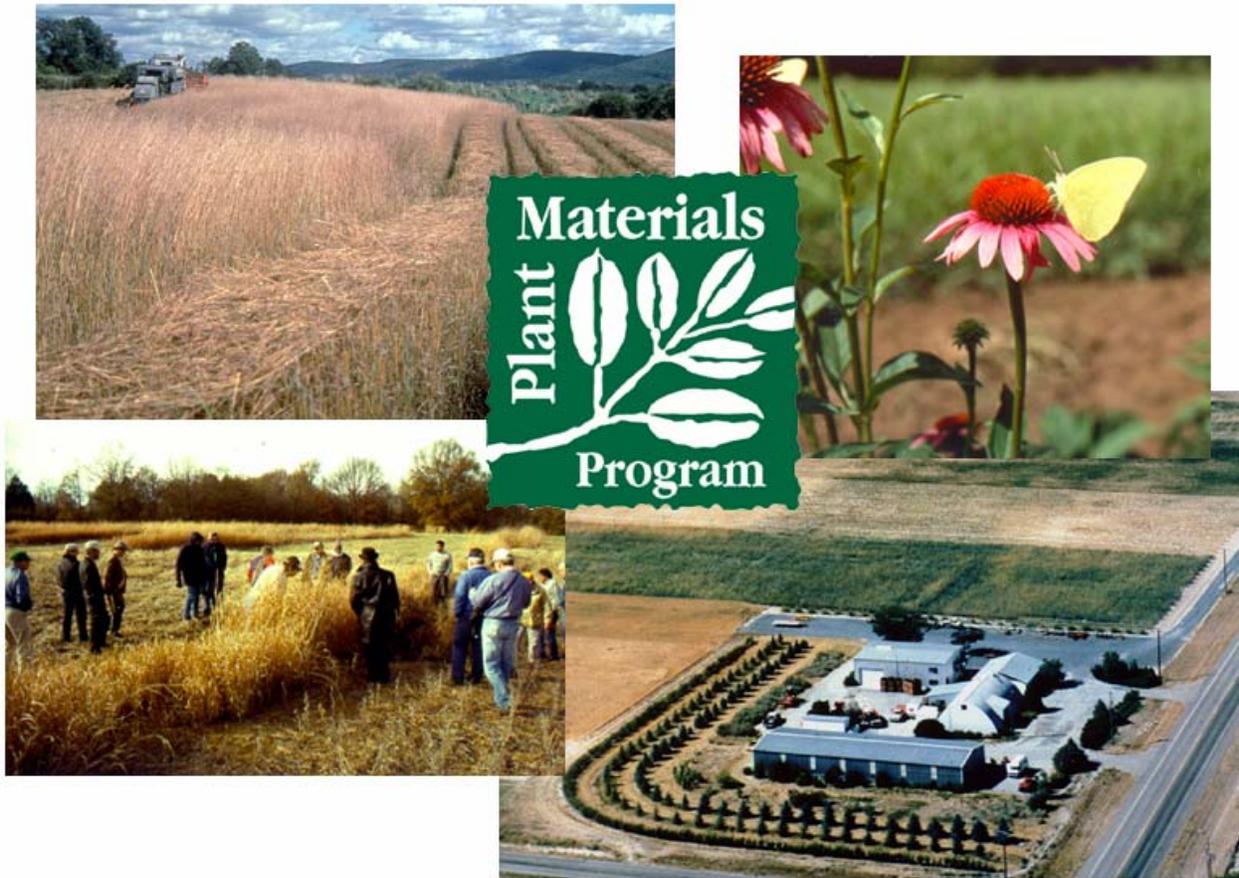


United States Department of Agriculture  
Natural Resources Conservation Service

# NATIONAL PLANT MATERIALS MANUAL

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Plant Materials  
Program

**Title 190**  
Issued June, 2000

# **NATIONAL PLANT MATERIALS MANUAL**

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# **NATIONAL PLANT MATERIALS MANUAL**

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## **PREFACE**

The National Plant Materials Manual, as a subdivision of the NRCS directives system, includes parts 539 through 542.

The format and content of this edition is intended to allow users to more easily find the information they need.

The National Plant Materials Manual (NPMM) describes plant materials policy and the operations and procedures of the Plant Materials Program, including Plant Materials Centers, within the Natural Resources Conservation Service (NRCS) and complements the General Manual.

All references to the Soil Conservation Service or SCS by Public Laws, Memoranda or other documents stated herein have been changed to the Natural Resources Conservation Service or NRCS, respectively.

All policies and responsibilities relating to plant materials previously assigned to the Soil Conservation Service are carried forward in full to the Natural Resources Conservation Service unless otherwise noted or amended in this manual.



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## PART 539 - INTRODUCTION

### PART 539.0 GENERAL

#### 539.00 Mission

The mission of the Natural Resources Conservation Service (NRCS) Plant Materials (PM) Program is to develop, test, and transfer effective state-of-the-art plant science technology to meet customer and resource needs. NRCS PM activities are consistent with the objectives of the current United States Department of Agriculture (USDA) and NRCS Strategic Plans (Exhibit 539-1), namely to provide timely and effective vegetative solutions for identified resource needs.

#### 539.01 Purpose

The purpose of the NRCS 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 plant science technology to solve conservation problems, and 5) promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plans (Exhibit 539-1).

To accomplish this purpose, NRCS maintains and operates a Plant Materials Program as part of its on-going coordinated conservation operations activities through a network of Plant Materials Centers (PMC) and Plant Materials Specialists (PMS).

#### 539.02 Policy

The Plant Materials Program:

- works to meet the goals and objectives of the USDA and NRCS Strategic Plans (Exhibit 539-1) and to comply with the authorities described in Part 539.1.
- works to meet the objectives of other federal, state, and local programs and initiatives, such as the USDA “Farm Bill”.
- cooperates with other partners with the major emphasis being to provide timely and effective state-of-the-art plant science technology.
- performs activities and provides services consistent with USDA and NRCS Affirmative Action, Equal Employment Opportunity, and Civil Rights policies.

#### 539.03 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.

### **539.04 Changes to the Manual**

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

Deviations pertaining to changes in policies or procedures found in the NPMM must be reviewed and approved by the NPL (see [Error! Not a valid link.](#)). Deviations typically affect local operations and only the PMC the deviation is approved for. No deviations are effective until approved in writing by the NPL. Approved deviations will be filed in the appropriate section(s) of the NPMM.

Amendments pertaining to permanent changes in policies or procedures found in the NPMM may be submitted to the NPL for consideration (see [Error! Not a valid link.](#)). Amendments typically pertain to national operations. The NPL will determine the appropriate procedure for review of the proposed amendment.

### **539.05 Supplements to the Manual**

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.

Examples of supplements include Long Range Plans (LRPs) for state plant materials activities, PMC LRPs, PMC Business Plan, the PMC Workload Analysis, and details of state regulations pertaining to plant release selection, certification, or marketing.

### **539.06 Quality Assurance Review**

#### **(a) General**

A Quality Assurance Review of plant materials activities is performed in accordance with NRCS policies on program reviews. A review may be general or specific in nature. A review is meant to constructively evaluate the activities of a PMC or plant materials program in order to improve it.

The NPL may initiate a Quality Assurance Review for a Plant Materials Center and Plant Materials Specialist. Other NRCS administrative levels may initiate a Quality Assurance Review for a PMC, PMS, or state plant materials activities as appropriate.

#### **(b) Guidelines for Plant Materials Program Reviews**

Procedures for review and the composition of the review committee will be determined at the time the review is initiated. A general review committee may include the NPL, PM Information Coordinator, Regional PM Coordinator, State Conservationist (STC) or the STC's representative(s), District Conservationist (DC), another PMC Manager, PMS, or others.

**Error! Not a valid link.** provides a Guide for Quality Assurance Review for a plant materials program. This guide may be used for reviewing a PMC, PMS, or a state plant materials program. 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.

## **PART 539.1 AUTHORITY**

### **539.10 General**

The authority to operate a Plant Materials Program is provided for in Federal Law. A brief description of the authorities relevant to the PM Program is found in Part 539.11. Full text for each of these authorities is located at the National Plant Materials Center in Beltsville, MD.

### **539.11 Description of Authorities**

Authority for the NRCS PM program is provided by:

#### **(a) Soil Conservation Act of 1935**

The Soil Conservation Act of 1935 (Public Law 74-46, 49 Stat. 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 (now the Natural Resources Conservation Service) Plant Materials Program.

#### **(b) Soil and Water Resources Conservation Act of 1977**

The Soil and Water Resources Conservation Act of 1977 (Public Law 95-192; 16 USC 40) declares that it is the policy of Congress to ensure that the Department of Agriculture 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.

#### **(c) NRCS Policy on the Operation of Plant Materials Centers (1984)**

This policy issued in 1984 is contained in 7 CFR 613 and the Federal Register, Vol. 49 No. 62 (March 29, 1984) and clarifies the role, activity, and function of NRCS Plant Materials Centers to support NRCS conservation activities. This CFR updates information on NRCS conservation activities and Plant Materials Centers as described in Public Law 74-46. This CFR is presented in **Error! Not a valid link.** because of its importance to the Plant Materials Program.

#### **(d) 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 changed Soil Conservation Service to NRCS.

**PART 539.2 - EXHIBITS FOR PART 539**

**Exhibit 539-1 NRCS Goals and Objectives**

The goals and objectives for the NRCS are referenced in the USDA and NRCS Strategic Plans: 1997-2002. The goals and objectives for NRCS are:

- (1) Goal 1:** Individuals and their neighbors working together as effective and willing stewards of the natural resources on their property and in their communities.
  - (a) Objective 1.1:** A strong and effective grassroots conservation partnership across the United States and its territories, commonwealths, and affiliated governments.
  - (b) Objective 1.2:** A diverse and well-served customer base across the United States and its territories, commonwealths, and affiliated governments.
  - (c) Objective 1.3:** Private landowners and communities with the science-based information and technologies they need to conserve natural resources.
  
- (2) Goal 2:** A healthy and productive land that sustains food and fiber production, sustains functioning watersheds and natural systems, enhances the environment, and improves urban and rural landscapes.
  - (a) Objective 2.1:** Healthy and productive cropland sustaining U.S. agriculture and the environment.
  - (b) Objective 2.2:** Healthy watersheds providing clean and abundant water supplies for people and the environment.
  - (c) Objective 2.3:** Healthy and productive grazing land sustaining U.S. agriculture and the environment.
  - (d) Objective 2.4:** Healthy and productive wetlands sustaining watersheds and wildlife.
  - (e) Objective 2.5:** High-quality habitat on private land supporting the Nation's wildlife heritage.

**Exhibit 539-2 Guidelines for Submitting Changes to the NPMM**

The following information should be included in the letter to the NPL when submitting changes to the NPMM as described in Part 539.04.

1. Date of request.
2. Requestor's name, address, and phone number.
3. Is this a deviation or amendment? (See Part **Error! Not a valid link.** for the difference between a deviation and 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 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 appropriate State Conservationist.

**Exhibit 539-3 Guidelines for Quality Assurance Review of a plant materials program**

The following items may be covered in a Quality Assurance Review of a plant materials program. Specific items to be covered will depend on the type of plant materials program 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.

- 1) Objectives and procedures of review.
- 2) Review report of last PMC/Program Quality Assurance Review.
- 3) Review the organizational structure of the PM program within the service area and how it functions.
- 4) Review report of previous State Conservationist's Advisory Committee (or comparable Advisory Committee) and progress made on decisions and actions.
- 5) Review supplements to NPMM and impact on the PMC or program being reviewed. Have the supplements been forwarded to the NPL?
- 6) 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?
- 7) A written summary of studies and activities at the PMC should be provided near the beginning of the review.
- 8) 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 the PMC is involved in.
- 9) Operation of the PMC
  - a) Physical Facilities
    - i) Land adequacy and tenure (PMC and field evaluation sites available for PMC use).
    - ii) Water supply - domestic (date and results of last water tests if on well?) and irrigation supplies.
    - iii) Infrastructure - are electric, water, natural gas lines, garbage disposal and security adequate for the PMC?
    - iv) Inventory of Buildings - adequacy, maintenance, and needs - present information in table form as appropriate (see Exhibit 539-4 for sample of a table).
  - b) Equipment Inventory - adequacy and replacement - "Equipment" includes farm and field equipment, office equipment, computer equipment, and audio/visual equipment regardless of cost.
    - i) Are inventory records kept up to date for the PMC?
    - ii) 5-year acquisition and replacement schedule.
    - iii) Is equipment adequately maintained and are maintenance records kept?
  - c) Financial Management of the PMC
    - i) Budget.
    - ii) Who is responsible for maintaining the budget?
    - iii) Who prepares the budget request for the next Fiscal Year?

- iv) How much is the State Office offset and overhead?
- v) How good is the fund accountability for the PMC?
- vi) A copy of the current year's budget should be available for the review committee.
- d) Purchases and Procurement
  - i) How are suppliers identified or sources for materials decided on?
  - ii) What records are kept at the PMC on expenditures?
  - iii) How are purchases made or handled at the PMC?
- e) Safety and Health Issues of PMC Buildings, Equipment and Operations
  - i) When was the last safety review conducted for your facility? Who conducted the last safety review?
  - ii) Does the PMC comply with Occupational Safety and Health Administration (OSHA), other Federal, State, or Local regulations as found in the NPMM (Part 540.21 **Error! Not a valid link.** and **Error! Not a valid link.6**)? Are current codes of state air, water, and waste quality standards available?
  - iii) Does the PMC have a safety coordinator, hazardous materials coordinator, and plans for emergency hazardous materials clean-up? Are regular safety meetings held?
  - iv) Are fire extinguishers, smoke detectors, first aid kits, etc. in working order and stocked?
  - v) Have health issues been addressed?
  - vi) Is the storage, use, and disposal of pesticides/hazardous materials in compliance with Federal, State, NRCS and NPMM (Part 540.21 **Error! Not a valid link.**, **Error! Not a valid link.** and Exhibit 540-7) policy and guidelines?
  - vii) Are water quality issues (domestic water supply, irrigation tailwater, run-off) dealt with at the PMC?
  - viii) Are there fuel tanks at the PMC? Are they in compliance with current Federal and State regulations?
  - ix) The review committee should look for non-compliance of the above items during the tour of the facility.
- 10) Physical appearance and planning for the PMC.
  - a) Does the PMC have an adequate conservation plan and is it being followed?
  - b) Is a history of land use, maintenance, and treatment available for the PMC?
  - c) Has the PMC had a cultural resource assessment completed?
  - d) What is the appearance and quality of the facilities, grounds, and fields?
  - e) Are there any demonstration areas at the PMC and how useful are they?
  - f) Is the U.S. flag flown?
  - g) 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?
  - h) Are required Equal Employment Opportunity (EEO) statements, labor laws, worker's compensation, and other personnel information posted in the PMC office?

## Part 539.2 – Exhibits for Part 539

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Exhibit 539-3

- i) Have provisions been made to accommodate physically challenged persons at the PMC?
- 11) State(s) Long-Range Plan (LRP) for plant materials activities
  - a) Are the LRPs developed on a state, multi-state, PMC service area, or regional level?
  - b) Is the LRP current?
  - c) Are these LRPs and/or plant materials needs and objectives being incorporated into State or Regional Strategic Plans?
  - d) How are these LRPs developed? Do they provide the guidance outlined in Part **Error! Not a valid link.** and Exhibit 540-2?
  - e) Are these LRPs of sufficient detail and scope to direct the development of the State plant materials program and PMC LRP to address the priority resource needs for the State?
  - f) Are these LRPs filed as a supplement to the NPMM?
- 12) PMC LRP for plant materials activities
  - a) Does the PMC have a current LRP?
  - b) Are the priorities established and specific needs in the LRP consistent with the objectives and priorities of the NRCS Goals and Objectives (Exhibit 539-1)?
  - c) Does the PMC LRP relate to the priority needs established in the State(s) LRP for plant materials?
  - d) How was the current LRP developed? Refer to Part 540.22(a) for LRP development.
  - e) 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?
- 13) PMC Business Plan (formerly the Plan of Operations)
  - a) Are the activities conducted at the PMC consistent with the PMC LRP?
  - b) Is the Business Plan detailed enough to adequately direct the activities of the PMC?
  - c) How is the Business Plan developed, and do others participate in the development or review of the Business Plan? Refer to Part 540.22(b) for Business Plan development?
  - d) Is the Business Plan reviewed periodically through the year?
  - e) Are the items in the Business Plan being completed and products being delivered?
- 14) PMC Workload Analysis
  - a) Is there a Workload Analysis for the PMC? (see Part 540.22(c))
  - b) How is staff determined?
  - c) Is staff adequate?
- 15) Is there a copy of the Field Office Technical Guide (FOTG) maintained at the PMC? Is the FOTG being followed as appropriate for plantings being installed either on the PMC or off center?
- 16) Plant Materials Program Procedures
  - a) 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?
  - b) Are program activities consistent with policies and procedures contained in the NPMM?

- i) Are plans being prepared for all studies (see Part 540.52)? Is study information inputted into the current PM database?
- ii) Is plant materials inventory being maintained?
- iii) Are the procedures for releasing plants being followed (see Part 540.74)?
- iv) Are the guidelines for database maintenance and Information Technology being implemented?
- v) Are reports being completed?
- vi) Are the technology transfer products outlined in the PMC Business Plan, study plans, and Workload Analysis being completed in a timely manner?
- vii) Are field plantings consistent with the needs and priorities established in the state(s) and PMC long-range programs?
- c) Technology Transfer
  - i) Is the Plant Materials Progress Report of Activities current?
  - ii) What is the distribution of the Plant Materials Progress Report of Activities?
  - iii) Is the PMC Annual Technical Report prepared yearly?
  - iv) Are results of studies summarized and published as State technical notes, in technical journals, or other appropriate places?
  - v) Does the PMC have a current brochure?
  - vi) Are oral presentations made on the activities and studies at the PMC?
  - vii) Does the PMC have field days, workshops, or training sessions?
  - viii) What is the target audience for these activities?
- d) What are the contributions of plants released from the center?
- e) How are field personnel, other agencies, cooperators, and other potential users informed of new products from the Plant Materials Program?
  - i) Are planting guides and/or Technical Notes prepared?
  - ii) Are new releases and/or new technology included in the FOTG?
  - iii) Are other information leaflets and publications used?
  - iv) Are technical journals used to summarize results of plant materials studies?
- 17) Relationship with other agencies, conservation districts, and others
  - a) What agencies and organizations work with the PMC & PMS? Are there any problems concerning the cooperative release of new plants and/or technology?
  - b) Does the State Conservationist enter into formal cooperative agreements and memorandums of understanding?
    - i) With state and other federal agencies and others?
    - ii) With conservation districts?
    - iii) With state experiment stations or crop improvement associations?
- 18) Personnel administration
  - a) Lines of authority.
  - b) Job responsibilities, duties, descriptions, and standards of performance established for all staff positions.

## Part 539.2 – Exhibits for Part 539

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- c) Job responsibilities, duties, descriptions, and standards of performance established for all staff positions.
  - d) PMC relationship with the field PMS and other State specialists:
    - i) In developing plans?
    - ii) In allocating plant materials?
    - iii) In evaluating field plantings and problems?
  - e) 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?
  - f) Training
    - i) Are training plans current?
    - ii) Are employees provided the training outlined in their training plans?
    - iii) Are employees provided the opportunity to receive training from outside sources?
    - iv) What is done to encourage self-improvement?
    - v) Is the PMC used as a training center?
  - g) Is membership in professional organizations and attendance at meetings encouraged?
    - i) What organizations do staff members belong to?
    - ii) What meetings have been attended in the last 2-3 years?
  - h) Have staff members received any awards and/or commendations in the past 2 -3 years?
- 19) Quality Assurance Review report should include:
- a) Date of review.
  - b) PMC or program being reviewed.
  - c) Review committee.
  - d) Summary of findings.
  - e) Recommendations.
  - f) Agreed-to changes.
  - g) How will agreed-to changes be followed up?
  - h) Recommendations for distribution of final Quality Assurance Review report.

Exhibit 539-4 Table for Inventory of PMC Structures

<b>Inventory of PMC Structures</b>											
<u>Plant Materials Center: PMC Name</u>										<u>Date: November 19, 1998</u>	
Name of Bldg. & Use	Year Built	Replacement Cost	Historical Signif.	Size (sq. ft.)	Type of Construction	Ownership	Condition	Maintenance Past 5 yrs.	Repairs Needed	Cost of Repairs	Other Remarks
Office	1952	1,000,000	None	20x60	Wood Frame	NRCS	Good	Painted	New roof	\$5,000.00	Need more space
Seed Barn	1953	\$50,000.00	None	40x80	metal	State	fair	none	insulation	\$4500.00	
Chem. storage	1978	30,000.00	None	20x20	concrete	NRCS					New Bldg.

**Exhibit 539-5 NRCS Policy on the Operation of Plant Materials Centers (7CFR613, 1984)**

**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 Plant materials centers.

AUTHORITY: Pub. L. 74-46, 49 Stat. 163 (16 U.S.C. 590a-f); Pub. L. 74-210, 50 Stat. 525 (7 U.S.C. 1010-1011)

SOURCE: 49 FR 12188, Mar. 29, 1984, unless otherwise noted.

**§ 613.1 Purpose.**

This part provides Natural Resources Conservation Service (NRCS) policy on the operations of plant materials centers. The centers have responsibilities for assembling, testing, releasing, and providing for the commercial production and use of plant materials 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 needed for broad programs of resource conservation and development for agriculture, wildlife, urban, recreation, and other land uses and environmental needs. It is NRCS policy to conduct plant materials work in cooperation with other agencies of the U.S. 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 for erosion control adapted to soil and site conditions where vegetation is difficult to establish. 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 grazing season on dryland pastures and rangelands.
- (7) Replacing 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.
- (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.

**§ 613.3 NRCS responsibilities in plant materials.**

NRCS operates or enters into agreements with state universities or other state organizations to operate plant materials centers. NRCS employs specialists for selecting and using plant materials. NRCS responsibilities are to:

(a) Identify the need for suitable plant materials and cultural and management methods in resource

conservation and for environmental protection and enhancement.

(b) Assemble and comparatively evaluate plant materials at the plant materials centers 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 by grant to or by exchange with conservation districts, experiment stations, other federal and state research agencies, and state seed certifying organizations that will use the material to establish seed fields, seed orchards or plantings for vegetative increase.

(f) Encourage conservation districts, commercial seed producers, and commercial and state nurseries to produce needed plant materials for conservation uses and to assist them in this production.

(g) Encourage the use of improved plant materials 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 Plant materials centers.**

(a) The National Plant Materials Center. The National Plant Materials Center at Beltsville, Maryland, serves as the central facility for assembling, increasing, and determining the characteristics of plant materials from foreign and domestic sources. Plant materials with potential value for conservation and related uses are distributed to other plant materials centers.

(b) Other Plant Materials Centers. There are 23 other plant materials centers. Each serves several major land resource areas. Seventeen of these other centers are operated by NRCS, and six

by cooperating agencies, as follows:

(1) Operated by NRCS:

Tucson, Arizona  
Lockeford, California  
Brooksville, Florida  
Americus, Georgia  
Molokai, Hawaii  
Aberdeen, Idaho  
Manhattan, Kansas  
Quicksand, Kentucky  
East Lansing, Michigan  
Coffeerville, Mississippi  
Elsberry, Missouri  
Bridger, Montana  
Cape May Courthouse, New Jersey  
Big Flats, New York  
Corvallis, Oregon  
Knox City, Texas  
Pullman, Washington

(2) Operated by cooperating agencies with financial and technical assistance from NRCS:

Los Lunas, New Mexico (New Mexico State University)  
Bismarck, North Dakota (North Dakota Association of Soil Conservation Districts)  
Meeker, Colorado (White River and Douglas Creek Soil Conservation Districts with partial funding from NRCS)

(3) Operated by cooperating agencies with technical assistance from NRCS:

Palmer, Alaska (State of Alaska)  
Kingsville, Texas (Caesar Kleberg Wildlife Research Institute, Texas Agricultural and Industrial University, and South Texas Association of Conservation Districts)  
Nacogdoches, Texas (Stephen F. Austin University and the East Texas Association of Conservation Districts).

Dated March 21, 1984

[**Note:** Corrections to the PMC lists as of 2/00:

- Move Los Lunas, NM, and Bismarck, ND PMCs to list (1).
- Move Kingsville, TX and Nacogdoches, TX PMCs to list (2).
- Kingsville, TX PMC additional cooperating agencies also include Texas A&M University-Kingsville, and Gulf Coast Association of Conservation Districts.

## Part 539.2 – Exhibits for Part 539

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### Exhibit 539-5

- Nacogdoches, TX PMC additional cooperating agencies also include the USDA-Forest Service, the Northeast Texas Association of Conservation Districts, and the Louisiana Association of Conservation Districts.
- Add to list (1) the PMC located in Booneville, AR, established in 1987 on land owned by the State of AR.
- Add to list (1) the PMC located in Golden Meadows, LA, established in 1989 on land owned by the Louisiana Land and Exploration Company.
- The Quicksand, KY PMC was moved to Alderson, WV in 1999.

**PART 540 OPERATION AND MANAGEMENT**  
**SUBPART A - PLANT MATERIALS OPERATIONS**

**PART 540.0 ROLES AND RESPONSIBILITIES**

The following roles and responsibilities provide support for the plant materials programs. 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 is comparable.

**540.00 Staff Positions - National Responsibilities**

**(a) Chief, NRCS**

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

**(b) 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.

**(c) Director, Ecological Sciences Division**

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

**(d) National Program Leader, Plant Materials**

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

- communicating with and providing information to agency administrators, national program leaders, legislative personnel, and other national level partners regarding program accomplishments and program needs.
- providing leadership and opportunities for discipline training.
- providing leadership in performance evaluation and accountability within the Program.
- recommending budget allocations for the Program.
- communicating national plant materials program information, priorities, needs, and concerns to appropriate region and state levels.
- participating in national and regional strategic planning efforts.

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**Subpart A – Plant Materials Operations**

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540.00(d)

- providing leadership and direction for information coordination.
- encouraging, guiding, assessing, and assuring diversity and equity in program operations and delivery.

**(e) National Plant Materials Information Coordinator**

The PM Information Coordinator provides overall coordination for information management to the PM program. Responsibilities include:

- serving as coordinator and facilitator in program efforts to provide technology transfer of PM data to field offices.
- developing and maintaining a data management system for PM.
- serving as data steward for PM databases.
- serving as administrator of PM information on the Internet.
- developing and maintaining an information system for PM.

**(f) National Plant Materials Center Manager**

The NPMC Manager is responsible for operation of the NPMC and its technical programs. Responsibilities include:

- managing and administering the National PMC and the activities of a national scope as directed by the NPL.
- coordinating the PM Internet site development and population of the homepage.
- coordinating the collection and preservation of all PM publications and national PM information.
- collecting and preserving information on PM releases.
- assisting with PM program promotional activities.
- providing release and germplasm processing assistance to the PM program.
- coordinating the export and import of plants with the Agricultural and Plant Health Inspections Service (APHIS).
- those activities defined for the PMC Manager as described in Part 540.02(e).

**540.01 Staff Positions - Regional Responsibilities**

**(a) Regional Conservationist**

The Regional Conservationist (RC), assisted by the STC, 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:

- providing leadership in the development and implementation of a regional organizational structure which will allow key plant science resource needs and priorities to be met.
- ensuring plant materials program integration at state, regional, and national levels.
- providing leadership in the evaluation and accountability of all program activities and accomplishments.
- appointing the regional technology coordinator.

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540.02(a)

**(b) Regional Technology Coordinator**

The Regional Technology Coordinator will facilitate technology development for NRCS in each region. Responsibilities include:

- being the primary contact person and liaison for NRCS Institutes, Centers, PMCs, consortia, other agencies, and partners.
- serving as liaison with national program managers and technology committees.
- facilitating inter- and intra- region and national technology development.
- assisting with the identification of customer needs on state and regional levels and the coordination of product development and transfer.
- serving as a member of the Regional Technology Workgroup.

**(c) Regional Plant Materials Coordinator**

The Regional PM Coordinator functions in a collateral capacity to provide leadership in the coordination of Plant Materials activities within and between regions and with other regional partners. Responsibilities include:

- serving as the initial technical contact for regional Plant Materials issues.
- serving as a liaison with the National Program Leader.
- serving on local and/or regional Plant Materials committees as appropriate.

**540.02 Staff Positions - State and Local Responsibilities**

**(a) State Conservationist**

The STC, assisted by the staff, provides overall administrative leadership, support, integration, and coordination of the plant science activities within and between states, the regional office, and with other local, state and regional partners. Responsibilities include:

- 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.
- ensuring plant materials program integration at local, state, and regional levels.
- providing leadership in the evaluation and accountability of all program activities and accomplishments and directs resources and staff as necessary to address priority needs with recommendations from the state program manager and state technical staff.
- overseeing the administration and operation of a PMC(s) located in their state.
- ensuring that the plant materials needs of all states within the PMCs service area are met.
- serving on service area or regional advisory committees for plant materials.
- appointing the state technology contact.

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540.02(b)

**(b) 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:

- ensuring technology development and transfer, support, integration, and coordination of plant science activities within the state.
- serving on state/regional technical or advisory committees as appropriate.

**(c) State Technology Contact**

The State Technology Contact coordinates technology development within the state. Responsibilities include:

- being the primary contact person and liaison for NRCS Institutes, Centers, PMCs, consortia, other agencies, and partners.
- coordinating the identification of customer needs on state and regional levels and the coordination of product development and transfer.
- serving as liaison with the Regional Technology Coordinator and member of the Regional Technology Committee.

**(d) Plant Materials Specialist**

The Plant Materials Specialist (PMS) is a member of the state technical support staff in each state served. The PMS may also be referred to as a “Plant Resource Specialist”. PMSs may serve multiple states and provide support to one to three PMCs. The locations and service areas of PMSs is found in Exhibit 540-1. Responsibilities include:

- providing leadership in the coordination of PM activities with the NPL, State Conservationist, PMC Advisory Committee, PMC Manager, Regional PM Coordinator, State Technology Contact, NRCS Field Offices, Conservation Districts, and other local, state, and regional offices and partners.
- assisting in the development of technology products for identified customers, such as state technical support staff, land users, NRCS Field Offices, universities and other state and federal agencies.
- providing leadership in the transfer of technology products to NRCS Field Offices, Conservation Districts, partners and other identified customers.
- providing leadership in completing plant science technology needs assessment and development of the state PM Long Range Plan (LRP).
- assisting in the development of the PMC LRP and other PMC operational documents.
- providing technical assistance to the PMC and PMC Manager.
- promoting PM program integration at local, state and regional levels.
- integrating pertinent plant materials and plant technologies into the Field Office Technical Guide, PM web site, joint publications, professional papers, etc.
- maintaining working partnerships with Agricultural Experiment Stations, ARS, Crop Improvement Associations, seed growers and dealers, etc.

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**Subpart A – Plant Materials Operations**

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540.02(h)

**(e) Plant Materials Center Manager**

The Plant Materials Center Manager (PMCM) is a member of the state technical support staff in each state served. The PMCM may also be referred to as “Team Leader”.

Responsibilities include:

- managing and administration of the PMC.
- 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.
- providing leadership in the coordination of PM activities with the PMS, Regional PM Coordinator, State Technology Coordinator, NRCS Field Offices, Conservation Districts, and other local, state, and regional offices and partners.
- developing technology products for identified customers, such as state technical support staff, land users, field offices, and universities.
- providing leadership in the transfer of technology products to NRCS Field Offices, Conservation Districts, and other identified customers.
- promoting PM program integration at local, state, and regional levels.
- assisting in completing plant science technology needs assessment and development of the State PM LRP.

**(f) 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.

**(g) District Conservationist**

The District Conservationist (DC), or equivalent position within the state, is responsible for assisting Soil and Water Conservation Districts (SWCD) to carry out plant science related programs and activities. Field Offices assist with plant materials activities which may include:

- assessing local resource and conservation problems and need in conjunction with the SWCD.
- promoting plant science technology and improved plant materials.
- initial seed and plant collecting for improved plant selection.
- assisting with installation and evaluation of field plantings, conservation field trials, and demonstration plantings.

**(h) Conservation Districts**

Regional, state, area, and district conservationists are to keep conservation districts and other identified partners informed and actively involved with on-going and proposed plant science related programs, projects, and activities.

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**Subpart A – Plant Materials Operations**

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540.02(i)

**(i) Institutes, Centers, and Regional Technical Teams**

These NRCS entities will provide technical guidance and support at state, regional, and national levels as appropriate according to the developed organizational structure.

**540.03 Committee Responsibilities**

**(a) National Plant Materials Advisory Committee**

The National Plant Materials Advisory Committee provides guidance to the National PM Program. The principal duties of the National PM Advisory Committee are to:

- review and provide input for strategic planning within the Program.
- discuss and act on issues which may have major impacts on the PM Program.
- 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 PM Program to achieve NRCS objectives.
- increase the level of awareness and support of the PM program at all levels of NRCS.

Members of the committee may include:

- STCs appointed by the Deputy Chief Science and Technology.
- the Deputy Chief Science and Technology or his/her representative.
- the Regional Technology Coordinators.
- the NPL-PM.
- the National PM Information Coordinator and NPMC Manager (advisors to the committee).
- representatives from the National Association of Conservation Districts (NACD).
- representatives from other appropriate Federal Agencies or NRCS offices as determined by the committee.
- the NPL provides technical assistance to the committee.

Meetings will normally be chaired by a STC in the STC's state, and will be rotated among the STCs on the committee. Meeting frequency will be annually or more often as determined by the committee.

**(b) Regional Plant Materials Advisory Committee**

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 plant materials program activities into one process for technology development.

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540.03(d)

- reviews, approves, and arranges for the carrying out of projects, activities, and develops a regional long-range plant materials plan.
- 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).

Members may include:

- STCs in the region.
- the Regional Conservationist.
- the Regional Plant Materials Coordinator.
- advisors to the committee. Advisors may include the NPL-PM, regional PM Program personnel and other members as determined appropriate by the committee to serve as advisors.

Meetings will normally be chaired by the STC in the host state, and will be rotated among states in the region. Meeting frequency will be annually or as determined by the committee.

**(c) State Conservationist’s Plant Materials Advisory Committee**

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, the Regional and National Plant Materials Advisory Committees, and other partners. The 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 plan.
- reviews and approves the PMC LRP.
- reviews and approves PMC studies and activities to address the needs in the state and PMC LRP.

Members include:

- STCs in the PMC service area.
- Advisors to the committee. Advisors may include the NPL-PM, regional PM Program personnel and other members as determined appropriate by the committee.

Meetings will normally be chaired by the STC in the host state, and will be rotated among states in the PMC service area. Meeting frequency will be annually.

**(d) 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 Regional Technology Coordinator, State Technology Contacts (one per state), and NRCS Institute and Center representatives as assigned (advisory capacity).

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**Subpart A – Plant Materials Operations**

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540.03(e)

**(e) Plant Materials Technical Committee**

The Plant Materials Technical Committee provides input to the PM Advisory process. The PM Technical Committee may be on a state, multi-state or other regional/local level for a single PMC or for multiple PMCs. Responsibilities include:

- provides overall technical leadership in the identification, integration, and prioritization of plant technology needs.
- develops recommendations for addressing needs and submits information to the State Conservationist's Plant Materials Advisory Committee for review and approval.
- promotes the transfer of developed applied science technology.

Members may include:

- STCs or their representatives, such as the SRC.
- state and multi-state technical staff.
- appropriate PMC Managers and technical staff, PMSs, and Regional PM Coordinator.
- the Regional Technology Coordinator.
- the State Technical Contact.
- appropriate field and area personnel.
- advisors to the committee, which may include appropriate partners.

Meeting frequency will be determined by the committee. PM Technical Committees typically meet prior to a STCs PM Advisory Committee meeting to discuss plant materials issues to be brought to the STCs

**(f) State Plant Materials Committee**

The State Plant Materials Committee is critical for the integration of plant materials activities into FO operations and the needs of FOs into the PM program. Each state will have a State PM Committee. Responsibilities include:

- serving as a focal point for identification and prioritization of key local and state plant issues, concerns, and product needs.
- developing a state plant materials LRP which includes prioritized plant issues, concerns, and needs along with proposed action items.
- developing an annual state plant materials plan.
- is responsible for ensuring identified local and state plant science needs are presented to the appropriate decision makers.
- ensures that the developed plant technology is disseminated to meet customer needs.

Members may include:

- the SRC, or equivalent.
- appropriate state, area and/or regional specialists.
- district and area personnel.

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- PMS and PMC personnel and other partners as determined by the committee to serve as advisors. The PMS or PMC Manager can chair or facilitate but should not direct the meetings.

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

**(g) Standing or Ad Hoc Program Committees**

Standing or ad hoc committees provide guidance or assistance to the National Plant Materials Program on specific issues. Standing or ad hoc committees can be formed and dissolved by the NPL depending on the needs of the program.

**PART 540.1 PLANT MATERIALS LONG RANGE PLANNING**

**540.10 General**

Long Range Plans (LRP) are developed to direct plant materials activities at the national, regional, state, or local levels. An LRP for plant materials will be developed and implemented to identify, prioritize, and integrate customer, resource, and program needs. The LRP will help facilitate the development and transfer of plant technology to address priority concerns. The LRP is analogous to a strategic plan.

The LRP should be of sufficient scope to serve as a basis for the development of the LRP for the servicing Plant Materials Center(s) and provide direction for plant materials related activities at the level (state, PMC service area, regional) which the plan was developed.

Regional and state LRPs will be filed as a supplement to the NPMM. One paper copy will be sent to the NPL-PM. An electronic copy will be sent to the NPMC.

**540.11 Contents of a Plant Materials LRP**

An example of a plant materials LRP is included in Exhibit 540-2. The PM LRP should include the following items:

- **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 (state, PMC service area, regional, 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.
- **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 (see Exhibit 539-1). Non-resource needs may include promotion of activities, training

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540.11

provided, and outreach efforts to minority and socially disadvantaged groups and other undeserved 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) as appropriate), ecological setting (land use, site description, soils, cause and effect info, 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.

- **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.

#### **540.12 Development of the LRP**

The responsibility for development of the LRP depends on the level at which the plan was developed. The PMS(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 multi-state technical committee would be responsible. At the regional level, the regional advisory committee would be responsible.

#### **540.13 Review of the LRP**

The LRP will be reviewed annually by the appropriate committee at the level of development and modifications made as necessary by the reviewing committee.

### **PART 540.2 OPERATION AND ADMINISTRATION OF THE PLANT MATERIALS CENTERS**

#### **540.20 General**

A Plant Materials Center (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.

PMCs are strategically located to serve MLRA, otherwise referred to as eco-regions. Service areas of PMCs generally cover parts of several states that have common land and climatic characteristics. The location and service area of each PMC is shown in Exhibit 540-3.

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**Subpart A – Plant Materials Operations**

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540.21(a)

**540.21 PMC Operations**

PMC operation will follow established NRCS administrative policies and procedures. Administrative procedures are handled directly with the State Office 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.

**(a) Administrative Activities**

- Equipment and buildings - The PMCM 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 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. See Exhibit 539-4 for a table which may be used for tracking PMC structures.
- 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 PMCM or 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. PMC budgets are to be reviewed and approved by the State Conservationist. PMCs are responsible for fiscal management within the budget limitation. The PMC is to use manual forms or software programs to assist in budget management.
- Procurement - Procurement matters are to be conducted according to procedures in accordance with Federal Acquisition Regulations and by guidelines established by the State Office which provides administrative support to the PMC. PMCs procure supplies to operate the PMC and conduct plant science studies. PMCs procure other plant materials for standards of comparison, for testing, and for demonstration.
- Cooperative Agreements - PMCs enter into cooperative agreements and memorandums of understanding to augment and enhance plant materials activities and the PMC budget in their states in accordance with NRCS administrative procedures. Copies of all Memoranda of Understanding, Memoranda of Agreement

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### **Subpart A – Plant Materials Operations**

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540.21(a)

and other cooperative agreements that a PMC enters into should be sent to the NPMC once signed. Such agreements may be for the lease of land or buildings to operate a PMC, for reimbursables with cooperators, and for agreements where services are rendered.

#### **(b) 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 may be classified as agronomists (GS-471), biologists (GS-401), range conservationists (GS-454), foresters (GS-460), horticulturist (GS-437), natural resource specialist (GS-401), resource conservationist (GS-401), biological science technician (GS-404), secretary (GS-318) or soil conservationist (GS-457). Qualification standards are provided in Qualification Standards Handbook X-118, which is issued by the Office of Personnel Management. Positions are normally advertised interdisciplinary and applicants must meet one or more of the required series. Position Description and Knowledge Skills and Abilities (KSAs) evaluation factors for these positions are available from the NRCS State Office Human Resource Manager.
- Personnel procedures - Procedures (i.e., performance workplans, 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. These plans are often used to provide justification for training. Exhibit 540-4 includes recommended training for positions at the PMC. EEO and Civil Rights Training is provided to each employee by the State Office in accordance with NRCS requirements.

#### **(c) Preparing Reports and Information**

Each PMC will follow the guidelines outlined in Part 541.2 for the reporting of annual accomplishments and activities. Additional reports and information may be requested by the NPL or PM Information Coordinator and prepared on a periodic basis as outlined in Part 541.23.

PMCs will prepare administrative information, such as an annual budget (Part 540.21(a)), and planning tools, such as the PMC Long Range Plan (Part 540.22(a)), the Business Plan (Part 540.22(b)), and the Workload Analysis (Part 540.22(c)), to support the operation of the PMC.

Many of the reports and planning required by PMCs tools are prepared on an annual basis on a recurring schedule. Exhibit 540-5 provides a summary and schedule of the reports and information a PMC needs to prepare each year.

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**Subpart A – Plant Materials Operations**

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540.22(a)

**(d) Safety and Health Policy**

The NRCS plant materials program is conducted in conformity with the NRCS General Manual 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 that affect their operations. Federal statutes and regulations that may influence PMCs the most are discussed in Exhibit 540-6, which includes a brief description of each.

Each PMC must assign a Safety Officer/Coordinator to perform annual safety inspections as required by Federal and State regulations. Exhibit 540-7 provides an outline for safety inspections at PMCs.

**540.22 PMC Planning**

**(a) PMC Long Range Plan**

The purpose of the PMC Long Range Plan (LRP) is to identify, guide, and direct the operation toward solving high-priority resource problems identified in each service area state plant materials LRP. The PMC LRP is analogous to a Strategic Plan.

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 plant materials LRP and/or NRCS National Objectives (Exhibit 539-1). The PMC LRP needs to be reviewed annually with major rewrites as state, regional, and national priorities change.

PMC LRPs will be filed as a supplement to the NPMM. One paper copy of the PMC LRP will be sent to the NPL-PM. An electronic copy will be sent to the NPMC.

An example of a PMC LRP is included in Exhibit 540-8. 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 major land resource areas 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 plant materials 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 (see Exhibit 539-1). Non-resource needs may include promotion of activities, training provided, and outreach efforts to socially disadvantaged groups and other undeserved clientele.

## Part 540 – Operation and Management

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540.22(a)

- General discussion of current knowledge for each identified need (is current information available to solve the need?).
  - Geographic location (include map(s) or MLRAs as appropriate), ecological setting (land use, site description, soils, cause and effect info, 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 LRPs 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.

#### **(b) Business Plans**

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 PMC Manager, along with assistance from the PMC staff and PMS, 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.

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.

PMC Business Plans will be filed as a supplement to the NPMM at the PMC. One paper copy of the PMC Business Plans will be sent to the NPL-PM. An electronic copy will be sent to the NPMC.

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 projects 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, 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.
- performance goals spreadsheets - as attachment.

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540.23(b)

- the staff member(s) responsible for identified action item and activity.
- when the action item or activity will be completed.

Exhibit 540-9 is an example of a Business Plan. Business Plans should be reviewed by the PMC staff periodically throughout the year to ensure that scheduled items are being completed. 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 (see Part 541.22).

**(c) Workload Analysis**

The PMC Manager is to develop an annual Workload Analysis for the PMC. The Workload Analysis will be prepared by October 1 for the fiscal year. The Workload Analysis of a PMC operation is a valuable management tool to determine staffing required 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 which are funded by reimbursable or non-CO-46 funds. Exhibit 540-10 can be used as a guide for constructing a Workload Analysis.

The Workload Analysis will be filed as a supplement to the NPMM at the PMC. One paper copy of the PMC Workload Analysis will be sent to the NPL-PM. An electronic copy will be sent to the NPMC for archiving.

**(d) 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 PMC Manager is to make maximum use of the conservation plan.

**540.23 Expectations, Evaluation, and Review of a PMC Program**

**(a) Expectations**

PMCs are expected to follow the guidelines of the NPMM. PMCs are expected to maintain a balanced program of technology and release development and transfer over a 5-10 year time frame.

**(b) Evaluation of Performance**

PMCs will report progress towards performance goals on a regular basis as determined by the NPL. Evaluation factors for performance goals may include:

- contact and assistance provided to NRCS field offices, partners, and other individuals.
- technology product development and transfer completed by the PMC, such as written materials, and presentations.

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540.23(b)

- number of releases.
- evaluation of plant materials.
- amount of information sent to the NPMC for posting on the Internet.
- number of field evaluation plantings.
- seed and plants produced.

#### **(c) Reviews**

Each PMC will undergo an in-depth program review every 5-10 years. Reviews will follow Quality Assurance Review procedures outlined in Part 539.06.

### **PART 540.3 OPERATION AND ADMINISTRATION OF THE NATIONAL PMC**

#### **540.30 Purpose**

The National Plant Materials Center (NPMC), located at Beltsville, Maryland, has responsibility for providing specialized support to the National Plant Materials Program and providing limited support to the Mid-Atlantic region as a field PMC.

#### **540.31 Operation**

##### **(a) Operating Procedures**

The NPMC will follow the same guidelines for operation and administration as those outlined for PMCs in Part 540.2.

##### **(b) Personnel**

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

##### **(c) Supervision**

The State Conservationist 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, as well as providing input for the NPMC Manager's annual performance evaluation.

#### **540.32 National Activities**

The NPMC carries out or assists with activities of the National PM Program. These activities include:

- providing assistance to the NPL in carrying out activities of national scope as requested.
- 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. Works closely with the

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540.33

NRCS Conservation Communications Office, National Headquarters (NHQ) to ensure coordination of PM Program information into the national delivery system.

- soliciting published information from PMCs and PMSs and providing long-term storage of paper and electronic documents at the NPMC; preparing documents for inclusion on the PM Internet web site.
- 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 Agricultural research Service (ARS)-National Plant Germplasm System (NPGS), and coordination with the Plant Protection and Quarantine Office, Animal and plant Health Inspection Service (APHIS) for import and export of plants.
- maintaining the PM releases database and permanent release files to provide current information for reports and the annual releases publication “Improved Plant Materials Released by NRCS and Cooperators.”
- assisting the PM Information Coordinator with PM Information Technology (IT) activities, including development of the PM Internet web site, development and maintenance of PM databases, assisting with national PM training, and coordination of activities with the NRCS National Plant Data Center

**540.33 Regional Activities**

Provides plant materials 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 Part 540.2.

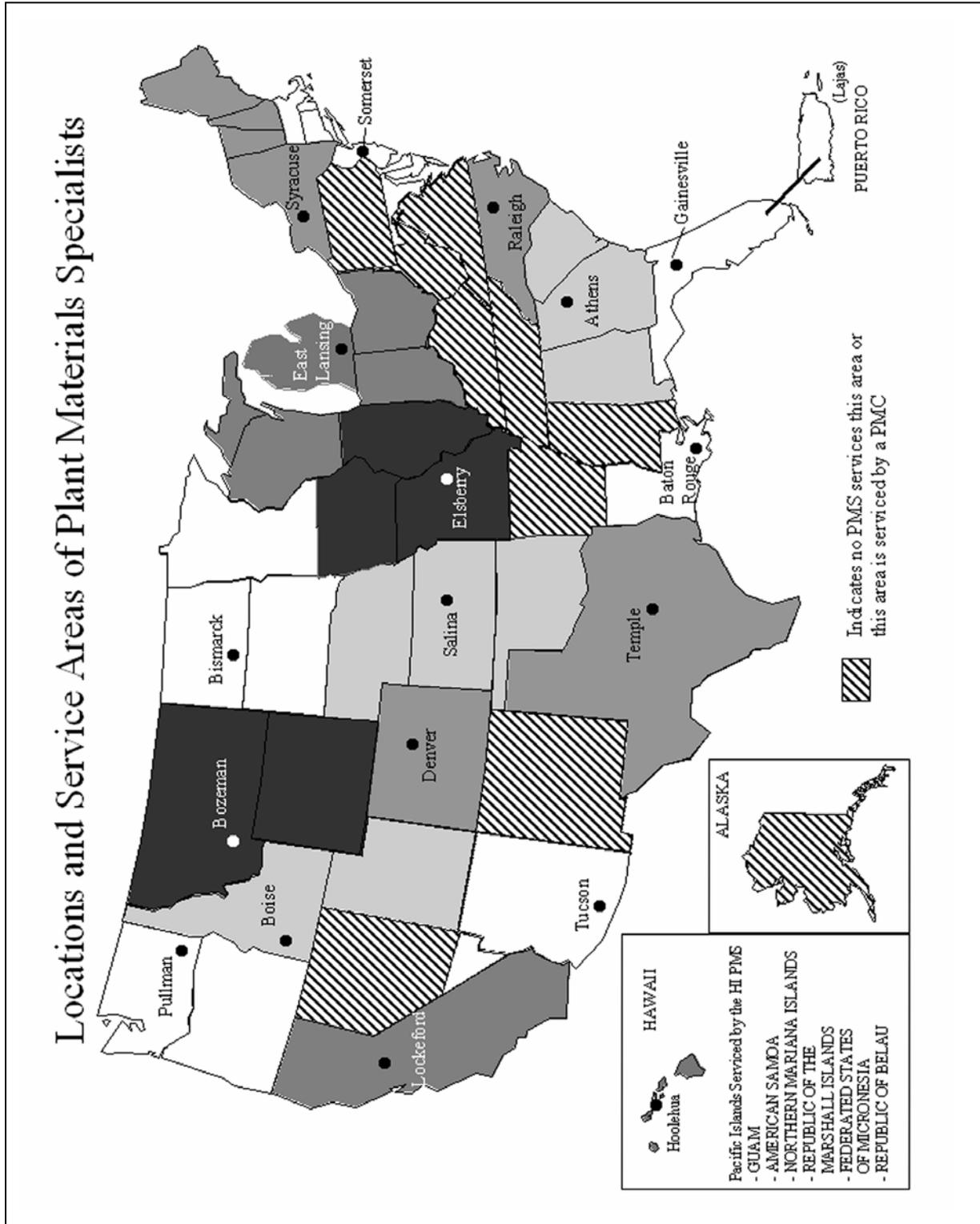
**Part 540 – Operation and Management**  
**Subpart A – Plant Materials Operations**

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**PART 540.4 - EXHIBITS FOR PART 540, SUBPART A**

**Exhibit 540-1 Locations and Service Areas of Plant Materials Specialists**



**Exhibit 540-2 Example of State Plant Materials Long Range Plan**

**STATE PLANT MATERIALS LONG RANGE PLAN  
1996-2001**

**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 540.01. 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 revised National Plant Materials Manual, Exhibit 539-1 (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: Healthy Watersheds Providing Clean and Abundant Water**

(1) Degradation of water quality has occurred through non-point source contaminants and excessive soil erosion from cultivated areas. 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 that are gently sloping to steeply sloping. The soils have been formed from loess and glacial till. Water erosion may be controlled by contour farming, minimum tillage, and terracing. Information on these practices is found in the FOTG. To reduce the degradation of water quality through sedimentation and non-point source contaminants, the practices of nutrient and pesticide management, filter strips, field borders, and forest riparian buffers may be applied. Information on these practices may be found within the FOTG. 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

(2) 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

(3) 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.

## Part 540.4 – Exhibits for Part 540, Subpart A

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Exhibit 540-2

Priority Ranking: High

(4) 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

### **NRCS Objective: Healthy and Productive Cropland**

(1) There are a limited number of woody species listed in the FOTG that are approved for use in windbreaks within MLRA's 69, 72, and 77. These areas have overall fairly harsh growing conditions with extreme temperatures, severe winds, and prolonged droughts. With these conditions, wind erosion is the primary resource concern within the area. There are approximately 1, 500,000 acres of cropland within these MLRA's which have soil loss exceeding 7 tons per acre per year due to wind erosion. The use of windbreaks can reduce soil erosion on fields, contribute to soil moisture through snow trapment, and provide habitat for various wildlife species. The need exists for a better variety and a broader selection of superior woody species (both native and introduced) for use in windbreaks within these MLRA's.

Recommended Action: Identify and evaluate woody species (both native and introduced species) which may have potential for use in windbreak plantings in MLRA's 69, 72 and 77. Woody species which are already commercially available and which may have potential for use in these areas should also be evaluated.

Priority Ranking: Medium

### **NRCS Objective: Healthy and Productive Wetlands**

(1) Wetlands are the most productive ecosystems. The creation, enhancement, and restoration of wetlands has 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: High Quality Wildlife Habitat**

(1) 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

**NRCS Objective: Healthy and Productive Grazing Lands**

(1) 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

**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 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 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.

## **Part 540.4 – Exhibits for Part 540, Subpart A**

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This lack of understanding hinders the effectiveness of the program in meeting employee, resource,

## **Part 540.4 - Exhibits for Part 540, Subpart A**

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Exhibit 540-2

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
- Commercial Seed Industry Representative
- State Native Plant Organization Representative
- State Forestry Service Representative
- Plant Materials Specialist (Advisor)
- Plant Center Manager (Advisor)

### **Appendix B. Listing of References**

- 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

**Part 540.4 – Exhibits for Part 540, Subpart A**

Exhibit 540-2

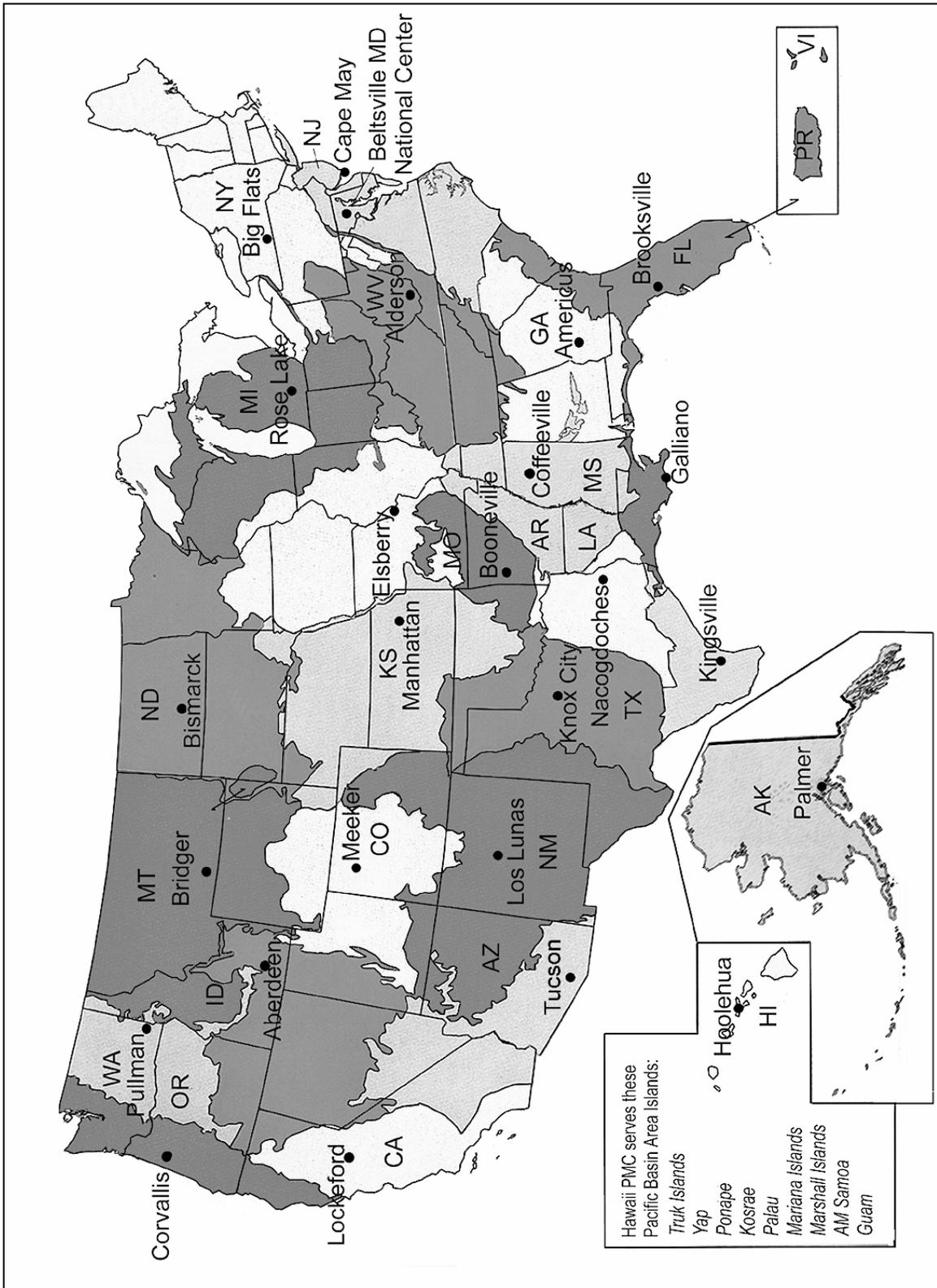
		Ranking Priority	Action Planned		
			Evaluate Existing Technology	Transfer Existing Technology	Develop New Technology
Problem	Plant Materials Needs				
<b>NRCS Objective: Healthy Watersheds</b>					
Degradation of water quality due to sedimentation and nonpoint source contaminants from cropland	Summarize and transfer existing plant materials and technology information	High	x	x	
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 untreated and unconfined waste	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			
<b>NRCS Objective: Healthy and Productive Wetlands</b>					
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
<b>NRCS Objective: High Quality Wildlife Habitat</b>					
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

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Exhibit 540-2

Problem	Plant Materials Needs	Ranking Priority	Action Planned		
			Evaluate Existing Technology	Transfer Existing Technology	Develop New Technology
<b>NRCS Objective: Healthy and Productive Cropland</b>					
Lack of superior woody varieties and selection for use in windbreak plantings	Identify and evaluate woody species for use in windbreak plantings	Medium			x
<b>NRCS Objective: A Diverse and well served Customer Base</b>					
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	
<b>NRCS Objective: Healthy and Productive Grazing Lands</b>					
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

Exhibit 540-3 Locations and Service Areas of Plant Materials Centers



## **Part 540.4 - Exhibits for Part 540, Subpart A**

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Exhibit 540-4

### **Exhibit 540-4 Recommended Training for Plant Materials Staff**

The following lists have been adapted from the NRCS training guidelines and are recommendations for staff training/proficiency in the PM Program. 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.

#### **Plant Materials Center Manager**

- Principles of Management and Supervision
- EEO for Supervisors & 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
- Wetland Flora, Restoration, and Constructed Wetlands
- Also includes training identified for Assistant PMC Managers and Biological Science Technicians
- Field Office Operations

#### **Plant Materials Specialist**

- Principles of Management and Supervision
- EEO for Supervisors & 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
- Agrostology: Biology of Warm-Season Grasses
- Biology of Legume Species
- Biosystematics, Genetics and Plant Breeding Concepts
- Wetland Flora, Restoration, and Constructed Wetlands
- Also includes training identified for Assistant PMC Managers and Biological Science Technicians

**Assistant Plant Materials Center 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
- 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
- Wetland Flora, Restoration, and Constructed Wetlands
- Also includes training identified for Biological Science Technicians

**Biological Science Technician**

- Intro to NRCS Computer Operations
- Intro to Civil Rights Modules 1&2
- How to use NRCS Directives
- Intro to NRCS
- Orientation for New Employees
- Partnership Roles and Responsibilities
- Managing Quality Workshop (TQM)
- Effective Interpersonal Skills
- Farm Management and Agronomy Principles for PMC Bio Tech.
- Roadmap to Problem Solving Workshop

**Secretary/Program Assistant/Office Automation Clerk**

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

## Part 540.4 - Exhibits for Part 540, Subpart A

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Exhibit 540-5

### Exhibit 540-5 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.

<b>Item</b>	<b>Date Due</b>	<b>Part #</b>	<b>Page #</b>
Plant Materials Progress Report of Activities	April 1	541.21	541-2
PMC Annual Technical Report	May 1	541.22	541-3
Budget Information	May-June	540.21(a)	540-11
PMC Business Plan	October 1	540.22(b)	540-14
Workload Analysis	October 1	540.22(c)	540-15
Annual Report on PMC Activities and Accomplishments (ECS-008)	December	541.20	541-1

**Exhibit 540-6 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.

**Federal Insecticide, Fungicide, and Rodenticide Act**

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

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

**Comprehensive Environmental Response, Compensation, and Liability Act**

The Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA), (also known as "Superfund Act") 42 USC 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 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. The EPA maintains a list of potentially hazardous waste site locations and a system for tracking progress of obligations, allocations, and expenditures for all remedial projects at the National Priority List (NPL) sites.

Importance to PMCs: Currently, there are no hazardous waste sites identified on PMC's. 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 we would not have to report to the EPA. Hazardous chemicals should also only be purchased for immediate or near future use and not stored long term.

**Resource Conservation and Recovery Act**

The Resource Conservation and Recovery Act (RCRA) 42 USC 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

## **Part 540.4 - Exhibits for Part 540, Subpart A**

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treated, stored, or disposed of must obtain a permit from the EPA or the state, if a state has an authorized Hazardous Waste Management (HWM) program.

## Part 540.4 – Exhibits for Part 540, Subpart A

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Exhibit 540-6

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.

### **Safe Drinking Water Act**

The Safe Drinking Water Act (SDWA), USC 300f-300j-10, was passed on December 16, 1974. The purpose of the Act is to assure that potable water systems serving the public meet minimum national standards. The Act authorizes the 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.

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.

### **Clean Water Statutes**

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 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 assure adequate controls of sources of pollutants. The Act also sets standards and minimum requirements for the control and abatement of water pollution.

The Clean Water Act of 1977, 33 USC 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.

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.

### **Toxic Substances Control Act**

The Toxic Substances Control Act (TSCA), 15 USC 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. The EPA primarily regulates the manufacture, processing, of commercial distribution of chemical substances and mixtures. However, the EPA also regulates the use and disposal of certain substances by noncommercial entities, including federal agencies. For the most part, TSCA and the regulations promulgated under the Act pertain to the commercial and industrial production, use, and disposal of toxic chemicals. The USDA concerns involve the

provisions of the statute and regulations covering facilities and sites which may contain PCB's and asbestos.

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 the General Manual Title 360, Part 420, Subpart T.

### **Clean Air Act**

The basic purpose of the Clean Air Act (CAA), 42 USC 7401-7642, is to protect and enhance the quality of the nation's air resources so as 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.

Importance to PMCs: PMCs in general do not generate air contaminants. Most important might be management activities that are concerned with natural occurrences, such as fire, having attendant air quality impacts.

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Exhibit 540-7

### Exhibit 540-7 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 the General Manual Title 360, Part 420 should be followed as well. This list may not be inclusive for each PMC, and all items on this list may not pertain to each PMC.

- 1) General Safety Coordination
  - a) Safety coordinator(s) should be appointed for the PMC and included on all contact sheets for emergency response.
  - b) Safety updates should be provided in staff meetings and in writing if needed.
  - c) Safety training should be provided to all employees at a level necessary for performance of the employees' job.
  - d) State NRCS safety coordinators should be identified.
- 2) General Health Items
  - a) Limit the amount of time employees work in confined spaces
  - b) Appropriate clothing should be worn by employees, i.e., work boots for field work, hats for sun protection
  - c) Conduct a job hazard analysis as needed
  - d) Instruction on defensive driving and winter driving techniques may be provided through the State Office
  - e) HIV/AIDS information
  - f) Workplace violence information
  - g) Lyme disease information
  - h) Information on exercise or fitness programs, cancer awareness, and proper nutrition should be provided as available
  - i) Travel safety information provided as available
  - j) 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.
  - k) Handicap access provided to PMC buildings as needed or appropriate so that facilities do not become a safety hazard to handicapped individuals
- 3) PMC Facility
  - a) Structures and equipment used on a daily basis are in good working order
  - b) Adequate lighting is available for tasks
  - c) 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
  - d) Asbestos
    - i) Survey and analysis of suspected materials completed
    - ii) Abatement has been done
    - iii) If abated asbestos present, contractors doing remodeling work should be notified of possible asbestos content
  - e) Radon surveys as needed
  - f) Office safety given same attention as field safety
  - g) Fire safety inspection completed on a regular basis
  - i) Combustibles not located near electrical panels, boilers, and heating units

- ii) Adequate space around electrical panels, boilers, and heating units
- iii) Signs posted on doors which must be left open during business hours
- iv) Boxes and materials not blocking hallways and exit paths
- v) Fire lanes marked for "no parking"
- vi) Oily rags stored in metal container with self-closing lid
- vii) Fire extinguishers properly positioned, mounted, and checked annually
- viii) Smoke detectors and carbon monoxide detectors in place and inspected or serviced regularly
- ix) Regularly used extension cords should be replaced with permanent outlets
- h) First aid and emergency response
  - i) Supplies adequate and clearly identified
  - ii) Contact numbers available
- i) Hazardous materials spills
  - i) Spill kits adequately stocked and accessible
  - ii) Cleanup instructions identified
  - iii) Emergency numbers clearly identified in appropriate locations
  - iv) Emergency response sheets for pesticides, chemicals, and petroleum should be posted and kept current.
- j) Lock-out/tag-out procedures in place and followed
- 4) Equipment and Field Operations
  - a) Agricultural equipment
    - i) Basic equipment safety instructions and protocols established
    - ii) Heavy equipment safety covered
    - iii) Specialized equipment, i.e. combines, safety has been covered
  - b) Operation of tools and equipment
    - i) Instruction on basic hand tool use and care
    - ii) Machine operation and safety instructions conveyed
    - iii) Proper jacks, supports, and blocking used when servicing equipment
  - c) Seed cleaning
    - i) Dust - provide air filtering and/or dust masks
    - ii) Noise - ear protection
    - iii) Moving parts - guards installed and warning markings as needed
- 5) Pesticides and Chemicals
  - a) Pesticide/chemical handling
    - i) Respirators proper size and fit-tested by industrial hygienist
    - ii) Adequate protective clothing provided for each individual
    - iii) Worker Protection Standards followed for handling and use of pesticides
    - iv) Chemical hygiene (lab) instructions and protocols in place
    - v) Pesticide applicators license displayed or carried with applicator according to state regulations
  - b) Pesticide/chemical use and application
    - i) Proper application logs maintained
    - ii) Signs used to mark treated areas and re-entry time
    - iii) Mixing area clearly identified and protected from running off the site

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Exhibit 540-7

- c) Pesticide/chemical storage
  - i) Pesticides stored under approved storage conditions
  - ii) Adequate ventilation in storage area
  - iii) Pesticides and industrial chemicals (i.e., lubricants, cans of petroleum products, etc.) inventoried and safely stored in approved cabinets or storage areas
  - iv) MSDS sheets for each chemical used or stored are kept on-site and available for review
- d) Hazardous waste disposal protocols established and followed
- e) Fertilizers are stored and handled as appropriate
- 6) Miscellaneous
  - a) Ergonomics of work stations, hand tools, etc. given consideration
  - b) Fire and burning safety considered (field and trash pile burning)
  - c) Animal hazards (i.e., poisonous spiders, snakes, cattle) considered on the job site

**Exhibit 540-8 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 540.22. 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, Exhibit 539-1 (NRCS Goals and Objectives).

The PM Technical 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.

**General Description of the Service Area**

**Climate** - USDA Plant Hardiness Zones 4, 5, 6, 7 are within the area serviced. Rainfall is quite varied both in annual amount and in seasonal distribution, but predominately occurs in the form of snowfall. Annual precipitation averages of individual climatological stations range from about 8 to 20 inches. The mean annual precipitation for the major portion of the service area is 14 inches.

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Exhibit 540-8

**Major Land Resource Areas** - Included in the service area is all or portions of six Major Land Resource Areas (MLRAs). MLRAs include the following:

- 32 - Northern Intermountain Desertic Basin
- 33 - Semiarid Rocky Mountains
- 34 - Central Desertic Basin, Mountains, and Plateaus
- 48A - Southern Rocky Mountains
- 48B - Southern Rocky Mountain Parks
- 49 - Southern Rocky Mountain Foothills

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 two categories according to the PM Technical Committee:

#### **NRCS Objective 2.2: Healthy Watersheds providing clean and abundant water supplies for people and the environment**

##### A. High Altitude Lands Revegetation - Priority Ranking: High

These lands are commonly the Alpine and Sub-alpine zones of the Rocky Mountains (MLRA 48A,B,49). Similar associated problems are found from 8,500 feet (mountain shrub zone) to 14,000 feet elevation. These high altitude lands which serve as quality watersheds provide scenic beauty, recreation, habitat for wildlife, rich mineral resources, and forest products.

##### *Problems*

Increased use of these fragile lands reduces their aesthetic value and watershed quality. Historic developments, mining, skiing, and tourism neglected to consider the long-term consequences of the destruction of this unique environmental system. Modern developers are becoming aware of the need to address rehabilitation in a timely manner.

Primary concerns are: 1) a short, cold growing season, 2) severe freeze drying with ice crystal scouring, 3) severe light intensity and soil surface temperatures, 4) shallow, erodible soils often on steep slopes, 5) limited quality topsoil and poor quality subsoil, 6) the lack of commercial supplies of appropriate plant species, and 7) the technology to establish suitable plant cover.

##### *Needs*

The region needs commercially available quantities of plant varieties and the technology to establish them. Cultivars selected should:

- provide erosion control and stabilization associated with developments including mining, recreational developments, urbanization, transmission and highway corridors.
- enhance watershed hydrologic function.
- provide improved winter and summer range for livestock and wildlife.

- be capable of withstanding intensive use.
- be acceptable by the users and comply with the law.
- include indigenous species for revegetation and reclamation uses.

### *Targeted Plant Science Studies*

- Evaluation and Release of Improved Selections of Meadow Foxtail, *Alopecurus pratensis*.
- Evaluation and Release of Improved Selections of tufted hairgrass, *Deschampsia cespitosa*.
- Evaluation of Establishment Techniques for Timothy species.

### B. Revegetation of Drastically Disturbed Lands - Priority Ranking: High

The region the PMC serves has several land uses that have the potential to cause the disturbance of the existing natural plant community. Mining and drilling operations, past and present, include exploration for the processing of coal, oil, natural gas, and other minerals have or will create large areas of surface disturbed lands. Construction of roads, highways, gravel quarries, utility corridors, and pipelines in the region have and will lead to increased surface disturbed areas.

### *Problems*

**Oil Shale Lands** - There are approximately 25,000 square miles of oil shale lands in the area served by the center. The elevation range encompasses vegetation types from salt desert shrub to alpine grasslands. These oil shale lands provide valuable spring, summer, fall, and winter range for deer, elk, non-game wildlife, and livestock.

Generally, processed shale has a high pH and salinity, and is deficient in available nitrogen and phosphorus. The chemical properties of processed shale also vary considerably due to the temperature of the retorting process used.

Large areas of surface disturbance are needed in the development of oil shale. In addition, oil shale development has the potential to produce large quantities of spent material after the hydrocarbons are extracted. Successful revegetation with developed plant materials will be necessary to gain public acceptance of this method of energy production.

**Coal Mined Lands** - Much of the Upper Colorado region is underlain by rich coal deposits. Many of these deposits are being developed, or could be developed, to meet energy needs.

Abandoned mines, as well as current and future mines, have and will affect all land resources of the region. The surface lands overlying the coal deposits provide forage for livestock and wildlife, forest products, and areas for recreation. In addition they serve an important watershed role. Coal mining will disturb large portions of the region creating a continuing need to identify and develop plant materials for revegetation efforts.

**Critical Site Revegetation and Stabilization** - The area has and will continue to experience the accelerated construction of roads, highways, parks, trails, recreation sites, exploratory sites, utility corridors, quarries, and pipelines. Part of this is due to the concentration of mineral and energy resources found in the Upper Colorado Region. Continued expansion of industry will require plant materials to successfully revegetate critically disturbed areas to restore these disturbed sites.

## Part 540.4 – Exhibits for Part 540, Subpart A

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Exhibit 540-8

Road developments, old and new, have created many critical or highly erodible sites that contribute significant amounts of erosion and sediment. Generally the soils on these sites are low in fertility or are exposed sterile sub-soils. Often slope gradients are increased, infiltration rates decreased and runoff water generated and concentrated. Crossings at water courses often require special stabilization techniques supported with specialized plants.

The demand is increasing for low maintenance, durable vegetation that is attractive despite heavy use. Some locations require salt tolerant species, and most locations must use species requiring limited quantities of water and fertility. Plant materials must be made available commercially that are adaptive to the conditions of the project area and the technology developed to establish them.

### *Needs*

The region needs commercially available quantities of plant varieties and the technology to establish them. Cultivars selected should:

- be acceptable to the prospective users and environmental legislation.
- have wear resistance and low maintenance requirements.
- have erosion control qualities.
- have salinity tolerance.
- have a good texture and foliage color.
- have strong capabilities for rapid establishment.
- be adaptable to diverse sites.
- provide habitat for small, upland, and nonage species of wildlife.
- be palatable and nutritious as food for wildlife.
- when within rights-of-way or other suitable sites be of low preference to wildlife.

### *Targeted Plant Science Studies*

- Evaluation and Release of Improved Selections of inland saltgrass, *Distichlis stricta*.
- Evaluation and Release of Improved Selections of Utah fescue, *Festuca dasyclada*.
- Evaluation of Selected Rhizomatous Species for Roadside Use.
- Demonstration Planting at National Park on Wear Tolerant Species for Trails.

### **NRCS Objective 2.3: Healthy and Productive Grazing Land**

#### A. Increased Productivity and Conservation of Rangelands - Priority Ranking: High

Millions of acres of rangeland occur in the Upper Colorado Region. The magnitude of this rangeland area makes it a major source of sediments and salts affecting the water quality of the Colorado River and its tributaries. Primarily, the problem areas reflect a previously degraded range condition and reduced quality of the vegetative cover. The rangeland area serves as a watershed and provides recreational opportunities.

In addition, there is an increasingly strong need for adapted forage species to convert formerly abandoned cropland and de-watered mountain parks to productive rangeland.

### *Problems*

Forage production on the regions native range needs to be increased to reduce erosion of soil and salt sediments and improve its carrying capacity. Much of the area receives less than 10 inches of annual moisture and has been impacted by seasonal mismanagement. Improvement of these rangelands by seeding is marginally practical due to limited supplies of quality forage species.

Commercial quantities of quality shrubs, grasses, legumes, and forbs adapted to these western rangelands are limited and need to be made available.

### *Needs*

The region needs commercially available quantities of plant varieties and the technology to establish them. Cultivars selected should:

- be acceptable to the prospective users.
- be quickly established.
- have erosion control qualities.
- have salinity tolerance.
- have drought tolerance.
- have strong capabilities for rapid establishment.
- be palatable and nutritious to livestock and wildlife.

### *Targeted Plant Science Studies*

- Evaluation and Release of Improved Selections of mountain brome, *Bromus marginatus*.
- Site Evaluation of Improved Selections of tall wheatgrass *Elytrigia elongata*.
- Evaluation of silver buffaloberry, *Sheperdia argentea*.

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Exhibit 540-9

### Exhibit 540-9 Example of a PMC Business Plan

#### Plant Materials Center Business Plan – FY2000

#### 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.

<b>Section I - Project and Study Activities - Initial Evaluation, Advanced Evaluation, Off-center, Inactive</b>					
<b>Number</b>	<b>Title/Activity</b>	<b>Person Resp.</b>	<b>Description of Progress</b>	<b>Due Date</b>	<b>Complete Date</b>
<b>08I073J</b>	<b>IE antelope bitterbrush (<i>Purshia tridentata</i>)</b> Collect and process seed/cuttings Plant seeds in greenhouse	BT/BA BT/BA		07/01 09/30	
<b>08I160K</b>	<b>IE thinleaf alder (<i>Alnus tenuifolia</i>)</b> Develop plot management plan Evaluate plots -spring Evaluate plots - fall Compile and summarize data from last year	HT HT HT HT		10/01 05/25 09/25 11/01	
<b>13A120G</b>	<b>Evaluate eastern gamagrass for Forage Quality</b> Develop plot management plan Fertilize plots Schedule clippings - 3 times Prepare samples for analysis Evaluate sample data Summarize data and develop report	HT/BT BT BT HT HT HT		10/20 Spr/Sum Summer 08/25 Yearly 03/15	
<b>22A002S</b>	<b>Selection of <i>Spartina spartinea</i> for a sexually propagated cultivar</b> 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	
<b>48A200J</b>	<b>Nutrient Quality of Selected Forbs/Legumes for White-Tailed Deer</b> 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	

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Exhibit 540-9

<b>Section II - Field Operations/Seed &amp; Plant Increase Activities - Seed Increase, Foundation Seed Production, Facilities/Equipment</b>					
Number	Title/Activity	Person Resp.	Description of Progress	Due Date	Complete Date
<b>59S025D</b>	<b>Foundation Increase of 'Crockett' herbaceous mimosa</b> Develop field management plan Apply fertilizer Carry-out required irrigation Inspect fields and rogue out off-type plants Schedule field inspections Harvest current year crop	MGR BT/BA BT MGR  BT/BA		11/01 Seasonal Summer 08/30 08/30 09/30	
<b>04S222P</b>	<b>Increase of alkali sacaton, (<i>Sporobolus airoides</i>)</b> Apply field management plan, fertilize, irrigate Field inspections Harvest crop Clean and store seed	BT BT MGR BT/BA BT/BA		10/30  05/30 09/30 09/30	
	<b>Harvest Seed from PMC Breeder Blocks</b> Determine anticipated needs Develop maintenance and harvest schedule Harvest selected cultivars Clean and store seed	MGR/PMS MGR BT/BA BT/BA		10/01 10/01 09/30 09/30	
	<b>Field Management/Operations</b> Develop field management plan Evaluate irrigation system Locate new plantings Develop fertilizer needs	MGR BT MGR/BT BT		Oct Jan Nov Mar	
	<b>Facilities Management Plan</b> Review equipment status and needs Equipment inspection Monthly safety inspection Snow removal Yard/landscape maintenance	MGR BT FM Staff Staff			
	<b>Repair/Maintenance of Irrigation System</b> Develop work schedule Develop list of materials and cost estimates Repair conveyance system Perform maintenance to system	MGR BT BT/BA BT/BA		12/01 01/10 03/30 Seasonal	

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Exhibit 540-9

<b>Section III - Technology Transfer Activities - Reports, Plant Releases, Written and Oral Information, Training</b>					
<b>Number</b>	<b>Title/Activity</b>	<b>Person Resp.</b>	<b>Description of Progress</b>	<b>Due Date</b>	<b>Complete Date</b>
	<b>Develop Annual Technical Report</b> Summarize project(s) data Prepare report Printing Distribution				
<b>20A222A</b>	<b>Naming and Select Release of dotted gayfeather</b> Develop release notice Review names for clearance Submit information for review Prepare articles to advertise release	MGR/PMS MGR MGR MGR/PMS		Jan Jan Jan Mar	
	<b>Assist State NRCS PAS to produce video on PMC releases</b>	MGR		Sept	
<b>48A226T</b>	<b>Develop training module to assist NRCS field offices with grass seeding</b> Develop outline Complete literature review Complete draft Review and update Develop publish and distribution schedule	MGR/PMS PMS MGR/PMS MGR MGR/SE		1 <sup>st</sup> Qtr 1 <sup>st</sup> Qtr Feb May June	
	<b>Prepare and present paper at SAAS meeting</b>	MGR		12/01	
	<b>Produce/revise four plant guides</b> Arizona cottontop 'Santa Rita' Four-wing saltbush 'Sonora' black grama 'Seco' barley	MGR/SE MGR/SE MGR/SE MGR/SE		11/01 02/02 05/01 05/01	
	<b>Deliver plant guides and fact sheets to NPMC for posting on PMC homepage</b>	MGR		Sept	
	<b>OJT Training for Staff</b> Computer Use/Programs Plant Breeding Pesticide Safety Pest Applicator License	SE MGR/AGR FM/GHM BT		Jan Mar May Seasonal	
	<b>Develop technical notes for FO use</b> PM for Wildlife Bioengineering and PM Cool Season Forages	FM MGR HT		11/30 02/01 06/01	

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Exhibit 540-9

<b>Section IV - Administration and Operations - Budget, Long-Range Plan, Business Plan, Meetings</b>					
<b>Number</b>	<b>Title/Activity</b>	<b>Person Resp.</b>	<b>Description of Progress</b>	<b>Due Date</b>	<b>Complete Date</b>
	<b>Update Centers Long-Range Plan</b>	MGR/PMS		06/30	
	<b>Prepare Business Plan for FYXX and submit to PMS for review</b>	MGR		09/15 09/30	
	<b>Develop specifications and cost data for facilities and equipment needs ID in 5 year replacement plan</b>	MGR		04/01	
	<b>Develop Workload Analysis for PMC</b>	MGR		05/30	
	Review WA and approve	MGR		06/30	
	<b>Performance appraisals for staff</b>				
	Evaluate current years	MGR		10/30	
	Develop new appraisals	MGR		11/30	
<b>28A132B</b>	<b>Hire Seasonal Employees for NPS Project</b>				
	Advertise and Interview applicants	MGR/FM		03/30	
	Recommendations for hire to SO	MGR/FM		04/15	
	Complete application process	MGR		05/01	
	Have seasonal on staff	MGR		05/30	
	<b>Update Staff EDP</b>				
	Manager	PMS		10/30	
	All other PMC positions	MGR		10/30	
	<b>Conduct safety lecture at staff mgt.</b>	FM/MGR		Each Q	
	<b>Prepare 3-year budget plan for Adv. Mtg</b>	MGR		07/30	
<b>24A330B</b>	<b>Prepare budget worksheet for new NPS agreement</b>				
	Review IA agreement	MGR		11/01	
	Calculate staff and monies needed	MGR		12/15	
	Develop time schedule	MGR		12/30	
	Submit to NPS for approval	MGR		01/10	
	<b>Evaluate work with cooperators and determine if new agreement are needed</b>	MGR		Quarterly	
	<b>Maintain PMC budget within limits</b>				
	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	
	<b>PMC Advisory Meeting</b>				
	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	
	<b>Support the EO/CR activities in the state and have information presented at staff conferences</b>				
	Quarterly Meetings	MGR		Quarterly	

**Part 540.4 – Exhibits for Part 540, Subpart A**

Exhibit 540-10

**Exhibit 540-10 Example of a PMC Workload Analysis**

**PLANT MATERIALS CENTER  
STAFF WORKLOAD ANALYSIS – FY2000**

Category/Item	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
	FTE=	\$/hr.=	FTE=	\$/hr.=	FTE=	\$/hr.=	FTE=	\$/hr.=	FTE=	\$/hr.=	FTE=	\$/hr.=	FTE=	\$/hr.=	Hrs.	\$
<b>Projects and Studies</b>																
IE Antelope Bitterbrush	200	6,200	75	1,725	10	140	100	1,500	150	1,500	30	210	40	0	605	11,275
IE Thinleaf Alder	50	1,550	200	4,600	10	140	50	750	75	750	0	0	40	0	425	7,790
Evaluate Eastern Gamagrass - Forage	220	6,820	30	690	30	420	100	1,500	175	1,750	45	315	70	0	670	11,495
Spartina spartinea - dev. Of sexually prop. Cv.	50	1,550	230	5,290	10	140	75	1,125	25	250	60	420	20	0	470	8,775
Nutrient Quality of Forbs/Legumes for Deer	10	310	150	3,450	15	210	50	750	30	300	30	210	20	0	305	5,230
<b>Subtotal</b>	<b>530</b>	<b>16,430</b>	<b>685</b>	<b>15,755</b>	<b>75</b>	<b>1,050</b>	<b>375</b>	<b>5,625</b>	<b>455</b>	<b>4,550</b>	<b>165</b>	<b>1,155</b>	<b>190</b>	<b>0</b>	<b>2,475</b>	<b>44,565</b>
<b>Field Operations/Maintenance</b>																
Foundation Increase - 'Crockett	10	310	30	690	0	0	75	1,125	100	1,000	50	350	0	0	265	3,475
Increase of Alkali Sacaton	10	310	30	690	0	0	75	1,125	100	1,000	0	0	15	0	230	3,125
Harvest Seed from PMC Breeder Blocks	20	620	50	1,150	0	0	100	1,500	150	1,500	50	350	20	0	390	5,120

**Part 540.4 - Exhibits for Part 540, Subpart A**

Exhibit 540-10

<b>PLANT MATERIALS CENTER STAFF WORKLOAD ANALYSIS - FY99</b>																
Category/Item	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$
Field Management/ Operations	50	1,550	120	2,760	15	210	450	6,750	350	3,500	200	1,400	20	0	1,205	16,170
Facilities Management																
Buildings	20	620	25	575	0	0	70	1,050	100	1,000	25	175	0	0	240	3,420
Landscape	20	620	25	575	0	0	50	750	150	1,500	125	875	20	0	390	4,320
Equipment	50	1,550	50	1,150	40	560	75	1,125	100	1,000	30	210	10	0	355	5,595
Repair/Maintenance of Irrigation System	0	0	10	230	0	0	100	1,500	30	300	10	70	0	0	150	2,100
<b>Subtotal</b>	<b>180</b>	<b>5,580</b>	<b>340</b>	<b>7,820</b>	<b>55</b>	<b>770</b>	<b>995</b>	<b>14,925</b>	<b>1,080</b>	<b>10,800</b>	<b>490</b>	<b>3,430</b>	<b>85</b>	<b>0</b>	<b>3,225</b>	<b>43,325</b>
<b>Technology Transfer</b>																
Develop Annual Technical Report	30	930	50	1,150	100	1,400	20	300	0	0	0	0	0	0	200	3,780
Naming and Select Release of Dotted Gayfeather	20	620	10	230	10	140	0	0	0	0	0	0	0	0	40	990
Assist State PAS w/ video on PMC Releases	30	930	20	460	40	560	0	0	0	0	0	0	0	0	90	1,950
Develop training to assist FOs with grass seeding	30	930	50	1,150	30	420	30	450	0	0	0	0	0	0	140	2,950
Prepare and present paper at SAAS meeting	50	1,550	0	0	5	70	0	0	0	0	0	0	0	0	55	1,620
Produce/Revise four plant guides	50	1,550	40	920	25	350	0	0	0	0	0	0	0	0	115	2,820
Prep and deliver written info to NPMC for Internet	10	310	10	230	80	1,120	0	0	0	0	0	0	0	0	100	16,600

**Part 540.4 – Exhibits for Part 540, Subpart A**

Exhibit 540-10

**PLANT MATERIALS CENTER  
STAFF WORKLOAD ANALYSIS – FY99**

Category/Item	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS		
	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	
Develop technical notes for FO use	30	930	50	1,150	15	210	0	0	0	0	0	0	0	0	0	95	2,290
<b>Subtotal</b>	250	7,750	230	5,290	305	4,270	50	750	0	0	0	0	0	0	0	835	18,060

<b>Administration and Operation</b>	40	1,240	10	230	5	70	0	0	0	0	0	0	0	0	0	55	1,540
Update PMC Long-Range Plan	40	1,240	15	345	5	70	0	0	0	0	0	0	0	0	0	60	1,655
Prepare Business Plan for FY00	40	1,240	40	920	0	0	0	0	0	0	0	0	0	0	0	80	2,160
PMC Advisory Meeting	20	620	10	230	12	168	10	150	0	0	0	0	0	0	0	52	1,168
Develop Workload Analysis for PMC	10	310	10	230	3	42	5	75	0	0	0	0	0	0	0	28	657
Update facilities & equip. replacement plan	40	1,240	10	230	5	70	5	75	2	20	2	14	0	0	0	64	1,649
Personnel - summer hires, performance, update EDP's	50	1,550	40	920	10	140	40	600	30	300	5	35	0	0	0	175	3,545
Safety - training, reviews	130	4,030	30	690	75	1,050	0	0	0	0	0	0	0	0	0	235	5,770
Budget - prepare, track, update	50	1,550	30	690	80	1,120	30	450	0	0	0	0	0	0	0	190	3,810
Procurement -bidding, purchases, tracking	15	465	15	345	15	210	15	225	15	150	5	35	0	0	0	80	1,430
Support EO/CR activities	25	775	25	575	25	350	25	375	25	250	5	35	0	0	0	130	2,360
Staff training	50	1,550	50	1,150	650	9,100	5	75	0	0	0	0	0	0	0	755	11,875
Office Duties- phone, filing, mail, etc.	180	5,580	145	3,335	60	840	75	1,125	35	350	5	35	5	0	0	505	11,265

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Exhibit 540-10

PLANT MATERIALS CENTER  
STAFF WORKLOAD ANALYSIS – FY99

Category/Item	Manager		Asst. Mgr./ Agronomist		Secretary		Farm Foreman		Bio. Sci. Technician		Bio. Tech. (summer)		Volunteers		TOTALS	
	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$	Hrs.	\$\$
Time Sheets - completion and processing	60	1,860	30	690	100	1,400	30	450	30	300	5	35	5	0	260	4,735
<b>Subtotal</b>	<b>750</b>	<b>23,250</b>	<b>460</b>	<b>10,580</b>	<b>1,045</b>	<b>14,630</b>	<b>240</b>	<b>3,600</b>	<b>137</b>	<b>1,370</b>	<b>27</b>	<b>189</b>	<b>10</b>	<b>0</b>	<b>2,669</b>	<b>53,619</b>

<b>Hours Allocated (Subtotal)</b>	1,710		1,715		1,480		1,660		1,672		682		285		9,204	
<b>Unexpected Events (10%)</b>	209		209		188		209		209		73		31		1,127	
<b>Total Hours</b>	1,919		1,924		1,668		1,869		1,881		755		316		10,331	

<b>Leave</b>																
Annual Leave	156		104		104		156		96		0		0		616	
Sick Leave	40		40		40		40		40		0		0		200	
Holiday/Admin.	80		80		80		80		72		0		0		392	
<b>Total Hours Allocated</b>	<b>2,195</b>		<b>2,148</b>		<b>1,892</b>		<b>2,145</b>		<b>2,089</b>		<b>755</b>		<b>316</b>		<b>11,539</b>	
<b>Total Hours Available</b>	<b>2,087</b>		<b>2,087</b>		<b>1,878</b>		<b>2,087</b>		<b>2,087</b>		<b>730</b>		<b>313</b>		<b>11,270</b>	
<b>% Allocated over Available</b>	5.16		2.91		0.72		2.76		0.08		3.37		1.04		2.39	

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## **SUBPART B - PRODUCT DEVELOPMENT**

### **PART 540.5 GUIDELINES FOR PRODUCT DEVELOPMENT**

#### **540.50 General**

Projects and studies are the foundation of plant science technology development in the PM Program. Projects are intended to address important NRCS conservation issues and are developed using goals identified in the USDA and NRCS Strategic Plan (Exhibit 539-1 NRCS Goals and Objectives). 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 maintenance work), 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 Exhibit 540-11.

#### **540.51 National Projects**

##### **(a) General**

Projects function to identify topics of work carried out by the PM Program. 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, Plant Materials (NPL), PM Information Coordinator, Regional Plant Materials Coordinators, PMSs, and PMC managers (PMCM). 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 PMCM, PMS, or Regional PM Coordinator 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.

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**(d) Contents of a Project Statement**

A complete sample project statement is found in Exhibit 540-12. Each project statement will contain:

- Project Title - a brief title statement that best describes the project.
- Project Code - this will be a standardized identifier for the project. Project codes will be related to PMC study ID codes.
- 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.
- Project Classification - classification of the project based on SWAPA, conservation practice, etc. based on a lookup table in Plant Materials Operation and Management System (POMS).
- Keywords - important words that may be used in a search of the database.
- Approval - all national project statements are approved by NPL.

**(e) Filing Project statements**

A list of national projects is included in Exhibit 540-13. National project statements will also be included in POMS (see Part 541.10) and will be found on the PM Program Internet site.

**540.52 Studies**

**(a) General**

Studies are designed to guide the activities of a PMC or PMS. They are prepared to address needs identified in the State and PMC LRP. Studies may cover the activities of one or more PMCs or PMSs. Coordination required between PMCs and PMSs is the responsibility of the staffs involved and the Regional PM Coordinator. Plans will be prepared for all PM studies.

**(b) Study Plans**

The study plan is to provide 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. PMCMs and/or PMSs develop study plans. Study plans are to be developed in POMS (see Part 541.10). Study plans may be modified as needed to achieve objectives.

**(c) Designating Study Plans**

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-9911-CR" or "MTPMS-F-9911-CR", where MT = PMC or State Abbreviation (ET = East Texas etc), PMC or PMS = Plant Materials Center or Plant Materials Specialists, P or F = Type Code, 99 = year study was initiated, 11 = Consecutive Number assigned by PMC or PMS, and

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CR= Use Code. PMSs should use the state code for the state where the study or planting is located, and not the state code for where the PMS is stationed. For example, the MTPMS would use code "WYPMS" in the study number for a field planting located in Wyoming. Specific details and codes for assigning study numbers are found in Exhibit 540-14.

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 which indicates related studies.

#### **(d) Development of the Study Plan**

The PMC or PMS takes the leadership for developing study plans. Plans may include input from other staff members or disciplines. Study plans are developed in POMS (see Part 541.10). This will allow consolidation of information at the national level. Various reports are available from the database to generate the initial study plan, study summaries, progress reports, and final reports.

Study Plans should be reviewed by others for technical merit and to make sure the plan meets the need of the resource concern being addressed. At a minimum, Study Plans developed by PMCs should be reviewed by the PMS, and Plans developed by the PMS should be reviewed by the PMC or another technical specialist. Additional reviewers might include other PMCs having similar studies, State Office specialists, Field Office staff, and University Agricultural Experiment Station researchers.

#### **(e) Content of the Study Plan**

A sample study plan is found in Exhibit 540-15. Study plans have the following elements:

- Title - use a title specific to the study.
- Study ID Code - follow guidelines in Part 540.52(c).
- Basic Information - included in this is study leader, relevant project code(s), and study start and end dates.
- Study status - status of study: on hold, active, inactive, completed.
- Practice/Resources - select the Land Use(s), Vegetative Practice(s), Resource Concern(s), and National Objective(s) being addressed by the study.
- Long Range Plans - identify concern(s) within the State and PMC LRPs that are addressed by this study.
- Study description - this is a brief text description that identifies specifically the objectives of the study.
- 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 Exhibit 540-16.
- 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

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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.

- Species used - a list of species and cultivars/releases (if applicable) which are used in the study.
- Keywords - important words that may be used in a search.
- Cooperators - list of other PMCs, PMSs, agencies or individuals that will be involved with the study.
- Study design - identifies the type of experimental design and describes the treatments to be evaluated by the study.
- Final evaluation - identifies Field Plantings (Part 540.61(f)) and Conservation Field Trials (Part 540.61(g)) which may be necessary to complete the evaluation process.
- Technology transfer products - Final products may include one or several formats. Exhibit 540-17 lists types of technology transfer products.
- Approval - Study plans and supplements are to be reviewed by peers to ensure technical adequacy. The State Conservationist's Plant Materials Advisory Committee reviews the plan for administrative items such as adequacy of resources to carry out the work.

**(f) Filing Study Plans**

Various reports from the database may be printed and should be filed at the originating PMC. In addition, a listing and electronic file of active studies along with a short description and study objective should be sent to the NPMC for inclusion on the Internet to highlight PMC research activities. It is the responsibility of each PMC to send updated information to the NPMC as studies are added or dropped.

**(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 and presented in the PMC Annual Technical Report (see Part 541.22). The Annual Technical Report will be generated from POMS annually on a fiscal year basis. For single year studies and Information-based Technology, the final report will serve as the summary. It is recommended that Information-based Technology be entered into POMS to facilitate the development of the PMC Annual Technical Report. Otherwise, a separate report will be prepared to capture Information-based Technology progress. The Annual Technical Report will serve as a basis for making adjustments to ongoing studies in the coming year.

**PART 540.6 TECHNOLOGY DEVELOPMENT AND TRANSFER**

**540.60 General**

The development and transfer of written and/or oral technology is an integral part of the Plant Materials Program. Technology development and transfer is accomplished through the use of Field-based Technology Studies or Information-based Technology. 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. Examples of products that may result from Field-based and Information-based Technology Studies are included in Exhibit 540-17.

**540.61 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 PMS. Examples of Field-based Technology Studies include the development of planting methods for streambank bioengineering, time of seeding studies for late season cover crops, and an evaluation of improved plant materials for use on strip mine sites. Study plans must be prepared for all Field-based Technology Studies and these plans must be approved by the State Conservationist's Plant Materials Advisory Committee (or equivalent) prior to starting a study. A basic outline for the process of Technology Development is found in Exhibit 540-11. A Technology Development checklist which may be used as a guide for Field-based Technology Studies is found in Exhibit 540-18.

**(b) Assembly of Materials for Field-based Technology Studies**

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

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 Part 540.72(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:

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- 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.
- Evaluation data for PMC studies should be recorded on evaluation forms printed from the POMS Database.
- Evaluation data will be recorded and added to POMS for uniform and safe storage of the data.
- 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.
- The data collected each year will be analyzed using MSTATC or a similar statistical package.

**(e) Off-center Evaluations**

Off-center evaluations are plantings and evaluations used by the PMC or sometimes PMS as part of a study to evaluate plant releases or technology off the center. Typically they consist of 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.

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 PMS, local district office, or other person.

The State Conservationist is to be assured through 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 PMS is also to determine that necessary funds, equipment, and manpower are available. Such factors as location, workload, and available facilities are to be considered in determining who is to have primary responsibility for each planting.

**(f) Field Plantings**

Field plantings may be 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 are evaluated in comparison with identified practice standards and specifications 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 PMS and coordinated with the PMC Manager.

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The establishment of field plantings will be addressed in the study plan as a long range plan for field plantings. The purpose of the long range plan 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 long range plan for field plantings. The long range plan will address field planting numbers, location, establishment and management techniques, timing and duration of evaluations, standards for comparison, evaluation responsibility, and data collection and manipulation. The size of the planting should be such that permits normal use and management.

The long range plan will include a the preparation of written products to adequately describe and convey new technology. These written product may include Plant Guides, Plant Fact Sheets, Technical Notes or information brochure 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, and maintenance requirements, or and detailed instructions on the procedures. See Part 540.63 for more information on preparing these and other types of written products.

Additional field plantings (other than those specified in the long range plan may be requested at the local level by completing a planting plan (SCS-ECS-009, see Exhibit 540-19) or other appropriate worksheet and submitting the request through the State Resource Conservationist (or equivalent). All additional field planting request will be considered by the SRC and PMS/PMC manager based upon the usefulness of the planting and availability of material.

Each field planting will be identified by a study number according to the format described in Part 540.52(c) and Exhibit 540-14. All field plantings should use Type Code "F" to designate a field planting. The field planting study will be a new and unique number, but may be linked back to a larger study or previous study through the POMS database.

Appropriate worksheets such as forms NRCS-ECS-10, -11 or modifications of these forms may be used for recording field evaluations. Exhibit 540-20 is a sample worksheet which may be used for a field evaluations. A register of field plantings will be developed and maintained. 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 or 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.

**(g) Conservation Field Trials**

Conservation Field Trials (CFT) are identified in the NRCS General Manual 450-403 as a tool for evaluating technology for addressing local soil and water resource problems. The

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approach is usually interdisciplinary. The PM Program may use CFTs to develop or test new

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technology, evaluate releases, or promote PM products. CFTs may be coordinated by the PMS or by the PMC. They may involve a study or be established based on a local need.

Each CFT will be identified by a study number according to the format described in Part 540.52(c) and Exhibit 540-14. All field plantings, including CFTs, should use Type Code "F" to designate a field planting. CFTs 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 Part 541.22). The Annual Technical Report may be generated from POMS. 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 as well as other forms of Technology Transfer media, tech notes, refereed papers, etc.

**(i) Selection**

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.

Criteria for selection:

- The selected applied plant technology must be practical and economical for the intended conservation use.
- 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.
- Selection criteria are to be documented in the study plan.
- In selecting applied plant technologies for subsequent incorporation into technical guides, consideration is to be given to the practical use of the technology.
- 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 Part 540.73(a)(3) for details on Environmental Considerations).

**540.62 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 PMC's. 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 Exhibit 540-18.

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**(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:

- summarizing existing material.
- reprinting existing material that still has application, but is in short supply.
- revising older material based on recently developed technology.
- summarizing new information/work that has been recently developed or is currently being developed.
- summarizing “personal” experience and knowledge on a specific subject.
- providing training to NRCS and non-NRCS personnel.

**(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 Exhibit 540-17. Information-based Technology Products should be outlined to assist the PMC or PMS in the development of the product. The outline may include:

- Title - A proposed title or working title for the activity.
- Basic Information - Activity leader, cooperators, start and end dates, and timeline for development.
- Need - Identify the specific need which is being met by undertaking this activity and the target audience.
- Objective/Description - This is a brief description of the activity and the purpose it will serve.
- 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 Exhibit 540-16.
- Materials - Identify what sources information is to be acquired from.
- Products - Identify the type of technology product (see Exhibit 540-17) 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.
- Copyright - Copyrighted material needs proper clearances and permission if information or artwork is extracted from copyrighted sources and should be considered during preparation.
- Review and Approval - cooperators and peers will review information for technical accuracy. NRCS policy will be followed for approval.
- Credit - Attention should be given to ensure that NRCS and the Plant Materials Program is given credit for involvement with the product development.
- Performance - ensure products are captured under the appropriate performance goal and management system.

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**540.63 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 could take one of many forms. Types of Technology Products are found in Exhibit 540-17.

**(b) Preparing Technology Products**

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

- All products developed by the Plant Materials Program will require full program credit, particularly where multiple partners are involved with product development. The use of PM “theme art” should be used to clearly identify the product.
- Products must be scientifically sound, professionally presented, and must satisfy customer expectations.
- “Personal” information is acceptable provided the source has recognized experience and knowledge on the subject.
- 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 Part 542.2 on plant nomenclature).
- Copyrighted material needs proper clearances/permission if information is extracted from copyrighted sources.
- Proper EO/CR statements should be included according to USDA regulations for printed material.
- 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.
- Format used should present material in an attractive way that can achieve a positive perception of the Plant Materials Program and/or follows predetermined format guidelines. Format will be determined by the nature of the product developed. For example, NRCS FOTG Technical Notes will follow state guidance for preparing a Technical Note (see Exhibit 520-22 and Exhibit 520-22), and manuscripts submitted to refereed or popular journals will follow the format required by the journal. Within the PM Program, a uniform format should be used for Plant Guides and Plant Fact Sheets, and Technical Notes to provide consistent recognition of PM products. Guidance for preparing Plant Guides may be found in Exhibit 520-22 and Exhibit 520-22, and for Plant Fact Sheets in Exhibit 520-22 and Exhibit 520-22.
- 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**

All products should be reviewed for technical soundness, comprehension, and consistency of format with NRCS guidelines. The depth of review will depend on the type of product. Products should be reviewed by NRCS peers and cooperators as applicable. The author has the responsibility to ensure the final product has received proper review and approval before distribution. Review may be state, regional, or national in scope and should follow proper guidelines and protocol.

**(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**

Two (2) written copies and an electronic file of all written products will be sent to the NPMC for inclusion on the Internet and for filing in the program archives. The NPMC will forward written materials to the National Agricultural Library (NAL). In addition, the PMC or PMS should save written and electronic copies of all written products.

**(f) Documentation**

The PMS and/or PMC manager has the responsibility to capture program outputs by documenting under the appropriate performance goal and measurement system, such as the NRCS-ECS-008 or current PM reporting system. All Field-based Technology Studies and Information-based Technology developed will be summarized annually in the PMC Annual Technical Report (see Part 541.22).

**540.64 Transferring and Marketing Technology Products**

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

**(a) Oral Communication**

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

**(b) 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

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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 and the PM Program through the use of logos and related artwork.

#### **(c) 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.

#### **(d) 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.

#### **(e) 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 Part 540.61(e).

#### **(f) Conservation Field Trials**

The PM Program may use CFTs to develop new technology, evaluate releases, or promote PM products. Part 540.61(g) describes CFTs in more detail.

### **PART 540.7 PLANT SELECTION**

#### **540.70 General**

The collection, assembly, selection, and release of new plant varieties and/or germplasm are integral parts of the Plant Materials Program. 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 isolate and/or select improved materials. Plant Selection activities are based on Study Plans as described in Part 540.52. The typical process for Plant Selection is outlined in Exhibit 540-11. A checklist which may be used as a guide for tracking the progress of Plant Selection Studies is found in Exhibit 540-28.

#### **540.71 Coordination of Plant Selection**

The NRCS Plant Materials Program relies on the cooperation, standards and regulations of other state and federal agencies during the development of plant releases.

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

The ESCOP policy statement for developing and releasing improved plants was revised by the Experiment Station Committee on Organization and Policy 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 Exhibit 540-29. The PM Program 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.

**(b) 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 the USDA Agricultural Marketing Service. The PM Program follows the guidelines of the Federal Seed Act for the species it produces. Note that not all species selected by the PM Program are included in the Federal Seed Act. The NPMC will reference copies of Federal Seed Act and Agricultural Marketing Service regulations.

**(c) Association of Official Seed Certifying Agencies (AOSCA)**

AOSCA develops the basic requirements for certified production of many crops in the U.S., 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 U.S. Federal Seed Act. The NPMC will retain reference copies of these documents. The PM Program 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 where seed is produced.

**(d) State Seed Certification Agencies**

The PM Program 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.

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540.72

**540.72 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 materials native to the United States, region of the country the PMC is located, or a particular ecosystem as appropriate based on the intended use of the release. 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:

- 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. 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, Exhibit 540-30) or Forms NRCS-ECS-580-a or NRCS-ECS-580-c (Seed Collection Envelopes). Copies of these forms are available from the NRCS National Forms Center.
- National Plant Germplasm System - 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. The NPMC will assist PMCs with accessing this information as necessary. Information on access to the GRIN database is found in Part 542.3. Materials in the NPGS may be obtained through 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 as necessary.
- Foreign Sources - Plant materials may be obtained from foreign sources as necessary to solve a specific conservation problem. The NPMC will assist with this process as necessary to locate sources of plant materials and coordinate 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 time frame needed to complete the acquisition.

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- 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 native species. 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**

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 as used in the past, will not be assigned to new accessions. Old existing PMC control numbers should be replaced with 9-million numbers.

PMCs will assign NRCS accession numbers to:

- new collections from native or foreign sources.
- unnamed non-varietal materials obtained from commercial sources.
- accessions which are combined (i.e., composited) during the plant selection process.
- one or more plants which are selected from an original accession during the plant selection process.

PMCs shall not assign NRCS accession numbers to:

- accessions received from another PMC which already have an NRCS accession number.
- materials which already have a PI number.
- named materials received from commercial sources. The NPMC assigns accession numbers to these materials to avoid assigning two different numbers to the same material. The NPMC should be contacted to obtain accession numbers for these materials.

The NRCS accession number (9-million) will always be used 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,

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will be included on release notices, release brochures, and technical summaries. Both the 9-million number and PI number will be included on D&D reports. Accession numbers and accessioning records will be tracked through POMS according to procedures found in Part 541.1 of the NPMM.

**540.73 Evaluation and Summary**

**(a) Evaluating Plant Assemblies**

**(1) General**

The purpose of a plant evaluation 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**

Performance is to 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 are to 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 and added to the POMS Database. 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.

**(3) Environmental Considerations**

The Plant Materials Program, by means of a categorical exclusion found within the Code of Federal regulations (7CFR650.6), does not routinely need to prepare a formal Environmental Assessment (EA) and/or Environmental Impact Statement (EIS) for new plant releases. However, under this CFR, an Environmental Evaluation 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 Environmental Evaluation conducted by the Plant Materials Program will be documented in the worksheet found in Exhibit 540-31. The Environmental Evaluation process determines if the new release will pose significant adverse effect on the environment. The Environmental Evaluation 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.

All plant releases, whether a native or introduced species, will undergo an Environmental Evaluation process supported by appropriate documentation. PMCs may continue to evaluate introduced species 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. The worksheet in Exhibit 540-31 will be used to conduct and document the Environmental Evaluation for

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Plant Materials Program releases. Plants will not be released until the 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).

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. Undesirable characteristics which may contribute to a plant having a significant adverse impact on the environment will be determined using a species literature review, initial and advanced evaluations at the PMC, field planting evaluation data, and herbage toxicity determination (if applicable). PMCs should be familiar with the criteria found in Exhibit 540-31 far in advance of completing the worksheet so that they can adequately answer the questions found in it.

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 POMS database and the PMC Annual Technical Report. If it is discovered that the plant has undesirable characteristics, but may have potential for meeting an urgent or priority conservation need, then careful consideration should be given to pursuing the release. It is advised that the NPL be contacted and all information be considered 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 Environmental Evaluation worksheet (Exhibit 540-31), that it is not clearly OK to make the release, then the NPL should be contacted immediately so that the decision can be made to pursue the release or if the release process should be terminated. If the decision is made to continue evaluating a plant for release or releasing a plant which could have significant adverse effects on the environment based on the Environmental Evaluation worksheet, then it will be necessary to consult with NRCS experts to determine if an EA and/or EIS is needed. This involves preparing and publishing a formal Notice Of Intent, invite comments from other Federal and state agencies and the public, and preparing an EA and/or EIS. The NPL should 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 release. Such releases may need a full EA and/or EIS conducted prior to release.

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If the Environmental Evaluation worksheet determines that it is OK to make the release based on no significant adverse effect on the environment, a summary of findings based on the documentation in the Environmental Evaluation will be included in the formal release notice (see Part 540.74(e)). 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 US outside its intended use), and methods for management and control of the release should it become a problem.

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

The Environmental Evaluation (Exhibit 540-31) and Environmental Assessment and/or Environmental Impact Statement (if required) must be included with the release documentation and a copy sent to the NPMC for archiving.

#### **(4) Determining Regions of Adaptation**

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. This is because:

- smaller quantities of plant materials are needed.
- pre-release evaluations are usually more controlled, resulting in more reliable data.
- pre-release evaluations usually contain more standards for comparison.
- released plants are more widely accepted if their region of adaptation is well known.

Region of adaptation may be determined using Intercenter Strain Trials, Off-center Evaluations, and Field Plantings. The results of such evaluations may be incorporated into the release notice, planting guides, and other information about the release.

#### **(5) Intercenter Strain Trials**

Intercenter Strain Trials (ICST) may be used for determining the area of adaptation of potential releases. The number of planned ICST sites depends on the environmental diversity of the area served by the PMC and the anticipated area of adaptation for the release. ICSTs may be useful for evaluating potential aggressive or invasive properties of new releases under controlled conditions outside of the releasing PMC service area. The PMC Manager and/or PMS should 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.

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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.

**(6) Off-center Evaluations**

Evaluation of potential releases can be conducted at locations away from the PMC. Typically these evaluations consist of plot or row plantings, of plant accessions, for a potential release 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 a Center, these sites generally are used for advanced evaluations.

Off-center evaluations generally are the responsibility of the PMC manager and coordinated with the PMS. See Part 540.61(e) for more information on responsibilities and approvals necessary for conducting off-center evaluations.

**(7) 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 PMS and coordinated with PMC Manager(s). Complete details of planning for, designating, implementing, and evaluating field plantings are found in Part 540.61(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:

- 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.
- Evaluation data for PMC studies should be recorded on evaluation forms printed from the POMS Database.
- Evaluation data will be recorded and added to POMS for uniform and safe storage of the data.

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- 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.
- The data collected each year will be analyzed using MSTATC or a similar statistical package.
- The data from every active study will be summarized in the PMC Annual Technical Report (see Part 541.22) as well as included in other forms of Technology Transfer media, tech notes, refereed papers, etc.

**(c) Preparing Summaries**

The data from every active study will be summarized each year and presented in the PMC Annual Technical Report (see Part 541.22). The Annual Technical Report may be generated from POMS. 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 as well as other forms of Technology Transfer media, technical notes, refereed papers, etc.

**(d) Making Plant Selections**

**(1) General**

Selection is choosing the most desirable accession(s) from the assembly or the most desirable individual plants in an accession to obtain the plant(s) having the best characteristics for a particular conservation use. Personnel responsible for conducting the evaluation are to select promising plants based on observations and quantitative/qualitative data.

**(2) Criteria for Selection**

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, selection is to be based on superior performance of the accession in relation to the performance of the other accessions being tested in the same group.

The criteria for selection and the desirable plant characteristics for a potential release are to 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

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Under certain circumstances it may be beneficial to blend accessions in developing an outstanding cultivar. Justification for combining accessions must be well documented before proceeding.

**(3) Documentation of Selection**

Documentation of selection will be completed in the POMS database. Selection criteria should be entered and reports generated from POMS. Reports may include documentation to support moving a release to advanced evaluation or summary information for preparing a release notice. Exhibit 540-32 provides an example of Documentation of a Plant Accession Selected for Advanced Testing. 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 Part 540.74(e)(1)).

**(4) Disposition of Non-selected Materials**

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 is believed to be viable, then the PMC should make an effort to determine if the material is needed in the USDA-ARS National Plant Germplasm System (NPGS). The PMC should contact the NPMC and follow the guidelines outlined in Part 540.74(g) to submit materials to the NPGS. The PMC should include all evaluation data for that accession with the seed.

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.
- provides performance and characteristics information for the accession if evaluation data was submitted to the NPGS.

**540.74 Release Procedures**

**(a) Determining the Type of Release**

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 Exhibit 540-33.

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, but when a selection for a specific trait within a population is completed or when distinct populations are bulked or individuals are crossed, the resulting population is then considered

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“genetically manipulated.” Genetic manipulation can also involve mutation inducement, 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. Exhibit 540-34 presents the release types and development tracks as found in AOSCA guidelines.

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 types may undergo continued selection and evaluation, and may be released later as a cultivar. How a release is typified should be based on criteria in the following descriptions.

**(1) Cultivar**

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 when reproduced (sexually or asexually), retains its distinguishing characters. 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 PM Program will use only the term “cultivar” when referring to cultivar releases.

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 identified need 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 use can be shown over the expected broad geographic and ecological area. There should also be a projected demand for the cultivar.

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

Classes of seed for cultivar releases are defined by AOSCA, and 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

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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**

Tested releases shall be 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 from either rigidly controlled and isolated natural stands or individual plants, or seed or plant production fields or orchards.

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 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 is a low number of commercially adapted materials available for this need, and performance testing is needed.

Tested releases use original site data, species literature searches, and multiple testing sites, replications, and data collected over a several-year (typically 3 to 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.

For pre-varietal releases, it is not permissible to use the same generation class names accepted by AOSCA for cultivars. 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 for any one of the generations varies by species.

**(3) Selected**

Selected propagating materials shall be the progeny of phenotypically selected plants of untested parentage that have promise but not proof of genetic superiority or distinctive traits. The propagating material will be produced so as to ensure genetic purity and identity from either natural stands or seed production areas, or seed or plant production fields or orchards.

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”

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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 identified need.

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.

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

**(4) Source Identified**

Source identified releases within the Plant Materials Program should usually be used only under special circumstances. Selected or tested categories of pre-varietal releases will normally be more appropriate and preferred for NRCS releases.

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.

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.

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.

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

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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**

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 United States agriculture and the state or 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 selection and development.

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 that which is deemed valuable germplasm but does not meet an NRCS priority or has some limitation that NRCS does not wish to overcome.

Documentation will include original site data, species literature search, 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.

**(b) Plant Identification**

All plants demonstrating potential for advanced evaluations and release are to be positively identified as to genus, species, and subspecies or variety as appropriate. This may be done by PMC staff if positive identification can be made.

If positive identification can not be made, a pressed plant specimen should be submitted to an appropriate college or university, or the specimen can be submitted to the NPMC. The NPMC will work through ARS or a plant taxonomist to obtain positive identification of the material. Plant specimens should be prepared in the manner described in Part 542.4. 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.

Each request submitted to a college, university, the NPMC or other authority for identification should follow the format described in Exhibit 540-35, and should contain the following:

- 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

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a specimen label. The voucher plant specimen should be prepared following the guidelines in Part 542.4.

- Detailed documentation and evaluation data which would be helpful to identify the plant, such as plant height, leaf characteristics, flowering and seed maturity dates and flower color.
- Where and when the specimen was collected (geographic location, soil type, associated vegetation, etc.).
- One seed packet containing approximately 100-200 seeds. The seed packet should be attached to the voucher specimen.

**(c) Naming Plant Releases**

**(1) General**

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.

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 Part 542.2), the provisions of the ESCOP Policy Statement (Exhibit 540-29), and current AOSCA guidelines. Release names for all types of releases may be a maximum of 10 syllables and 30 characters, including spaces, so that the name fits into the POMS database field for “release name”.

**(2) Selecting and using Cultivar release names**

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.

The following rules will be used when formulating cultivar names according to the *International Code of Nomenclature for Cultivated Plants*, 1995:

- 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 of 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 which are checked when clearing names for new cultivar releases.]
- Cultivar epithets must consist of no more than 10 syllables and no more than 30 letters or characters, excluding spaces and demarcation marks. [Note: the

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Plant Materials Program limits the length to 30 characters, including spaces, 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 (.).

When used with the common name, the release name would 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’.

**(3) Selecting and using Pre-Varietal release names**

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

When naming a pre-varietal release, the first part of the nomenclature, or descriptor term, can be any combination of words, letters, or numbers the releasing PMC feels is appropriate. The second part of the nomenclature 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 release name as they are with cultivars.

When used with the common name, the release name would be written as Beltsville Germplasm little bluestem. When used with the scientific name, the release name would be written as *Schizachyrium scoparium* Beltsville Germplasm. On release notices and other such information, the release can be described as Beltsville Germplasm selected release, Beltsville Germplasm little bluestem selected release, or *Schizachyrium scoparium* Beltsville Germplasm selected release.

**(4) Selecting and Using Germplasm release names**

As with other pre-varietal material, germplasm type releases are given a two-part nomenclature 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 nomenclature 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

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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**

The name of all releases, regardless of release type, must be cleared through the NPMC. Follow the format guidelines in Exhibit 540-36 for submitting a request for name clearance to the NPMC.

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 the ARS-NPGS-GRIN, USDA Plant Variety Protection Office, U.S. Plant Patent Office-Trademarks Division, and with 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 the 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. This letter will include a copy of the documentation received by the NPMC 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**

Registering release names with the proper office or registrar gains recognition for the release as well as discourages others from using the same release name for a different accession of the same species. Registration of cultivar and pre-varietal releases should be completed with the assistance of the NPMC. There are different procedures for registration of woody, herbaceous ornamental, and herbaceous agronomic species, and the NPMC can help obtain the proper application forms and providing registrar contacts. Abstracts describing registered releases are published in *Crop Science* and *HortScience* journals annually.

The requesting PMC should complete 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.

**(d) Assigning Plant Introduction Numbers**

**(1) General**

PI numbers are assigned through the USDA-ARS National Plant Germplasm System (NPGS). PI numbers 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, that accession must be maintained in perpetuity at a NPGS maintenance site.

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**(2) When to apply for a PI number**

PI numbers may be applied for when a PMC is within one year of finalizing a new release. PI numbers should not be applied for when the release will be considered for Plant Variety Protection (PVP). Releases which have been assigned a PI number for over one year are considered public domain and are no longer eligible for PVP (see Part 540.75(d)).

**(3) Applying for a PI number**

PI numbers should be requested once the release name has been cleared through the NPMC, and other items have been completed according to the checklist for Plant Selection Studies (Exhibit 540-28). This will ensure that the release name and other pertinent information will be entered into the NPGS system when the PI number is assigned, and will reduce paperwork after the PI number has been assigned.

PMCs should follow the guidelines found in Exhibit 540-37 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 will send a response to the requesting PMC. The requesting PMC will then forward the appropriate materials directly to the Curator. The NPMC should receive copies of all correspondence sent from the PMC to the Curator. The information required varies with each Curator and species, but the following materials may be required:

- 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.
- Seed or vegetative material. Seed may include a specified amount or volume. Vegetative material may include unrooted cuttings, rooted cuttings, or whole plants.
- Once a PI number has been assigned, all relevant information on the release is entered into the NPGS Germplasm Resources Information Network (GRIN) and confirmation is sent to the requesting PMC. 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 NRCS 9-million number, on all release documentation, submission of plant materials to the NPGS, correspondence with NPGS and others who are familiar with PI numbers, and on all Distribution and Delivery records. Using both the PI number and 9-million number will help prevent double-assigning of PI numbers by the NPGS. The PI number will be recorded in the POMS database. For Plant Materials, the NRCS 9-million remains the primary accession identifier so that studies and evaluations for a release are consistent (see Part **Error! Not a valid link.****Error! Not a valid link.**).

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**(e) Release Notices and Other Documentation**

**(1) Preparing Release Notices**

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 Environmental Evaluation worksheet (Exhibit 540-31) 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, and 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 US outside its intended use), and methods of management and control of the release should it become a problem. Release notices will not be approved by the NRCS-Ecological Sciences Division if they do not have a summary of environmental considerations. If it is determined in the Environmental Evaluation that the release has potentially significant adverse effects on the environment, then the PMC will contact the NPL prior to completing the release notice and routing for signatures (see Part 540.73(a)(3)) to determine if an Environmental Assessment and/or Environmental Impact Statement is needed for the release.

The PMC manager and/or the PMS 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. A release is not considered official until final review and signatures by all participating agencies have been completed. Exhibits 540-38, 540-40, 540-42, and 540-44 are outlines of information needed in each type of release notice. Exhibits 540-39, 540-41, 540-43, and 540-45 are typical release notices for cultivar, tested or selected, source identified, and germplasm releases, respectively.

**(2) 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.

**(3) Signatures on Release Notices**

The Notice of Release is signed by the appropriate personnel of the area served by the release first by State Conservationist(s) and then by cooperating agencies. The notice of release is then sent to the NPL in Washington D.C. to obtain the signature of the “Director, ECS.” The NPL will then forward the release notices back to the originating PMC or office. All release notices, regardless of release type, must be sent to the NPL to obtain the final signature of the Director of ECS.

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Once the final signature has been placed on the document the release is considered official.

The State Conservationist of the originating PMC is responsible for distributing the document for signatures and for distributing signed copies to all signatories.

**(4) Forwarding Information to the NPMC**

The releasing PMC is responsible for sending to the NPMC a paper copy of the signed release notice, an electronic copy of the release notice, and all documentation evaluating and justifying the release. The NPMC will maintain a file on each plant release in the PM Program.

**(f) Marketing New Plant Releases**

It is essential to publicize new releases in order to improve visibility and gain acceptance for use of a new release. A marketing plan should be included with the plant release Study Plan. Publicity of a new release may include plantings, such as Field Plantings (see Part 540.73(a)(7)), Special Demonstration Plantings (see Part 540.64(d)) and Conservation Field Trials (see Part 540.61(g)), and written materials, such as Release Brochures (see Exhibit 540-46), revision of Plant Guides (see Exhibit 540-25), 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 Exhibit 540-25) or other written documents. The PMC manager and the PMS are to prepare plans and materials for promoting the new release.

Assistance from the State Public Affairs Specialists is to 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, local articles, journals or periodicals, Soil and Water Conservation Districts, and commercial growers. The NPMC may be contacted for appropriate journals to submit information on new releases. NRCS guidelines on preparing and providing information to the public and news media may be obtained from the State Public Affairs Specialist.

**(g) Preservation of Plant Germplasm**

**(1) General**

Plant accessions and plant releases should be preserved as much as possible for future use in the PM Program and by other interested parties. Plant germplasm preservation is accomplished through the USDA-ARS National Plant Germplasm System (NPGS).

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Preservation of accessions will reduce duplicated efforts in making field collections or assembling collections of plant materials. It is to everyone's benefit to preserve plant germplasm.

Germplasm at any stage of plant selection, i.e., initial collections and assemblies through final plant releases, should be considered for long-term preservation. Plant germplasm in the cultivar, germplasm, tested, selected, or source identified release class would typically be assigned a PI number (see Part 540.74(d)), thus ensuring that the germplasm is maintained by the NPGS.

**(2) Submission of materials to the NPGS**

There are two methods of preserving germplasm in the NPGS: through the PI Stations and through the National Seed Storage Laboratory (NSSL). The PI Stations are the first source for preservation. Materials not accepted by the PI Stations can be submitted to the NSSL.

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. The Curator may recommend in some cases that seeds be maintained at the NSSL rather than at a PI Station. The NPMC will contact the NSSL to determine if they are interested in preserving the germplasm. If the germplasm is accepted by the NSSL, 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 (see Exhibit 540-47). This form indicates the amount of seed which is required by NSSL. The PMC will then forward materials directly to the NSSL in Ft. Collins, CO, and provide a copy to the NPMC of all correspondence. More information on NSSL's seed storage policy is found in Exhibit 540-48.

**(3) Submission of botanical specimens**

In addition to preservation as live material or seeds, any materials released through the PM Program should be represented in an herbarium with a mounted botanical specimen. Botanical specimens should be prepared according to the guidelines found in Part 542.4. 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 registrar for a genus will maintain the type specimen sample for each cultivar; when this is not the case, the National Arboretum

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herbarium will store standards. The releasing PMC will maintain a record of where the type specimen is stored and will notify the NPMC of that location. Specimens of all pre-varietal releases should be sent to the NPMC, and will then be forwarded to the National Arboretum for long-term storage. It is not necessary to identify a specimen as a standard for pre-varietal materials.

**(h) 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 it is being sold as. 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 varieties 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. G0 is equivalent to breeder, G1 to foundation, and so on. Refer to Exhibit 540-33 for limitations of generations for each release type.

**(2) Guidelines for Certification**

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

In releasing new plant materials with proof or potential evidence of conservation value, NRCS is guided by state and federal regulations and the ESCOP policy statement (Exhibit 540-29). 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.

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 Part 540.74(a) and Exhibit 540-33.

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540.75

**540.75 Protecting PMC Releases**

**(a) General**

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.

The principal reasons for seeking statutory protection of a new plant cultivar are to safeguard the cultivar name and provide a basis for granting exclusive production rights to one or more growers. 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, Amend. 1954, 68 Stat. 1190) are administered 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 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 administered by the U.S. Patent and Trademark Office, Department of Commerce. 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, but 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,

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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 do not apply to PMC work and will not be used.

**(d) Plant Variety Protection Act (PVPA)**

Plant Variety Protection (PVP) is a process by which plants can receive legal protections similar to patents. 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 the U.S. Department of Agriculture, Agricultural Marketing Service (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).

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

**(1) Seeking Plant Variety Protection**

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.

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.

If the decision is made to seek PVP then 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 Sec. 114 of the PVPA.
- obtain the concurrence of other cooperators in the release.

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- determine that adequate interest is available to warrant its commercialization.
- develop an abstract documenting the rationale and intent of seeking PVP protection.
- prepare a 2,500 viable seed sample to be included with the application.
- complete all applications for PVP.

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.

The information identified above will be provided to the NPL, who will serve as the NRCS PVP Liaison with ARS, AMS, and 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 protection, and that the PVP documentation will be forthcoming.

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

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.

#### **(2) Exclusive Production Rights**

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:

- it is anticipated that NRCS developed plant releases are likely to fail in the market place when released on a nonexclusive (public) basis.
- adequate supplies of seed of 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.
- special production techniques, production areas, or marketing techniques are required.

The licensing agreement with the commercial producer for exclusive production rights should include a provision that the commercial producer must grow and market a

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specified amount of seed with a certain time period or the exclusive production rights will be revoked. This is to ensure that releases achieve their market potential.

When the release notice has been executed, the NPL will so 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.

**(3) Licensing and License income**

The Federal Technology Transfer Act (FTTA) of 1986 (15 USC 3710) authorizes income from inventions to be used to pay awards to the inventors as well as expenses associated with acquiring and administration of patent activities, and to share the balance with the agency.

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

- NRCS license income will be distributed in compliance with FTTA.
- NRCS inventors 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.

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 PM Program.

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540.76

**540.76 Management of Plant Releases**

**(a) Increase of Plant Releases**

**(1) General**

An adequate supply of the new release is vital to the success of the plant materials program. PMCs will produce adequate supplies of foundation seed or plants to be able to supply commercial growers or nurseries with materials for commercial scale production of the release.

**(2) Guidelines for Increase**

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.

The basic requirements for certified production of many crops are found in the Certification Handbook published by AOSCA. Basic requirements have been established 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 seed established by AOSCA are to be used as a basic guide for seed-producing crops. These standards can be supplemented by standards or other requirements imposed by the state seed certifying agency or crop improvement associations.
- 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 - Practices are to be applied that give 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. New harvesting or cleaning methods should be reported as new technology development (see Part 540.62).
- Inventory - An inventory of plants and seed produced and plants and seed on hand are to be maintained as described in Part 540.76(b).

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540.76(a)(3)(iii)

**(3) Procedures for Increase**

**(i) Initial Increase**

Initial increase is the production of small quantities of seed or other propagules of potentially useful plants selected on the basis of initial or advanced evaluation for further evaluation 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 trials and for distribution to commercial nurseries.

Field-scale increase planting is to be established according to the standards used in producing foundation-quality seed or plants.

**(iii) Breeder and Foundation Increase**

PMCs maintain breeder and foundation seed or plants of cultivars that have been cooperatively released, or they arrange with agencies and organizations participating in the release for maintenance. [Note: for pre-varietal releases the equivalent to breeder and foundation seed is G0 and G1, respectively; pre-varietal releases are handled the same as cultivar releases.] The objective is to maintain viable, genetically pure breeder and foundation seed and plants. Guidelines for maintaining Breeder and Foundation 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 be incorporated into the release notice as well.

Foundation seed is provided to soil conservation district cooperators and crop improvement associations for commercial production. NRCS discontinues maintenance of breeder and foundation seed of a cooperatively released cultivar only when it is determined that discontinuing the cultivar is mutually satisfactory with other interested agencies or organizations.

Allocation of foundation seed or plants for the purpose of additional increase can be made to soil conservation district cooperators through NRCS channels and the conservation district governing board. Distribution can also be made through crop improvement associations or other cooperating agencies participating in the release. These associations and agencies in turn make allocations to their cooperators. Agreements with such associations can provide more specific guidelines on the allocation and distribution of foundation seed or stock.

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540.76(a)(4)

**(4) Encouraging Commercial Increase of Releases**

The purpose for 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 PMS, assisted by the state plant materials committee, is to assume leadership for encouraging the commercial increase of released cultivars to ensure that adequate supplies are available.

NRCS can supply individual commercial producers with foundation or other appropriate classes of planting materials as the producer requests to establish production fields consistent with availability of materials, requests from other producers, the experience and ability of the requesting producer, and the need for additional commercial increase. Released plant materials is provided to growers through:

- Crop Improvement Associations - Crop Improvement Associations may be involved in the production of certified seed or in the distribution of foundation seed to qualified growers. Agreements should exist between the Association and NRCS to facilitate how materials are handled and distributed.
- Certifying agencies - Certifying agencies, such as a state seed certification agency, can be provided with quantities of foundation seed or plants. The certifying agency in turn allocates this material to their cooperators and seed producers. The manner of allocation, selection of producers, and other details are influenced by agreement with the certifying agencies.
- District seed or plant increase - District increase programs may be involved in the production of certified seed or in the distribution of foundation seed to qualified growers. The manner of allocation, selection of producers, and other details are influenced by existing agreement with the certifying agencies.
- Direct distribution - A PMC may elect to distribute material directly to a commercial grower if other options do not exist or are not suitable. Care should be taken to ensure that the grower has the knowledge, expertise, and equipment to handle seed or plant production.

Requests for plant materials to be used for commercial increase are to be submitted by memorandums to the appropriate PMS or PMC. Seed and plant requirements and allocations for commercial increase are to be determined annually.

As needed, the PMS is to prepare a list of producers having materials available. The Crop Improvement Association, District, or Certifying agency assisting with distribution of materials should supply the PMS with a list of growers who are producing NRCS-released varieties. This list is to be distributed as designated by the state plant materials committee, but it is not to be considered all inclusive nor an endorsement of any single grower.

The PMS can request a special production report on need and plant increase plantings from the district conservationist. The request for this information is to be sent to the district conservationist according to the communications policies established by the state.

**(b) Inventory, Allocation, Exchange, and Distribution**

**(1) General**

All classes of seed and plants produced at PMCs, obtained through exchange, or purchased with federal monies 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**

Inventories are the responsibility of the PMC manager. The PMC manager is to track 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 a procedure for maintaining an inventory of small lots of seed (i.e., packets) or planting stock.

Inventories should be made available to the PMS. These inventories and information on estimated production serve as a basis for allocating plant materials.

**(3) Determining Needs for Plant Materials**

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 PMS. 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 need for distribution to commercial producers.
- requests from other PMCs.
- requests from cooperating agencies and partners.

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 PMS 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.

The PMS 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 PMS/PMC are to send copies of the summary to the State Conservationist advisory committee responsible for the PMC where production is being anticipated. The 5-year estimates are to be agreed upon, revised,

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extended annually, and incorporated into the PMCs LRP for seed and plant production. PMSs serving more than one PMC are to coordinate plant materials needs and production among the PMCs in their service area.

**(4) Allocation of PMC Produced Materials**

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 PMS responsible for the service area of the PMC. Requests from NRCS Field Offices are generally initiated using form SCS-ECS-009 (Planting Plan for Field, Special, and Increase Plantings, see Exhibit 540-19). The originator of the request is to be notified by the PMS/PMC if the request cannot be filled. Requests received by PMCs and PMSs directly from individuals or organizations outside their service areas are to be coordinated through the PMS serving the area from which the request originated. This procedure ensures that the appropriate PMS is kept informed concerning such requests and permits the PMS to keep abreast of the results of studies in the service area pertaining to NRCS plant materials.

Requests for foundation quality plant materials to be used for commercial increase should be directed to the PMS. The PMS 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.

Foreign requests for seed or plants may be received by a PMC or PMS. A recipient of a request (PMC manager, PMS) for distribution of plant materials to foreign countries is to provide information about the nature of the request to the NPMC for assistance in arranging for shipping to the foreign country (refer to Part 540.77(b) for procedures). 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.

Requests for seed shipments are usually initiated by the PMS using form SCS-ECS-001 (Plant Materials Allocation and Distribution, Exhibit 540-49) or by a letter containing the same information. Requests may be forwarded through a PMS to the appropriate PMC or directly to the PMC if applicable. Information from form SCS-ECS-001 may also be used to determine needs as described in Part 540.76(b)(3). If form SCS-ECS-001 is used, the original copy is sent to the PMC, the PMS retains a copy, and other copies are disseminated as needed. If SCS-ECS-009 is used to initiate a seed shipment, the original is maintained by the PMS and copies are distributed as appropriate. The PMC retains forms SCS-ECS-001 and/or SCS-ECS-009 until the seed shipment is completed. If other methods are used, copies should be retained until the shipment is complete.

**(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 Regional Plant Materials Coordinator is responsible for coordinating requests for plant materials among regions.

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**(6) Distribution of Plant Materials**

All 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.

All foreign plant material shipments are subject to guidelines established by the USDA-APHIS. The NPMC should be contacted regarding restrictions on all foreign seed shipments. Refer to Part 540.77(b).

A properly executed Distribution and Delivery Record (D&D) form SCS-ECS-596 (Exhibit 540-50) will accompany each shipment of plant materials. The D&D record may be generated electronically from the POMS database. Form SCS-ECS-596 is completed on the basis of the information shown on form SCS-ECS-001, request letter, or on the planting plans and/or notes for field, special, and increase plantings. 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 material. The SCS-ECS-596 is processed as follows:

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

**540.77 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 the 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**

Researchers in foreign countries may request plant materials from the Plant Materials Program. Requests may be received by any PMS or PMC. The PMS or PMC should first contact the NPMC to determine what restrictions there are on shipping the requested germplasm and provide the following information:

- 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)
- scientific and common names of the species to be exported

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- origin of seed to be exported (where was it produced)
- country of destination
- amount of seed to be shipped

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. 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 Part 540.73(a)(3) and in Exhibit 540-31.

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.

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

**(c) Importing germplasm from foreign countries**

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:

- the form in which the germplasm is to be shipped (seed or plants)
- scientific and common names of the species to be imported
- origin of seed to be imported (where was it produced)
- how the material will be used (e.g., research)
- any known restrictions on the use of the material because of property rights
- amount of material to be shipped

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

PMCs should use extreme caution when importing plant materials that may have invasive tendencies or that may 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 the U.S. For those species which are new to the U.S. and extensive evaluation of potential

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spread and invasiveness should be conducted on the PMC prior to moving the material off the PMC. Guidelines for assessing invasiveness and environmental considerations may be found in Part 540.73(a)(3) and in Exhibit 540-31.

Shipment of plant materials into the U.S.: The requesting PMC should send an import permit (if required) to the foreign plant source for inclusion with the seed shipment to the U.S. Packages sent to the U.S. 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.

Hand-carrying plant materials into the U.S.: 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.

For material that must be quarantined prior to release into the U.S., the NPMC will work with APHIS and the requesting PMC on a case-by-case basis.

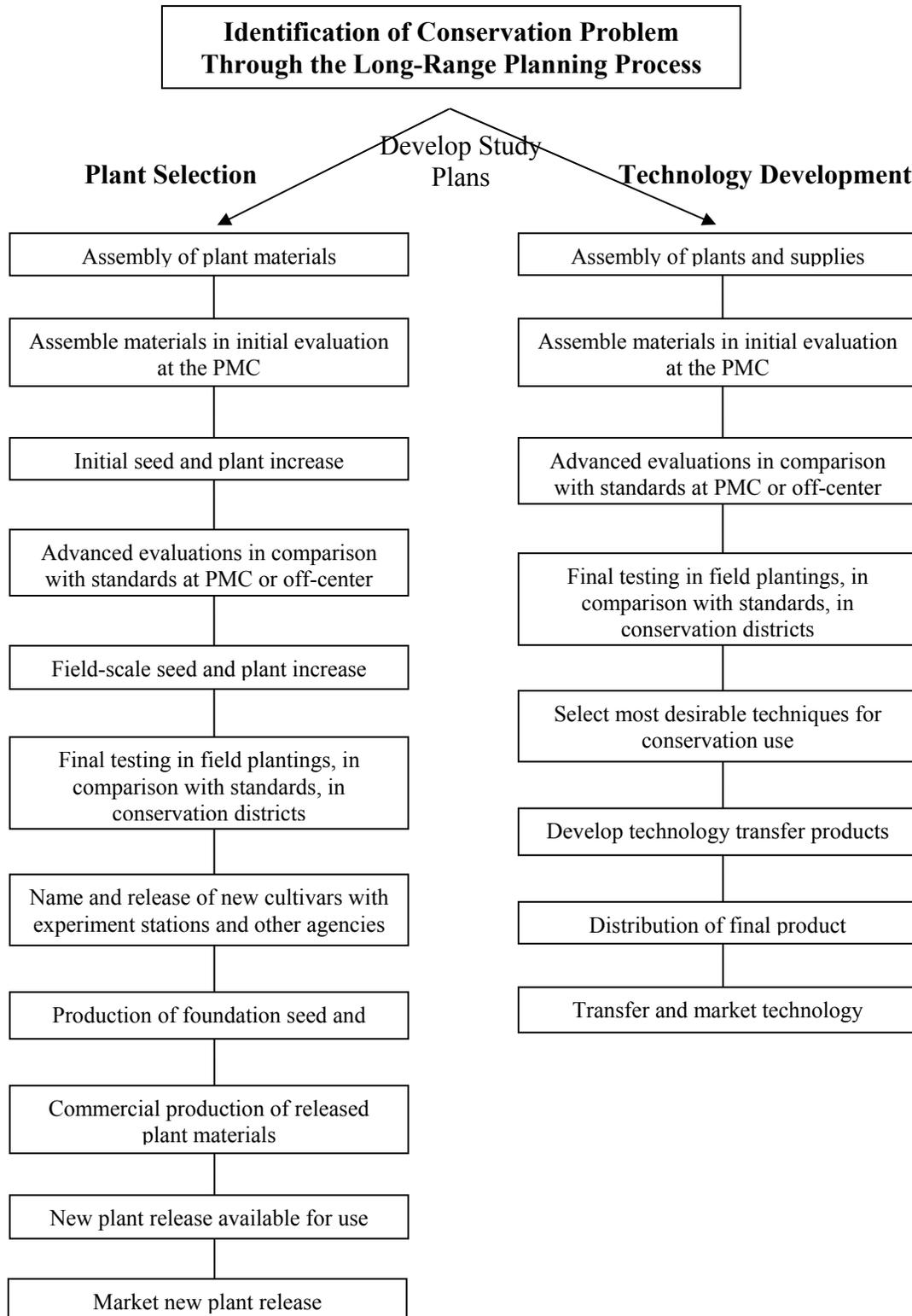
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**PART 540.8 - EXHIBITS FOR PART 540, SUBPART B**

**Exhibit 540-11 Typical Process for Product Development**



## Part 540.8 – Exhibits for Part 540, Subpart B

Exhibit 540-12

### Exhibit 540-12 Sample Project Statement for the Plant Materials Program

<b>UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE PROJECT STATEMENT</b>	
<b>Project ID Code</b>	Cropland 1.1
<b>Title</b>	Controlling erosion on cropland with cropping and residue management systems.
<b>Project Statement</b>	Winter legumes and other plants used for cover crops in the cropland area 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.
<b>Primary Resource</b>	Soil
<b>Other Resources</b>	water, air
<b>Primary Land Use</b>	Cropland
<b>Other land Use</b>	Wildlife
<b>Primary Vegetative Practices</b>	Cover and Green Manure Crop
<b>Other Vegetative Practices</b>	Wildlife Upland Habitat Management Nutrient Management

**Exhibit 540-13 List of National Projects**

<b>UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE PLANT MATERIALS PROGRAM PROJECT LIST</b>		
<b>Project #</b>	<b>Project Title</b>	<b>Project Statement</b>
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 in the cropland area 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.
Cropland 2.1	Controlling erosion on cropland with vegetative barriers in the US.	During the 1980's 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.
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 through out 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, improved plant materials are needed for bio-remediation and more effective treatments.
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 form natural areas.
Pasture/Hayland 1.1	Improving forage production and other conservation systems	Many cool season herbaceous species in common use for conservation systems are introduced. Native plant

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	with cool season plants.	alternatives need to be developed.
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Exhibit 540-13

Project #	Project Title	Project Statement
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 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.
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
Water Quality 1.1	Develop the technology for creating and restoring wetlands for water quality improvement.	Wetlands, historically, have been used for hunting, drained to create cropland and land for other uses, channeled to permit drainage of adjacent lands or provide access to adjacent sites and generally abused for many other purposes. The problem is to develop the technology to restore and/or create wetlands for a myriad of natural and man-induced purposes.
Water Quality 2.1	Develop the technology for restoring or creating riparian areas for water quality improvements.	Riparian areas have been used for man's purposes without regard for the natural function and/or role of these lands to the environment. Perhaps less than 1/2 of the riparian lands that were here when the country was discovered still exists. The need is to develop plants and the technology to establish, manage and utilize them to restore and/or create 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 US are limited. Engineering 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.
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. 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 are underrepresented in the marketplace for regional and sub-regional use.

**Exhibit 540-14 Details of Assigning Study Numbers**

Study numbers will be assigned using the following format:

MTPMC-P-9911-CR      or      MTPMS-F-9911-CR

**Nomenclature of Study Numbers**

Where MT = PMC or State Abbreviation (ET = East Texas etc)

Where PMC or PMS = Plant Materials Center or Plant Materials Specialists

Where P = Type Code

Where 99 = Year Study Started

Where 11 = Consecutive Number assigned by the PMC or PMS

Where CR = Use Code

**PMC Codes**

Use the two letter state code, i.e., 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)

**PMS Codes**

Use the two letter state code where the study or planting is taking place regardless of the state the PMC is located in. For example, the MTPMS would use code "WYPMS" for a field planting in Wyoming.

**Type Code**

P      Plant Selection Study  
T      Technology Development Study  
S      Seed Increase  
F      Field Plantings

**Use Code**

BF      Biofuel  
BU      Buffer  
CP      Cropland  
CR      Critical Area  
FI      Firebreaks  
GW      Global Warming  
IN      Invasive Species  
NU      Nutrient  
PA      Pasture/Hayland  
RA      Range  
RE      Recreation Area  
RI      Riparian  
TE      Threatened, Endangered, and Rare  
UR      Urban  
WE      Wetland  
WI      Windbreaks/Shelterbelts  
WL      Wildlife Habitat  
WO      Woodland/Forestland  
OT      Other

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-15

**Exhibit 540-15 Sample Study Plan for the Plant Materials Program**

<b>UNITED STATES DEPARTMENT OF AGRICULTURE                      NATURAL RESOURCES CONSERVATION SERVICE                      STUDY PLAN</b>							
<b>Study ID Code</b>	IDPMC-P-9901-CP						
<b>Title</b>	Controlling erosion on cropland with cover cropping and residue management systems in the arid, semiarid and summer dry parts of the US.						
<b>National Project No.</b>	Cropland 1.1						
<b>Study Type</b>	Comparative Evaluation						
<b>Study Status</b>	Active						
<b>Location</b>	IDPMC						
<b>Study Leader</b>	Brent Cornforth, IDPMC						
<b>Duration</b>	1999 through 2003						
<b>Cooperators</b>	University of Idaho, Aberdeen Experiment Station						
<b>Land Use</b>	Cropland Hayland						
<b>Vegetative Practices</b>	Primary 340 COVER AND GREEN MANURE CROP Secondary 512 PASTURE AND HAYLAND PLANTING						
<b>Resource Concern(s)</b>	<table border="0"> <thead> <tr> <th><u>Resource</u></th> <th><u>Consideration/Problem</u></th> </tr> </thead> <tbody> <tr> <td>Soil</td> <td>Soil erosion, wind</td> </tr> <tr> <td>Water</td> <td>Water quality, surface water contaminants suspended sediment</td> </tr> </tbody> </table>	<u>Resource</u>	<u>Consideration/Problem</u>	Soil	Soil erosion, wind	Water	Water quality, surface water contaminants suspended sediment
<u>Resource</u>	<u>Consideration/Problem</u>						
Soil	Soil erosion, wind						
Water	Water quality, surface water contaminants suspended sediment						
<b>Long Range Plan</b>	Study falls under Part II, Item 3 of the IDPMC LRP						
<b>Description</b>	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.						
<b>Status of Knowledge</b>	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.						

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-15

<b>Experimental Design Treatment 1</b>	Randomized Complete Block Design Title: Accession Description: Cultivars Planted
<b>Materials and Methods</b>	Samples of seed will be assembled from Plant Materials Centers, University researchers, and Commercial sources. Seed will be assembled beginning in January 1992. 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
<b>Final Evaluations</b>	Field Plantings will be installed in each of the MLRAs found in Idaho to test regional adaptation of materials tested at the PMC
<b>Technology Transfer Products</b>	TechNotes, revise FOTG standards, Current events article
<b>Literature Cited</b>	PMC release documentation, Commercial literature, University research results
<b>Keywords</b>	Cover crops, new species and cultivars, pasture land, hayland, Idaho
<b>Reviewed by:</b>	Plant Materials Specialist, Idaho _____
<b>Approvals:</b>	State Conservationist, Idaho _____

**Exhibit 540-16 Resources for Preparing Literature Reviews**

The following resources may be used for compiling a literature review:

**The National Agriculture Library (NAL)**

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 on-line access to AGRICOLA, CRIS, ISIS, and the AgNIC. AGRICOLA (AGRICultural OnLine Access) is a machine-readable database of bibliographic records created by the National Agricultural Library 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 (Current Research Information Network) is the U.S. Department of Agriculture's (USDA) 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 the NAL's Online Public Access Catalog. AgNIC (Agriculture Network Information Center) is a distributed network that provides access to agriculture-related information, subject area experts, and other resources.

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 the National Agricultural Library, Reference Division, Beltsville, Maryland 20705 or by contacting the NAL by phone (301-504-5479), fax (301-504-6927), or by e-mail ([agref@nal.usda.gov](mailto:agref@nal.usda.gov)) (note that phone numbers and e-mail 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.

Articles and documents may be requested by mail, fax, e-mail 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. Photo copies 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 e-mail. Specific guidelines for sending requests are found on the NAL web site.

**Local Colleges and Universities**

Many colleges and land-grant universities have extensive agriculture libraries where information may be found. Often times these libraries provide access to the AGRICOLA database or have Internet search engines to find information located in the library.

## **Part 540.8 – Exhibits for Part 540, Subpart B**

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### **Internet searches**

The Internet is an excellent place to find information from a variety of sources. The use of popular search engines 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.

### **Contact with other PMCs**

Often times other PMCs are working on similar projects and may be a source of literature and technical information.

### **Personal contacts**

Communications with experts and practitioners in the field of interest may be useful for obtaining first-hand 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.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-17

### Exhibit 540-17 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.

<b>Product Type</b>	<b>Description</b>
Books	Full-length books
Conservation Field Trial	A planting used to evaluate technology for addressing local soil and water resource problems (see Part 540.61(g))
Display	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 Part 540.61(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
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 Exhibit 540-26 and Exhibit 540-27)

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**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-17

<b>Product Type</b>	<b>Description</b>
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 allow the user to repeat the technology. (see Exhibit 540-25 and Exhibit 540-25)
Plant Materials Progress Report of Activities	Report giving highlights of studies and activities at the PMC; compiled and distributed widely annually (see Part 541.21)
PMC Annual Technical Report	Technical report which gives details of studies and activities; usually not for general distribution; compiled annually (see Part 541.22)
Popular Journal or Magazine Articles	Article published in a popular journal or magazine which has not been peer-reviewed
Poster	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 Notices	The formal notice for a new release which gets signed (see Part 540.74(e))
Special Demonstration Planting	Planting to promote the use and acceptance of released material and/or developed technology (see Part 540.64(d))
Technical Note	Written material used to convey technical information; usually conforms to NRCS or state guidelines for preparing and issuing the information (see Exhibit 540-25 and Exhibit 540-25)
Tours	A tour of the PMC; should be pre-arranged and more than 5 people
Training	A formal training session held for NRCS or non-NRCS attendees

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-18

**Exhibit 540-18 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.	
<b>Item</b>	<b>Date Completed</b>
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. The state Public Affairs Specialist has been consulted for format, printing, and distribution requirements.	_____
8. Final product should receive proper review to ensure technical adequacy. The type and depth of review depends upon the nature of the product.	_____
9. The final product clearly identifies that NRCS and the Plant Materials Program was involved in preparation of the product.	_____
10. The Product has been recorded with the completed PMC performance goals.	_____
11. Two paper copies <u>and</u> an electronic copy of the final product have been sent to the NPMC for archiving and use on the Internet.	_____

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-19

**Exhibit 540-19 Form SCS-ECS-9; Planting Plan for Field, Special, and Increase Plantings**

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE		SCS-ECS-009 (Rev. 8-89)			
<b>PLANTING PLAN FOR FIELD, SPECIAL, AND INCREASE PLANTINGS</b>					
Purpose of planting _____			Planting Plan No. _____		
Plants to be evaluated	Identifying cultivar or number	Seeding or planting rate	Total needed	Supplied by	
Standard(s) for comparison					
State _____	F.O. _____	SEC _____	TWP _____	RNG _____	
SCD _____	MLRA _____	Date to be planted _____			
Size _____	Soils _____	(series)	(texture)		
Cooperator _____		Address _____			
Irrig. _____	Precip. _____	Elev. _____	Slope _____	Exposure _____	
(yes or no)		(inches)	(feet)	(percent)	
Site history for previous three years:					
19__					
19__					
19__					
Method of planting to be used _____					
Materials needed	Rate	Total	Materials needed	Rate	Total
Lime			Mulch		
Fertilizer			Other		
Cooperator _____		Date _____	Submitted by _____		Date _____
(signature)					
Approved _____		(Chairman, District Board)		Date _____	
Approved _____		(SRC or PMS)		Date _____	
Location Map					
REVIEW INSTRUCTIONS AND COMPLETE CHECKLIST ON BACK OF ORIGINAL					

## Part 540.8 – Exhibits for Part 540, Subpart B

Exhibit 540-19

(to be completed when planting form is prepared)

1. Does the cooperator understand the purpose of the planting or practice, as well as the culture and management required for its success? \_\_\_\_\_
2. Does the site meet the requirements stipulated in the planting guide? \_\_\_\_\_
  - a. Is it conveniently located? \_\_\_\_\_
  - b. Is it on a soil identified in the planting guide in the project plan? \_\_\_\_\_
  - c. If it is to be grazed, is the field a separately fenced unit of adequate size? \_\_\_\_\_
3. Has the cooperator agreed to establish and manage the planting as stipulated in the planting guide? \_\_\_\_\_
4. Are planned weed control measures adequate? \_\_\_\_\_
5. Will the field and equipment be checked before planting? \_\_\_\_\_
6. Will an NRCS technician help with the planting? \_\_\_\_\_
7. Will followup assistance be provided? \_\_\_\_\_
  - a. To obtain adequate weed control? \_\_\_\_\_
  - b. To obtain evaluations as outlined in the planting guide or in the project plan? \_\_\_\_\_
8. Has the location map been completed on reverse side? \_\_\_\_\_
9. Comments - explanations if no answers: \_\_\_\_\_

\_\_\_\_\_  
(signature and title)

\_\_\_\_\_  
(date)

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**INSTRUCTIONS FOR USE:** The district conservationist completes the items above the ones on the back of the original. He retains the last copy and forwards the other copies for approval. When approved, on the reverse of the form, the plant materials specialist keeps the original and returns the other copies to the district conservationist. The area conservationist can keep a copy if he desires. The district conservationist and the plant materials specialist are to file their copies with other records relating to the planting.

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-20

**Exhibit 540-20 Sample Worksheet for Evaluating Plant Materials Plantings**

		<h2 align="center">Plant Materials Evaluation Worksheet for Plantings</h2>				
<b>Planting No.</b> _____		<b>Field Office</b> _____				
<b>Coordinator</b> _____		<b>Cooperator</b> _____				
<b>Planting Location</b> _____						
<b>Type of Planting</b>		Circle:    Herbaceous    Woody    Field Planting    Demonstration				
<b>Purpose</b> _____						
<b>Evaluation Date</b> _____		<b>Evaluator</b> _____				
<b>Avg. Annual PPT</b> _____		Circle One:    Favorable    Average    Unfavorable				
<b>Instructions:</b> Circle appropriate answer or write in data. 1 = excellent, 3 = good, 5 = fair, 7 = poor, 9 = very poor, 0 = none						
<b>Species, Cultivar, or Accession</b>						
<b>Stand</b>						
<b>Density</b>	For woodies, indicate both no. alive/no.planted; For herbaceous, indicate plants/sq. ft.					
<b>Vigor</b>						
<b>Ability to Spread</b>						
<b>Plant Height (in.)</b>						
<b>Plant Injury</b>	Indicate for each: None, Light, Moderate, or Severe					
<b>Kind of Injury</b>	Indicate: disease, insect, rodent, hail, drought, grazing, flood, winter, fire, machine					
<b>Weed Infestation</b>	Indicate for each: None, Light, Moderate, or Severe					
<b>For Herbaceous:</b>						
Forage Production						
Yield (tons/acre)						
(AUMs/acre)						
Seed Produced-y/n						
<b>For Woodies:</b>						
Crown Width (ft.)						
DBH (in.)						
Plant Uniformity						
<b>Branching Pattern/Density</b>	Indicate: Sparse (<40%), Moderate (40-60%), Dense (>60%)					
Fruit Production						
Fruit Mature Date						

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-20

<b>Species, Cultivar, or Accession</b>						
<b>Indicate "N/A" if not applicable for the following criteria:</b>						
<b>Wildlife Use (avg)</b>						
Wildlife - browse						
Wildlife - cover						
<b>Drought Toler.</b>						
<b>Flood Tolerance</b>						
<b>Salt Tolerance</b>						
<b>Acid Tolerance</b>						
<b>Water Tolerance</b>						
<b>Wear Tolerance</b>						
<b>Overall Rating</b>						
<b>Adapted to Site (Yes/No)</b>						
<b>Cooperator's Evaluation</b>						
<b>Maintenance Performed:</b>						
<b>Stand Management</b>	Indicate: Excellent, Good, Fair, Poor					
<b>Irrigation</b>	Kind _____	Circle One:    Full-season    Limited-season				
<b>Fertilizer</b>	Kind _____	lbs./acre _____	Date Applied _____			
	Nitrogen _____	lbs./acre _____	Date Applied _____			
	Phosphorus _____	lbs./acre _____	Date Applied _____			
	Potassium _____	lbs./acre _____	Date Applied _____			
<b>Pesticide</b>	Kind #1 _____	rate _____	Date Applied _____			
	Kind #2 _____	rate _____	Date Applied _____			
<b>Mowing</b>	Date #1 _____	Height (in.) _____				
	Date #2 _____	Height (in.) _____				
<b>Comments and Recommendations</b>						

**Exhibit 540-21 Reserved for Future Use**

### **Exhibit 520-22 Guidelines for Preparing a Technical Note**

A Technical Note is a document issued by a State Office, Regional Office, or National Headquarters. 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., Plant Materials, Biology, Agronomy, Range, etc.). While each State Office may specify the distribution and filing of Technical Notes differently, there is a common method for handling Technical Notes. This method is summarized below.

#### **Preparation**

Technical Notes relating to Plant Materials are typically written by a Plant Materials Specialist or Plant Materials Center 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, 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 so that it is 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 Plant Materials staff should clearly identify the office(s) and/or author(s) in the header so that recognition for the Technical Note is given to Plant Materials.

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 thing that will be consistent is the cover letter with distribution and filing instructions.

#### **Review**

Technical Notes should undergo a thorough review process since the contents are often referenced by NRCS employees and other professionals making recommendations to landowners. Typical reviewers may include the Plant Materials Specialist, Plant Materials Center staff, State Office resources staff, and appropriate Cooperators. Documents should be reviewed for both technical details and grammatical correctness.

#### **Distribution**

The preparer (PMC or PMS) typically sends the Technical Note along with a draft cover letter to the State Office to be sent out under the State Resource Conservationist's or State Conservationist's signature. There is usually a preferred format for the cover letter, though the format may vary by state. The same Technical Note may be assigned different numbers in different states based on the sequence of Technical Note numbers in each state.

The distribution letter will usually contain a brief summary of the Technical Note and why it is important. The distribution letter also contains information on where the Technical Note should be filed and how long it should be retained.

It may be helpful to include an index of all Technical Notes with the distribution letter when a new Technical Note is sent out. The updated index will remind/advise receiving offices of other Technical Notes they should have, as well as in facilitating locating Technical Notes in the future.

**Filing**

Technical Notes are usually filed in a discipline handbook (e.g., the State Agronomy Handbook), with the Field Office Technical Guide (FOTG), in a 3-ring binder containing all state Technical Notes, or in a file cabinet. 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.

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-23

**Exhibit 540-23 Sample Technical Note**

	United States Department of Agriculture	Natural Resources Conservation Service	2121-C Second Street, Suite 102 Davis, CA 95616-5475
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July 25, 1996

**PLANT MATERIALS TECHNICAL NOTE NO. CA-44  
190-VI**

**SUBJECT: ECS - PLANT MATERIALS - TRANSPLANTING WILLOW ROOT  
WADS FOR STREAM RESTORATION IN THE CENTRAL  
SIERRA NEVADA MOUNTAINS**

**Purpose:** To transmit the above named technical note.

**Effective Date:** When received.

**Filing Instructions.** Can be filed in the back of the National Plant Materials Manual binder with the other Plant Materials Technical Notes or filed in Technical Note binder - Plant Materials Section.



**CHARLES W. BELL**  
State Resource Conservationist

Enclosure

**DIST: O**

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The Natural Resources Conservation Service,  
formerly the Soil Conservation Service,  
is an agency of the  
United States Department of Agriculture

**AN EQUAL OPPORTUNITY EMPLOYER**

# TECHNICAL NOTES

U S Department of Agriculture

Natural Resources Conservation Service

TN - PLANT MATERIALS - 44

July 1996

## TRANSPLANTING WILLOW ROOT WADS FOR STREAM RESTORATION IN THE CENTRAL SIERRA NEVADA MOUNTAINS

The success of meadow and stream restoration projects can be greatly improved by the utilization of suitable plant materials that may be available onsite. Stream channel construction or restoration projects which require the excavation of mature clumps of willow (*Salix* spp.), or where opportunity exists for nearby offsite willow harvesting, should incorporate this practice as a project component. This practice serves not only to maintain the genetic integrity and species composition of the site, it also provides a soft engineering means for immediate armoring and long term stability of regraded streambanks. A California Interim Construction Specification, Root Wad is available from the State Conservation Engineer. This practice can be used in conjunction with sod placement (see TN-Plant Materials-43) or Rock Rip Rap.

This practice was developed and utilized by the NRCS in the Lake Tahoe Basin for geomorphic stream restoration. Species selected for use were Lemmon Willow (*Salix lemmonii*) and Scouler Willow (*S. scouleriana*). Root wad survival after one year averaged 71 percent, with the majority of loss attributed to out of bank flows of extraordinary duration and intensity.

Root wads are an assemblage of living stems, root crown and roots excavated as a contiguous unit. Soil bound by the roots is considered a component of the root wad. Willows which are considered for harvesting are preferably shrub like, mature and have multiple stems emerging from the root crown. To reduce the shock of transplanting, dormant willows are preferred. Dormancy typically lasts from late fall to early spring. When site conditions such as snowpack or seasonal flooding restrict activities to the summer months, non-dormant materials may be used. In this instance irrigation may be required to maintain adequate soil moisture until late fall

Prior to excavating and lifting the root wad, the stems should be lopped 12 to 18 inches above the root crown and have at least 2 buds remaining. Lopping should be performed square across the stem using sharp, clean tools.

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Prepared by Jerry Owens, Resource Conservationist, NRCS, South Lake Tahoe, CA. with the assistance of Dave Dyer, Manager, Lockeford Plants Materials Center, NRCS, Lockeford, CA.

CA-44-1

## Part 540.8 – Exhibits for Part 540, Subpart B

Exhibit 540-23

Due to the weight of a root wad, a backhoe is the preferred means of lifting. The backhoe should have a bucket with a minimum width of 24 inches. As excavation proceeds, the soil bound by the root mass shall be excavated from the original ground as a contiguous mass with a minimum surface area of 24 inches by 24 inches. The depth of the excavation should not be less than 18 inches as measured from the top of the root crown. The plant should be lifted from the original ground in such a manner as to minimize the disturbance of the soil bound by the roots. The backhoe may then convey the root wad to the desired placement location.

If the root wad is to be placed in temporary storage, or if transfer to an offsite location is required, the root wad should be wrapped in a single layer of wetted burlap immediately after harvest to prevent desiccation of the roots.

Temporary storage of root wads may be necessary due to construction constraints. If this is so, the burlap wrapped root wads should be placed in a shady location. Root wads should be placed, root side down with edges snugly adjoining adjacent wads. Root wads should not be stacked. A water source should be available for wetting the root wads to maintain adequate soil moisture. Root wads should be stored for no longer than 72 hours.

Spacing between root wads, and their placement location should be determined according to their intended function. Root wads may for example be utilized for streambank protection, creating surface roughness in flood zones, and wildlife habitat improvement. For streambank protection, root wads should be placed along the entire radius of either inside or outside curves, and above the high water mark of the stream, or at the top of the bank where seasonal overbank flows are expected. Spacing should be determined according to the size of the willow at maturity. For the Lemmon and Scouler willow, placement on 8 foot centers is adequate.

For final placement, the excavated root wad should be placed in a prepared planting hole. The sides of the planting hole should be vertical, lightly scarified, and the bottom loosened to an additional depth of 6 inches. The planting hole should be filled with water at least 1 hour but not more than 2 hours before final root wad placement.

The highest level of willow establishment success is achieved when root wads are installed within 30 minutes of harvest. Place root wads, with burlap removed, into the prepared hole and adjust to the final grade. Backfill the planting hole halfway and fill with water to eliminate air pockets.

CA-44-2

Continue to add soil and water until the saturated backfill material covers the top of the root crown to a maximum depth of 2 inches. After the free water has drained, backfill the planting hole to finish grade.

In most applications, it will be necessary to utilize heavy equipment for harvesting and transport of materials. The environmental impacts that such equipment can exert on sensitive meadow and stream environments can be minimized by utilization of either constructed haul roads or military style, heavy steel landing mats for use as temporary access roads. Both methods have been used successfully in the Lake Tahoe Basin.

Haul road construction requirements are specific to the type of soil material used and require the assistance of the NRCS State Conservation Engineer. Haul roads are constructed by placing lifts of soil material over an appropriate filter fabric. After construction, these materials are then removed and disposed of properly. Depending on the length of time or season during which this activity takes place, existing vegetation may recover sufficiently so that additional vegetative restoration in the haulroad footprint may not be necessary. Should reseeding become necessary, a well established cover of grass may be expected by the end of the second growing season, depending on climate and local growing conditions.

Landing mats come in a variety of configurations and are available through the Department of Defense or GSA surplus property programs. Landing mats are heavy steel interlocking panels which, once assembled, can support the weight of equipment. The use of two types in the Lake Tahoe Basin suggests that the non-perforated style performs best. Since individual panel dimensions vary, it will be necessary to locate the source and type available as a part of the planning process.

CA-44-3

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-24

### Exhibit 540-24 Guidelines for Preparing a Plant Guide

Plant Guides are similar to Plant Fact Sheets but they contain more detail and typically describe the entire process of establishment, management, and production. They may contain details on seed or plant production for growers. The following format may be adapted to the author's use. Photos and distribution maps may be included as appropriate.

Plant Guide for:

**COMMON NAME**

*Sciname* + Authority

plant symbol = xxxx

*Contributed by: Office or Affiliation*

**Description**

Include a detailed description of the species. This should include a botanical description, key or identification characteristics, general habitat information, and distribution information, and should be understandable by the layperson.

**Alternate Names**

Synonyms or other common names which are commonly used may be listed here. If a previous, but more accepted, scientific name is used in the header, include the statement "The currently accepted name for this species is *genus species*".

**Cultivars and Improved Materials (and their Origin)**

Cultivar names should be first letter capitalized, all other letters in lowercase, single quotes around cv. names; i.e., 'Blackwell'. Do not put in all caps. Pre-varietal releases should be the same but without single quote. Indicate the origin, by state, of the release in parentheses, i.e. 'Shelter' (WV).

Include brief descriptions of the cultivars/releases, such as why developed, unique characteristics, special uses, general adaptation information, and if the material is available.

**Uses**

Uses may be categorized or put in paragraph form, if categorized with explanation italicize the category. i.e.,

*Erosion Control:* xxxxx

*Wildlife Use:* xxxxx

**Adaptation**

Indicate where the species and cultivars/releases are adapted to – may include geographic area, climate, hardiness zones, soils, etc. Should include which cultivars/releases are best used under unique conditions, i.e. low precipitation, high elevation, low pH, etc.

**Establishment**

Include detailed instructions for establishing a planting, covering all considerations for planting – seedbed prep, fertility, equipment or techniques for planting; include seeds/pound and seeding rate; rate may include a range or different rates whether drilled or broadcast. For woody plants and vegetative propagules, may include spacing if that is important. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

Include average seeds/pound if applicable.

Include special requirements for individual cultivars/releases if applicable.

**Management**

How do you maintain the plants after they have established? This includes fertilization, watering, weed control, mowing, pruning, haying/grazing considerations etc. Also include a warning and control methods if there is a chance the plant might be overly aggressive or invasive. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

Include special requirements for individual cultivars/releases if applicable.

**Pests and Potential Problems**

What pests or potential problems might there be with using this species? Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

**Environmental Concerns**

What potential problems might there be with using this species? Potential problems may include aggressiveness, invasiveness, other environmental problems (i.e., changes hydrology of wet areas), difficult to control once established, and toxicity of foliage to domestic animals. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

**Seed and Plant Production**

Include information for the commercial grower to produce seed or plants. Include spacing, irrigation, fertilizer, and weed control requirements. Indicate general harvest information, including dates, method for determining maturity, harvesting techniques and seed cleaning techniques. Indicate seed or plant yields which may be expected, and longevity of the seed in storage. Include information on where Foundation seed may be obtained.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-24

### **References**

Include references used to prepare the Plant Guide or where a user might find more detailed information.

### **Prepared By:**

List author(s) along with title, affiliation, city, and state.

Include date prepared and/or revised here along with initials, i.e. 29Nov1999 JE

Include the following at the end of the Plant Guide:

For more information about this and other conservation plants, please contact your local NRCS field office or Conservation District, or visit the Plant Materials Program Web site at “<http://Plant-Materials.nrcs.usda.gov>” and the PLANTS Web site at “<http://plants.usda.gov>”.

Current EEO/CR Statement

## Exhibit 540-25 Sample Plant Guide



# Plant Guide

## INDIAN RICEGRASS

*Achnatherum hymenoides* (Roemer & J.A.

Schultes) Barkworth

plant symbol = ACHY

Contributed by: USDA, NRCS, Plant Materials Program

### Description

Indian ricegrass *Achnatherum hymenoides* (Roemer & J.A. Schultes) Barkworth (formerly *Oryzopsis hymenoides* and *Stipa hymenoides*) is a widely distributed, short to medium lived, native, cool-season bunchgrass generally found in the plains, foothills, mountains, and intermountain basins of the western United States on dry and primarily loamy-sandy-gravelly sites.

Indian ricegrass is 8 to 30 inches tall. It has many tightly rolled, slender leaves, growing from the base of the bunch giving it a slightly wiry appearance. The ligule is about 6 mm long and acute. It has a wide spreading panicle inflorescence with a single flower at the end of each hair-like branch. Seeds are round to elongated, black or brown, and generally covered with a fringe of short, dense, white callus hairs.

Indian ricegrass has fair to good seedling vigor. Seed of most accessions are very slow to germinate due a thick hull and embryo dormancy.

The nutritious seed of Indian ricegrass was one of the staple foods of American Indians.

### Improved Cultivars

Personnel at the Pullman, Washington, Plant Materials Center (PMC) originally collected 'Nezpar' Indian ricegrass (*Achnatherum hymenoides*) in 1935 from a site south of White Bird, Idaho. It was selected from 152 accessions for its vegetative characteristics and low seed dormancy by the Aberdeen, Idaho, PMC and released in 1978. It is adapted to the Northwest and Intermountain regions where precipitation averages 8 inches or above. It has survived in plantings with 6 inches annual rainfall. It prefers gravelly to loamy to sandy soils. It is noted for its large erect plant type, robust stems, abundant leaves, medium to small dark nearly hairless elongated seeds (< 50 percent dormant seeds), and good to excellent seedling vigor. Certified seed is available, and breeder seed is maintained by Aberdeen PMC.

'Paloma' Indian ricegrass (*Achnatherum hymenoides*) was collected in 1957 west of Pueblo, Colorado at about 5000 feet elevation on medium soils. It was selected by Los Lunas, New Mexico, PMC and released cooperatively by the PMC and New Mexico Agricultural Extension Service in 1974. It is adapted to the Southwestern Regions of the Western United States. It is considered very drought tolerant, has good seedling vigor, forage, seed yields, and is long lived. Paloma has good regrowth and spring recovery. It is considered the best Indian ricegrass cultivar for the Southwestern Regions of the Western United States. Certified seed is available, and breeder seed is maintained by Los Lunas PMC.

'Rimrock' Indian ricegrass (*Achnatherum hymenoides*) was collected in 1960 from a native site averaging 10 to 14 inches of precipitation, north of Billings, Montana, at about 3600 feet elevation on sandy soils. Bridger, Montana, PMC, released Rimrock in 1996 primarily because of its ability to retain mature seed better than Nezpar or Paloma. Its more acute angle of glumes helps retain seed longer and protects it from seed shatter caused by wind and/or rain. Certified seed is available, and Bridger PMC maintains breeder seed.

### Uses

Grazing/rangeland/hayland - Indian ricegrass is highly palatable to livestock and wildlife. It is a preferred feed for cattle, horses and elk in all seasons. It is considered a preferred feed for sheep, deer and antelope in spring and a desirable feed for sheep, deer, and antelope in late fall and winter. It reaches its peak production from mid-June through mid-July. It holds its nutrient value well at maturity. It is not considered valuable as a hay species.



Erosion control/reclamation - One of Indian ricegrass's greatest values is for stabilizing sites susceptible to wind erosion. It is well adapted to stabilization of disturbed sandy soils in mixes with other species. It is naturally an early invader onto disturbed sandy sites (after and in concert with needle and thread grass). It is also one of the first to establish on cut and fill slopes. It does not compete well with aggressive introduced grasses during the establishment period but is very compatible with slower developing natives such as Snake River wheatgrass, bluebunch wheatgrass, thickspike wheatgrass, streambank wheatgrass, western wheatgrass and needlegrass species. Drought tolerance combined with fibrous root system and fair to good seedling vigor, make Indian ricegrass desirable for reclamation in areas receiving 8 to 14 inches annual precipitation.

Wildlife - Forage value is mentioned in the grazing/rangeland/hayland section above. Due to the abundance of plump, nutritious seed produced by Indian ricegrass, it is considered an excellent food source for birds such as morning doves, pheasants, and songbirds. Rodents collect the seed for winter food supplies. It is considered good cover habitat for small animals and birds.

Beautification - Due to its attractive seedheads, Indian ricegrass is recommended for roadside, campground, and other low rainfall locations for beautification.

### **Adaptation**

Indian ricegrass is very winter hardy and has a broad climatic adaptation. It can be found at elevations from 2,000 up to 10,000 feet. It grows best in areas with average annual precipitation of 8 inches to above 14 inches. It has been seeded in areas with as low as 6 inches of rainfall and reproduced. It is also found on sites with precipitation well above 14 inches. It prefers sandy coarse textured soils in its southern areas of adaptation and can be found on sands, fine sandy loams, silt loams, clay loams, gravelly, rocky, to shaly areas in the mid-northern areas of its adaptation. It does well on hot, dry southern exposures. In Colorado, Utah, Nevada, and locations to the south, Nezpar does best above 6500 feet elevation and Paloma does best below 6500 feet elevation.

Indian ricegrass is often an early seral or pioneer species establishing seedlings in open or disturbed sites and on sandy soils. It is relatively short-lived for a perennial grass and reproduces by seed.

It does not tolerate poorly drained soils, extended periods of inundation, winter flooding or shading. It is tolerant of weakly saline and sodic conditions, but prefers neutral soils. It can also tolerate fire later in the growing season and when the plant is dormant without serious damage.

Species often associated with Indian ricegrass include the big sagebrush complex, saltbush species, winterfat, juniper species, needle and thread and other needlegrasses, bluebunch wheatgrass, Snake River wheatgrass, thickspike wheatgrass, streambank wheatgrass, western wheatgrass, and blue grama.

### **Establishment**

This species should be seeded with a deep furrow drill at a depth of 1/2 to 1 inch on medium to fine textured soils and 1 to 3 inches on coarse textured soils. A deeper planting depth puts the seed in contact with moist soil conditions, which aids in the stratification process and makes the seed less likely to be dug up by rodents. Use of older seed up to 4 to 6 years of age may improve germination and should be planted at 1/2 to 1-inch depth. Seed may require acid washing to scarify the seed and improve germination. Single species seeding rate recommended for Indian ricegrass is 8 pounds Pure Live Seed (PLS) per acre or 24 PLS per square foot or 24 PLS seeds per linear row foot at 12 inch row spacing. If used as a component of a mix, adjust to percent of mix desired. For rangeland mixtures, approximately 30 to 50 percent of the mix or 2.5 to 4 pounds PLS/acre should be considered. For mined lands and other harsh critical areas, the seeding rate should be doubled. Two separate seeding operations may be necessary when planting seed mixes because most species should be planted at shallower depths than those recommended for Indian ricegrass. This means that Indian ricegrass should be planted first, followed by the seeding operation for the rest of the mix.

The best seeding results are obtained from seeding in very early spring on heavy to medium textured soils and in late fall on medium to light textured soils. Dormant fall seeding may improve germination of dormant seeds. Summer and late summer (June - September) seedings are not recommended. Seedling vigor is fair to good, but the seed may have a high percentage of hard seed, and stands may take 2 to 5 years to fully establish. Indian ricegrass stands respond well to light irrigation and light fertilization.

Stands may require weed control measures during establishment. Bromoxynil may be applied at the 3-4 leaf stage for early suppression of young broadleaf weeds and application of 2,4-D should not be made until plants have reached the 4-6 leaf stage or later. Mow when weeds are beginning to bloom to reduce weed seed development. Grasshoppers may damage

Exhibit 540-26

new stands and other insects and use of pesticides may be required. All herbicides and pesticides should be applied according to the label.

**Management**

Indian ricegrass establishes slowly and new seedlings should not be grazed until at least late summer or fall of the second growing season. It makes its initial growth in early spring and matures seed by mid summer.

New stands should not be grazed until the plants are reproducing by seed. Indian ricegrass benefits from grazing use if it is moderately grazed in winter and early spring. Livestock should be removed while there is still enough growing season moisture to allow recovery, growth, and production of seed. Stands will deteriorate under heavy spring grazing systems.

The third and fourth years following establishment may be critical to stand survival. Reproduction is dependent on seed production and quality seed in the soil bank must be available as mature plants begin to go out of the stand. Grazing management with rest or deferment schedules that allow plants to produce seed every 2 to 3 years is recommended. By the eighth or ninth year following establishment, the seed bank should be adequate, with a wide variation of low dormancy to hard seed to ensure long term stand survival with proper grazing management.

**Environmental Concerns**

Indian ricegrass is relatively short-lived and spreads via seed distribution. It is not considered "weedy" or an invasive species but can spread into adjoining vegetative communities under the proper management, climatic, and environmental conditions. Most seedlings do not spread from original plantings, or if they do spread, the rate of spread is not alarming. Indian ricegrass is self-pollinated but may occasionally be pollinated by native needlegrass species. These natural crosses generally produce sterile hybrids.

**Seed Production**

Seed production of Indian ricegrass has been very successful under cultivated conditions. Row spacing of 24 inches under irrigation or high precipitation (4.0 pounds PLS per acre) to 36 inches on dryland (3.0 pounds PLS per acre) is recommended. Cultivation will be needed for weed control and to maintain row culture.

Seed fields are productive for about five years. Fall moisture, soil fertility, and plant regrowth determine the succeeding years yield. Birds will feed on seed, and wind can shatter seed from inflorescence prior to harvest. Average production of 100 to 200 pounds per acre can be expected under dryland conditions in 14 inch plus rainfall areas. Average production of 300 to 400 pounds per acre can be expected under irrigated conditions. Harvesting can be completed by direct combining in the hard dough stage or by windrowing. Windrowing helps ensure a more complete threshing. Indian ricegrass is so indeterminate that windrowing allows final curing in the swath prior to combining. Windrowing also reduces the risk of wind damage. It is very difficult to thrash all the seed if direct combined, and it may be beneficial to rethresh windrows after a few days for seed not threshed in the first operation. Seed heads have moderate to high rates of shatter and require close scrutiny of maturing stands. Seed is generally harvested in early July to early August. Seed must be dried immediately after combining (moisture content should be 12 percent in bins/15 percent in sacks).

Foundation and registered seed is available through the appropriate state Crop Improvement Association or commercial sources to grow certified seed.

**Contributed by:**

Daniel G. Ogle  
Plant Materials Specialist, USDA-NRCS  
Boise, Idaho

**For more information about this and other conservation plants, contact your local NRCS field office or Conservation District, or browse the Web at "<http://Plant-Materials.nrcs.usda.gov>" (Plant Materials) or "<http://plants.usda.gov>" (PLANTS database).**

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To file a complaint of discrimination, write the USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14<sup>th</sup> and Independence Avenue, SW. Washington, D.C., 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

**Exhibit 540-26 Guidelines for Preparing a Plant Fact Sheet**

Plant Fact Sheets are similar to Plant Guides but provide less detail and more of an overview for a species. They are generally one sheet of paper and include color photos. They are often used to provide general information about a conservation species to a landowner. The following format should be adhered to as closely as possible for consistency within the Plant Materials Program.

<p><u>Plant Fact Sheet for:</u></p> <p><b>COMMON NAME</b> <i>Sciname</i> + Authority plant symbol = xxxx</p> <p><i>Contributed by: Office or Affiliation</i></p> <p><b>Alternate Names</b> Synonyms or other common names may be listed here.</p> <p><b>Uses</b> Uses may be categorized or put in paragraph form, if categorized with explanation italicize the category. i.e., <i>Erosion Control: xxxxx</i> <i>Wildlife Use: xxxx</i></p> <p><b>NRCS Conservation Practices</b> This field is optional. Include if applicable. List NRCS Code and Descriptive Title for Practice.</p> <p><b>Description</b> Include a brief description of the species. This includes a botanical description, key identification characteristics, habitat and distribution information, and should be understandable by the layperson.</p> <p><b>Adaptation</b> Where is species adapted to – may include geographic area, climate, hardiness zones, soils, etc. Include a map from the PLANTS database if desired.</p> <p><b>Establishment</b> considerations when planting – seedbed prep, fertility, equipment or techniques for planting; include seeds/pound and seeding rate; rate may include a range or different rates whether drilled or broadcast. For woody plants, may include spacing if that is important. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.</p>
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**Management**

How do you maintain the plants after they have established? This includes fertilization, watering, weed control, mowing, pruning, haying/grazing considerations etc. Also include a warning and control methods if there is a chance the plant might be overly aggressive or invasive. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

**Pests and Potential Problems**

What pests or potential problems might there be with using this species? Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

**Environmental Concerns**

What potential problems might there be with using this species? Potential problems may include aggressiveness, invasiveness, other environmental problems (i.e., changes hydrology of wet areas), difficult to control once established, and toxicity of foliage to domestic animals. Since this information may vary by region of the US, indicate if necessary which region the recommendation applies to.

**Cultivars and Improved Materials**

cultivar names should be first letter CAPS, all other letters with smalls, single quotes around cv. names; i.e., 'Blackwell'. Do not put in all caps. Pre-varietal releases should be the same but without single quote. If there are a lot of releases, may indicate where they are best adapted to by region of the US.

**Availability**

Are seed or plants available from commercial sources? Just the species, or cultivars/releases as well?

**Prepared By:**

List author(s) along with title, affiliation, city, and state.

Include date prepared and/or revised here along with initials, i.e. 29Nov1999 JE

Include the following at the end of the Plant Fact Sheet:

For more information about this and other conservation plants, please contact your local NRCS field office or Conservation District, or visit the Plant Materials Program Web site at "<http://Plant-Materials.nrcs.usda.gov>" and the PLANTS Web site at "<http://plants.usda.gov>".

Current EEO/CR Statement

Exhibit 540-27 Sample Plant Fact Sheet

**USDA NRCS Plant Materials Program** **Plant Fact Sheet**

**SWITCHGRASS**  
*Panicum virgatum* L.  
plant symbol = PAVI2

*Contributed by: USDA, NRCS, Plant Materials Program*

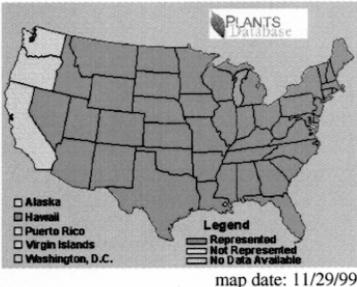
**Uses**  
*Livestock:* Switchgrass is noted for its heavy growth during late spring and early summer. It provides good warm-season pasture and high quality hay for livestock.  
*Erosion Control:* Switchgrass is perhaps our most valuable native grass on a wide range of sites. It is a valuable soil stabilization plant on strip-mine spoils, sand dunes, dikes, and other critical areas. It is also suitable for low windbreak plantings in truck crop fields.  
*Wildlife:* Switchgrass provides excellent nesting and fall and winter cover for pheasants, quail, and rabbits. It holds up well in heavy snow (particularly ‘Shelter’ and ‘Kanlow’ cultivars) and is useful on shooting preserves. The seeds provide food for pheasants, quail, turkeys, doves, and songbirds.

**Description**  
*Panicum virgatum* L., switchgrass, is native to all of the United States except California and the Pacific Northwest. It is a perennial sod-forming grass that grows 3 to 5 feet tall. It can be distinguished from other warm-season grasses, even when plants are young, by the white patch of hair at the point where the leaf attaches to the stem. The stem is round and usually has a reddish tint. The seed head is an open, spreading panicle.

**Adaptation**  
On suitable soils, switchgrass is climatically adapted throughout the most of the United States. Moderately deep to deep, somewhat dry to poorly drained, sandy to clay loam soils are best. It does poorly on heavy soils. In the East, it performs well on shallow, acid, and droughty soil.

**Establishment**  
Switchgrass should be seeded in a pure stand when used for pasture or hay because it can be managed better alone than in a mixture. Its shiny, slick, clean, free-flowing seed can be planted with most seed drills or with a broadcast spreader. A planting rate of 8-10 pounds PLS per acre is recommended for most applications. There are approx. 389,000 seeds/lb.

Seedings should be made in fine, firm seedbeds free of competition. Seedbeds should be firmed with a roller prior to the drilling or broadcasting of seed. If seeds are planted using the broadcast method, the area should be rolled afterward to help cover the seed. When drilled, seeds should be planted 1/4 inch deep. No-tillage seedings in closely grazed or burned sod also have been successful, where control of sod is accomplished with clipping, grazing, or proper herbicides. Late spring or early summer plantings of switchgrass should not be made with a companion crop because of potential moisture stress. Weed control with all plantings of switchgrass is important the first year. Phosphorus and potassium should be applied according to soil tests before or at seeding. Nitrogen, however, should not be used at seeding time because it will stimulate weed growth. Fertilizer applied during the seeding year usually does not increase stand density, but will increase plant vigor. If nitrogen is to be used the first year, it should not be applied until mid-July, and then only on stands with limited weed competition.



**Area of Known Occurrence**

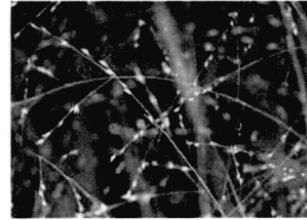
PLANTS DATABASE

Legend  
Represented  
Not Represented  
No Data Available

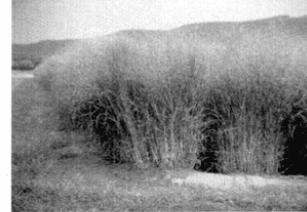
map date: 11/29/99

**Management**

If weeds are a problem during the seeding year, switchgrass may be mowed at a 4-inch height in May or a 6-inch height in June or July. Grazing is generally not recommended the first year, but a vigorous stand can be grazed late in the year if grazing periods are short with at least 30 days of rest provided between grazings. Switchgrass begins growing late in the spring, making about 70 percent of its production after June 1. This makes its management quite different from cool-season grasses. However, it is the earliest maturing of the common native warm-season grasses and it is ready to graze in early summer.



Established stands of switchgrass may be fertilized in accordance with soil tests. Generally, nitrogen, phosphorus, and potassium are added for maximum yields. However, phosphorus and potassium will not be needed if the field is grazed since these elements will be recycled back to the soil by the grazing animal. Apply nitrogen after switchgrass has begun to produce using a single application in mid-to-late May or a split application in both May and early July. Avoid high rates of nitrogen because carry-over could spur cool-season grass growth and harm young plants the following spring.



Switchgrass will benefit from burning of plant residues just prior to initiation of spring growth. Burning fields once every 3 to 5 years decreases other plant competition, eliminates excessive residue and stimulates switch grass growth. Switchgrass used for wildlife food and cover should be burned once every 3 to 4 years to reduce mulch accumulations that inhibit movement of hatchlings and attract nest predators.

Under continuous grazing management, begin grazing switchgrass after it has reached a height of 14 to 16 inches, and stop when plants are grazed to within 4 inches of the ground during late spring, 8 inches in early summer, and 12 inches in late summer. A rest before frost is needed to allow plants to store carbohydrates in the stem bases and crown. This will help produce vigorous plant growth the next year. Switchgrass may be grazed to a height of 6 to 8 inches after frost. The winter stubble is needed to provide insulation. With management intensive systems, grazing can begin in the first paddocks when plants reach a height of 10 inches and should not be grazed below a stubble height of 6 to 8 inches. Grazed paddocks need to be rested 30-60 days before being grazed again.

**Pests and Potential Problems**

Grasshoppers and leafhoppers can be major pests in new seedlings. Some stands are impacted by damping off and seedling blight. Leaf rust occasionally affects forage quality.

**Cultivars and Improved Materials (and area of origin)**

'Alamo' (TX), 'Blackwell' (OK), 'Caddo' (OK), 'Carthage' (NC), 'Cave-In-Rock' (IL), 'Dacotah' (ND), 'Forestburg' (SD), 'Kanlow' (OK), 'Nebraska 28' (NE), 'Pathfinder' (NE/KS), 'Shawnee' (NE), 'Shelter' (WV), 'Summer' (NE), 'Trailblazer' (NE/KS), Grenville (NM), Miami (FL), Stuart (FL), Wabasso (FL)

**Prepared By:** USDA, NRCS, Plant Materials Program

**Species Coordinator:** USDA, NRCS, National Plant Materials Center, Beltsville, MD

29Nov1999 JE

**For more information about this and other conservation plants, contact your local NRCS field office or Conservation District, or browse the Web at "<http://Plant-Materials.nrcs.usda.gov>" (Plant Materials) or "<http://plants.usda.gov>" (PLANTS database).**

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**Exhibit 540-28 Checklist for Plant Selection Studies**

The following checklist may be used to track the progress of a Plant Selection Study as well as serving to identify the proper order for items to be completed when making a plant release.

<b>Item</b>	<b>Date Completed</b>
1. A study plan has been prepared identifying the goals of the proposed release.	_____
2. Adequate consideration has been given to existing releases of the species to avoid duplication of efforts.	_____
3. Evaluation data has been summarized showing justification for this release.	_____
4. Advanced evaluation documentation has been prepared.	_____
5. The plant being released has been adequately identified as to genus, species, and subspecies, if appropriate.	_____
6. The cultivar or pre-varietal name has received clearance from the NPMC.	_____
7. If the release is a cultivar, the approved name has been registered.	_____
8. Consideration has been given to the desirability of seeking protection under the PVPA or patent statute.	_____
9. A Plant Introduction (PI) number has been applied for, if applicable.	_____
10. 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 Part 540.73(a)(3) and Exhibit 540-31.	_____
11. An information campaign has been developed to promote the new release as per Part 540.74(f). This is to include a schedule for special demonstration plantings (Part 540.64(d)), if any are planned.	_____
12. Adequate seed, plants, or other propagules are available to meet expected demand by commercial producers.	_____
13. A date has been estimated when seed or plants will be available commercially, which will serve as a public release date for promotional purposes.	_____
14. The NPMC has been contacted regarding long-term storage of material in the National Plant Germplasm System (NPGS).	_____
15. A release notice has been prepared and all required signatures for the notice have been obtained. <u>Note: The release is official on the date of the last signature, which is always the Director, ECS.</u>	_____
16. A paper copy of all documentation for the release (including evaluation documentation, cultivar name registration forms, <u>signed</u> release notice, and any articles, release brochures, and planting guides) and an electronic copy of these materials has been sent to the NPMC.	_____

**Exhibit 540-29 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:

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- Revised and Approved by ESCOP November 16, 1988

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).

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### **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 multilocal 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.

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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 SCS 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 introductions<sup>1</sup>. 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. This should be

<sup>1</sup>*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

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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), there should be the opportunity for a joint release by 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 from 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.

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### 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.

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### 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, the 1969 edition in no way changes 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 Part 540.74(a)(1).]

# Part 540.8 – Exhibits for Part 540, Subpart B

Exhibit 540-30

## Exhibit 540-30 Form NRCS-ECS-580; Plant Collection Information

United States Department of Agriculture Natural Resources Conservation Service		NRCS-ECS-580 (4/98)	
		<h3 style="margin: 0;">Plant Collection Information</h3> <p style="margin: 0;">(seed or vegetative)</p>	
<b>PLANT INFORMATION</b>		<b>COLLECTION INFORMATION</b>	
Scientific Name _____ _____ Common Name _____ Cultivar/Release _____ Plant type: _____ Number of Plants from which collected _____ (minimum population of 30 plants is preferred) <input type="checkbox"/> Seed <input type="checkbox"/> Vegetative Material		Date Collected _____ Collector's Name _____ _____ Collector's Headquarters _____ _____	
<b>COLLECTION SITE INFORMATION</b>			
State	Section	N. Latitude	
County	Range	W. Longitude	
Township	Site Location (ie. landmarks, roads, etc.)		MLRA
Elevation (ft or m)	Slope (%)	Exposure (N,S,E,W)	Precipitation (in or mm)
Plants Growing in Association			
<b>Soils Information</b>			
Soil Series & Texture	Soil Survey Sheet #	Soils Mapping Unit Symbol	
Remarks _____ _____ _____			
<p>Please complete the above form as completely as possible, following the instructions below for collecting and handling seed and vegetative material.</p> <p>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.</p> <p>Use the back of this sheet to sketch the collection area or record additional information.</p> <p>Be sure to label each collection as it is made so collections do not get mixed up. Send seed to the Plant Materials Center serving the state, unless other specific instructions are provided.</p> <p><b>Seed Collection:</b> 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 30-50 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. Fleshy seed from woody species should be enclosed in a plastic bag and kept in a cool place out of direct light.</p> <p><b>Vegetative Material Collection:</b> 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.</p>			

**Exhibit 540-31 Worksheet for Documenting an Environmental Evaluation of NRCS Plant Releases**

**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 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 judgement and experience when interpreting the final results.

**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 not so clear and there is the potential for a high impact on habitats and control may be moderate to difficult.

**Instructions**

Rate the plant or release based on the following criteria by circling your assessment. If the criteria does not apply to the species or release, then do not rate for that 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. 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.

All rating criteria must be completed, 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.

When finished with ranking, interpretation, 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.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-31

**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 US?** 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:** \_\_\_\_\_

---

<u>Summary of Criteria from Section A</u>	<u>Score</u>
<b>Part 1. Impact on Habitats, Ecosystems, and Land Use</b>	_____
<b>Part 2. Ease of Management</b>	_____
<b>Part 3. Conservation Need and Plant Use</b>	_____
<b>Part 4. Biological Characteristics</b>	_____

**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

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**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) 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) Often 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 negative influences on community composition 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 of other plants 3
  - c) Demonstrates allelopathic effects to mature stages of other plants 5

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**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-31

- 5) Impact on habitat for wildlife or domestic animals (aquatic and terrestrial), including threatened and endangered species (coordinate with USFWS and state Heritage Programs as appropriate)**
- a) No negative impact on habitat, or this criteria not applicable based on intended use for the plant 0
  - b) Minor negative impact on habitat (e.g., decreased palatability; lower wildlife value; decreased value for undesirable animal species) 2
  - c) Significant negative impact on habitat (e.g., foliage toxic to animals; significantly lower value for wildlife; excludes desirable animal species from an 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) 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., 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) The previous options are not effective for managing or controlling the release 10

Exhibit 540-31

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## Part 540.8 – Exhibits for Part 540, Subpart B

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- 3) Side effects of chemical or mechanical control measures**
- a) Control measures used on release will have little or no effect on other plants 0
  - b) Control measures used on release will cause moderate effects on other plants 3
  - c) Control measures used on release will cause major effects on other plants 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 1
  - c) Seeds remain viable in the soil for 4-5 years 3
  - d) Seeds remain viable in the soil for more than 5 years 5

- 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 3
  - c) Regeneration from root or stem parts left in the soil 5

- 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 3
  - c) Resprouts and produces seed in same year 5

**Total Possible Points 40**

**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.*

- 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 Need**
- a) Many other plants available 1
  - b) Few other plants available 3
  - c) No other plants available 5

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## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-31

### 3) Consequences of Not 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 \_\_\_\_\_**

### **Part 4. Biological Characteristics**

*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 under natural conditions, 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 |

\*\* If reproduces only by seed, skip to #5

#### 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 |

\*\* If reproduces only vegetatively, skip to #11

- 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) Moderate (11-1,000) 3
  - d) Many-seeded (>1,000) 5
- 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) Hybridization**
- a) Has not been observed to hybridize outside the species 0
  - b) Hybridizes with other species in the same genera 3
  - c) Hybridizes with other genera 5

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-31

### 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 70**

**Total Points for Part 4 \_\_\_\_\_**

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### 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. US 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.

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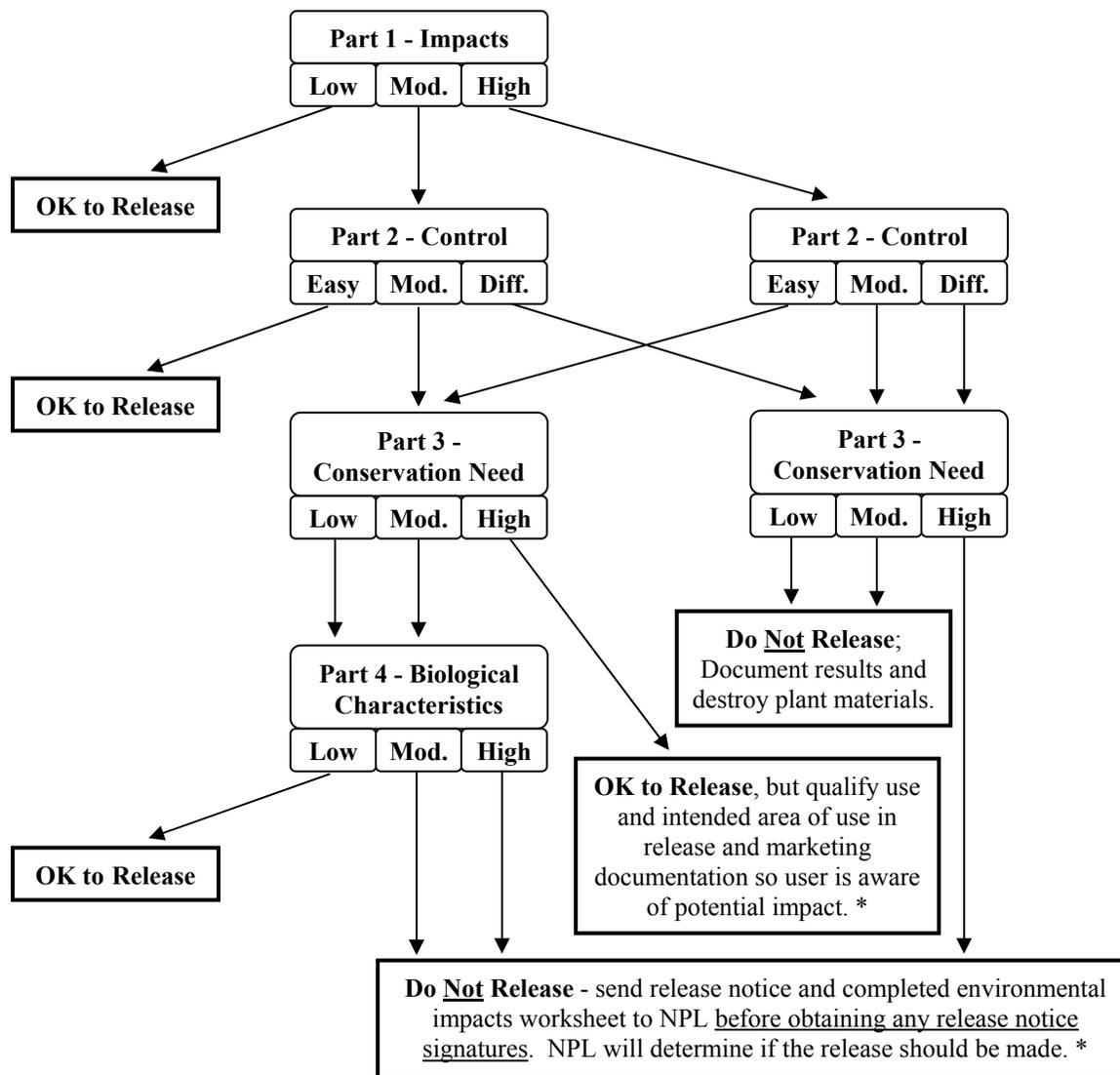
### Section B. Scoring and Interpretation

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	<b><u>Low</u></b> chance plant is going to affect the environment
	16-25	<b><u>Moderate</u></b> chance plant is going to affect the environment
	26-45	<b><u>High</u></b> chance plant is going to affect the environment
Part 2. Ease of Management	0-20	<b><u>Easy</u></b> to control
	21-30	<b><u>Moderate</u></b> to control
	31-40	<b><u>Difficult</u></b> to control
Part 3. Conservation Need and Plant Use	0-5	<b><u>Low</u></b> need
	6-9	<b><u>Moderate</u></b> need
	10-15	<b><u>High</u></b> need
Part 4. Biological Characteristics	0-25	<b><u>Low</u></b> chance plant is going to propagate and increase itself
	26-40	<b><u>Moderate</u></b> chance plant is going to propagate and increase itself
	41-70	<b><u>High</u></b> chance plant is going to propagate and increase itself

**Section C. Action to Take for Releasing Plants**

Based on the interpretation above, follow the decision tree below. 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 Environmental Assessment or Environmental Impact Statement may need to be prepared prior to release (see NPMM Part 540.73(a)(3)).

## Part 540.8 – Exhibits for Part 540, Subpart B

Exhibit 540-32

### Exhibit 540-32 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	
<b>Species:</b>	<i>Elymus trachycaulus ssp. trachycaulus</i>
<b>Common Name:</b>	slender wheatgrass
<b>Plant Symbol:</b>	ELTRT
<b>Accession Number:</b>	432403
<b>Year Selected:</b>	1978
<b>Selecting PMC:</b>	MONTANA PMC
<b>Lead PMC:</b>	MONTANA PMC
<b>Lead PMS:</b>	MONTANA PMS
<b>Selection Method:</b>	Selection was based on emergence, seedling vigor, and persistence under saline-alkaline conditions.
<b>DESCRIPTION</b>	
<b>Origin:</b>	Collected in Carbon County, Montana, in a saline swale, 13 miles north of the Montana-Wyoming border and 5 miles north of Warren.
<b>Botanical Description:</b>	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.
<b>Spread and Invasiveness:</b>	
<b>Spread by Seed:</b>	medium
<b>Spread Vegetatively:</b>	none
<b>Potential Invasiveness:</b>	low
<b>Area of Known Invasiveness:</b>	none
<b>Mode of Reproduction:</b>	Self-Pollinated
<b>Chromosome Number:</b>	42
<b>Out-crossing Percent:</b>	5
<b>Photosynthetic Pathway:</b>	c4
<b>Plant Type:</b>	Grass
<b>Growth Form:</b>	Perennial
<b>Growth Habit:</b>	Bunch, Erect
<b>Mature Height:</b>	4.0
<b>Seeds per pound:</b>	97000
<b>Seasons of Growth:</b>	spring
<b>ADAPTATION</b>	
<b>Climatic Conditions:</b>	
<b>Coldest Hardiness Zone:</b>	2
<b>Growing Season Days (Frost Free Days):</b>	90
<b>MLRA Potential:</b>	32, 34, 52, 58, and 67
<b>Maximum Precipitation:</b>	25
<b>Minimum Precipitation:</b>	5

<b>ADAPTATION (continued)</b>	
<b>Soil Condition:</b>	
<b>Soil Texture Range:</b>	Fine Sandy Loam - Clay
<b>Minimum Rooting Depth:</b>	2
<b>High pH:</b>	8.9
<b>Low pH:</b>	5.5
<b>Salinity Tolerance:</b>	22
<b>Inundation Tolerance:</b>	1
<b>Inundation in Days:</b>	15
<b>Drainage Tolerance:</b>	Slightly Drained
<b>STRATEGY</b>	
<b>Standards of Comparison:</b>	Revenue, Primar, or San Luis
<b>Advanced Evaluation Strategy:</b>	Test in Intercenter Strain Trials in the Northwest.
<b>Field Planting Strategy:</b>	Test in field plantings in the Northwest.

**Part 540.8 – Exhibits for Part 540, Subpart B**

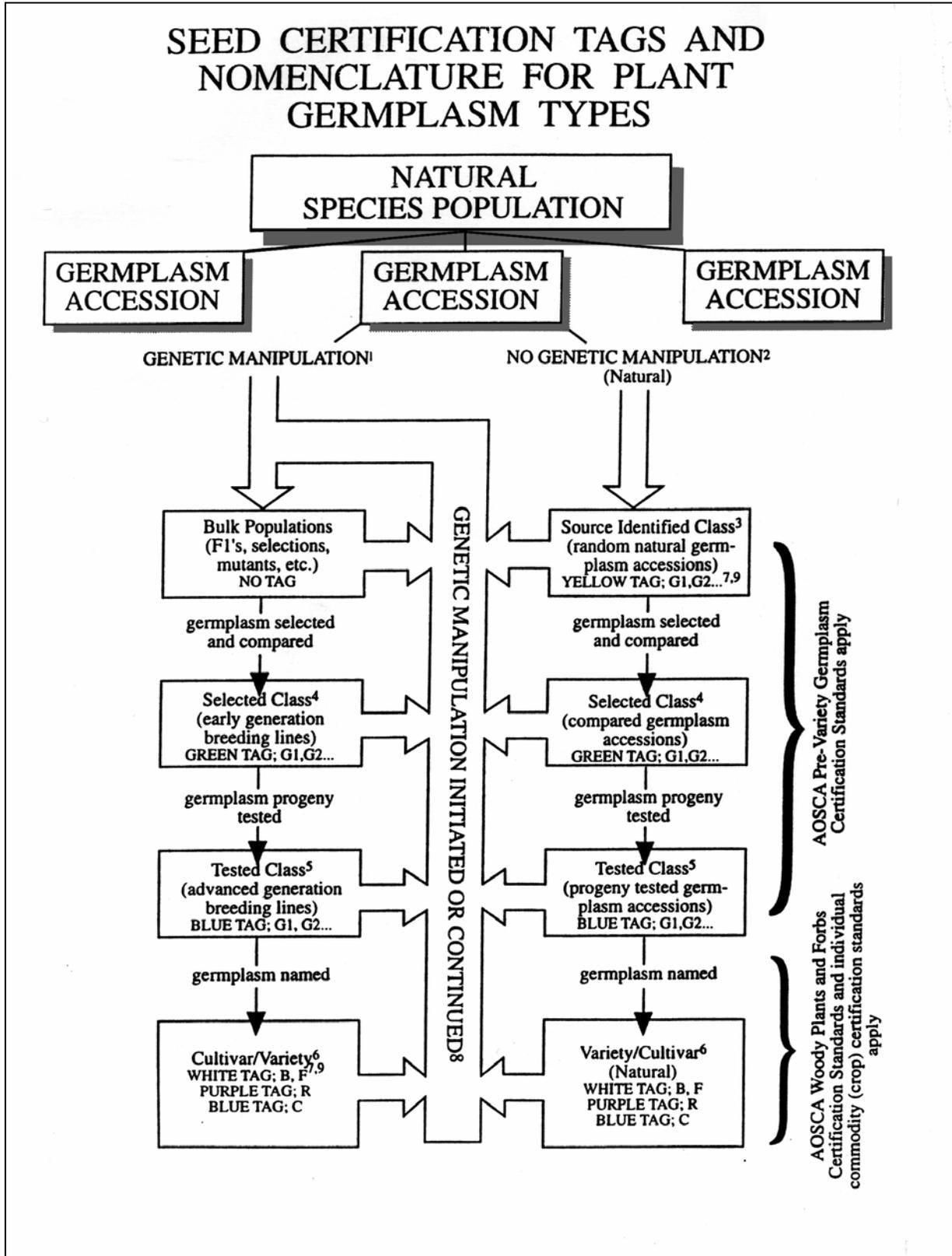
Exhibit 540-33

**Exhibit 540-33 Summary of Plant Release Types and Criteria for Release**

		<b>Release Type</b>				
	<b>Cultivar</b>	<b>Tested</b>	<b>Selected</b>	<b>Source-Identified</b>	<b>Germplasm</b>	
<b>Definition of release types</b>	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.	
<b>Genetic Manipulation vs. Natural Track</b>	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.	
<b>When to use</b>	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
<b>Size of Collection</b>				Seed collection from at least 200 plants in a population (if possible) recommended	
<b>Selection basis</b>	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
<b>Criteria for release</b>	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)
<b>Limitation of Generations</b>	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	

Exhibit 540-34 AOSCA Guidelines for Release Types and Development Tracks



**SEED CERTIFICATION TAGS AND NOMENCLATURE FOR  
PLANT GERMPLASM TYPES**

(Text which accompanies graphic in Exhibit 540-34)

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 I 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 Part 540.74(a)(1).]

## **Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-35

### **Exhibit 540-35 Information Needed for Requesting Positive Identification of Plants Prior to Release**

The following information should be included in letter format when requesting positive identification of a plant sample from a university or from the NPMC.

1. Requesting PMC/PMS name.
2. Date of request.
3. Person requesting and office phone number.
4. Anticipated genus and/or species name of the sample.
5. Plant common name if known.
6. NRCS Accession Number or PI Number if assigned.
7. Anticipated class of release for this plant (cultivar, tested, selected, source identified, or germplasm).
8. Evaluation Data - Vegetative characteristics (plant height, spread, leaf characteristics) which may aid in identification.

Send this information to the appropriate plant taxonomist at a local college or university or to the NPMC, Beltsville, MD for processing.

**Exhibit 540-36 Information Needed for Requesting Plant Release Name Clearance**

The following information should be included in letter format when requesting plant release name clearance from the NPMC.

1. Requesting PMC/PMS name.
2. Date.
3. Person requesting and phone number.
4. Plant Scientific Name.
5. Plant Common Name.
6. PLANTS plant symbol.
7. NRCS Accession Number.
8. Assigned PI Number (if applicable).
9. Type of Plant (grass, grass-like, legume, forb, or woody).
10. Anticipated class of release (cultivar, tested, selected, source identified, or germplasm).
11. List up to 3 proposed release names in order of preference.
12. Anticipated release date (month/year).
13. Attach Advanced Evaluation Documentation for the release.

Send this information to the NPMC, Beltsville, MD for processing.

## **Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-37

### **Exhibit 540-37 Information Needed for Requesting Plant Introduction (PI) Numbers**

The following information should be included in letter format when requesting a PI Number.

1. Requesting PMC/PMS name.
2. Date.
3. Person requesting and phone number.
4. Plant Scientific Name.
5. Plant Common Name.
6. PLANTS plant symbol.
7. NRCS Accession Number and/or other numbers assigned to this release.
8. Type of Plant (grass, grass-like, legume, forb, or woody).
9. Anticipated class of release (cultivar, tested, selected, source identified, or germplasm).
10. Anticipated release date (month/year).
11. Attach Advanced Evaluation Documentation for the release.

Send this information to the NPMC, Beltsville, MD for processing.

**Exhibit 540-38 Outline for an Official Plant Release Notice for a Cultivar Release**

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
CITY, STATE

and

NAME OF COOPERATOR(S)  
CITY, STATE

NOTICE OF RELEASE OF '<CULTIVAR>' <COMMON NAME>

The Natural Resources Conservation Service, U.S. Department of Agriculture and <Cooperator Name> announce the naming and release of '<Cultivar>' <common name> (<Scientific name Author>). '<Cultivar>' <common name> has been assigned the PI number <XXXXXX>.

**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.

**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.

**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.

**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.

**Conservation Use:** State conservation applications for which the plant release is recommended. Indicate which traits make this plant suitable for particular functions.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-38

**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.

**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.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-38

**Signatures for release of:**

**'<Cultivar>' <common name> (<Scientific name>)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Cooperating Agency  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-39

### Exhibit 540-39 Sample of an Official Plant Release Notice for a Cultivar Release

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
ABERDEEN, IDAHO

and

NEVADA STATE DIVISION OF AGRICULTURE  
RENO, NEVADA

#### NOTICE OF RELEASE OF ‘STILLWATER’ BALTIC RUSH

The Natural Resources Conservation Service, U.S. Department of Agriculture and the Nevada Division of Agriculture announce the naming and release of ‘Stillwater’ Baltic rush (*Juncus balticus* Willd.). ‘Stillwater’ Baltic rush has been assigned the Plant Introduction number 457632.

**Collection Site Information:** ‘Stillwater’ was originally seed collected in 1988 from native plants located within the boundaries of the Stillwater National Wildlife Refuge (NWR), northwest of the town of Fallon, Churchill County, Nevada. Elevation is approximately 3,900 feet and the soils are mostly poorly drained calcareous loams.

**Description:** ‘Stillwater’ Baltic rush is a perennial, rhizomatous, facultative wetland plant. Stems are upright, round, wiry, and grow up to 3 feet tall. Leaf sheaths are clustered at the base, bladeless or nearly so. The inflorescence consists of panicles borne laterally on the culms. Plant spread from rhizomes can exceed 2 feet in a single growing season.

**Method of Breeding and Selection:** A total of 60 Baltic rush collections from the Aberdeen PMC Service Area were initially evaluated in 1989-90 for survival, vigor, overall growth and spread, potential seed production, and above ground biomass production. The seven top accessions were moved into a crossing block. The progeny of this crossing block were grown out in a nursery and the three top accessions were selected and moved to advanced evaluation.

In advanced evaluations replicated over eight years, accession 9056794 (now referred to as ‘Stillwater’) consistently outperformed the other two accessions in rate of spread, above ground biomass production, seed abundance, and rhizome production (see table). Plantings were evaluated at sites throughout the Intermountain region and at locations in other western states.

See attached advanced testing documentation for additional information on the characteristics of ‘Stillwater’.

**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-39

Site	Biomass (dry wt. g)			Seed Production (g)			Rhizome Production (no.)			Rate of Spread (cm/yr)		
	S	A	B	S	A	B	S	A	B	S	A	B
01ID	90.2	45.3	37.1	40.7	17.9	23.5	36	7	5	20.2	10.2	3.1
02ID	98.6	64.2	37.7	35.7	15.4	21.5	26	11	19	16.7	9.3	2.6
03ID	87.5	35.7	29.5	24.9	19.4	22.3	36	14	7	19.4	8.5	5.7
04MT	84.5	34.9	24.2	45.0	21.5	18.4	30	12	9	19.3	9.7	2.4
05MT	68.7	25.7	53.7	33.1	21.5	17.9	20	14	15	18.9	12.3	4.1
06NV	97.9	57.3	33.6	28.6	20.4	21.5	35	19	12	20.0	7.2	5.9
07NV	99.2	61.0	45.7	39.0	18.4	21.5	31	9	14	20.6	10.1	3.1
08WA	78.4	35.3	34.5	25.4	19.0	19.4	34	14	13	21.3	10.6	2.1
09WA	68.2	22.5	32.8	33.6	23.5	15.4	39	17	16	17.1	11.4	4.8
10WA	79.3	27.5	35.2	31.7	20.4	18.4	20	19	7	19.4	7.6	3.5

‘Stillwater’ Baltic rush (S) compared to 2 other accessions (A, B) at 10 sites over 8 years: mean vegetative and seed production data.

**Ecological Considerations and Evaluation:** Although ‘Stillwater’ has a higher rate of spread and seed production than other accessions of Baltic rush, we feel that ‘Stillwater’ does not have the potential to be invasive. Evaluations have shown that the rate of spread of ‘Stillwater’ decreased greatly at less than optimum hydrological conditions for the species. ‘Stillwater’ was “OK to release” when evaluated through the “Worksheet for Conducting and Environmental Evaluation of NRCS Plant Releases”.

**Conservation Use:** ‘Stillwater’ Baltic rush is recommended for erosion control, constructed wetland system applications, wildlife food/cover, wetland creations and restorations, and for increasing plant diversity in wetland and riparian communities. Its rhizomatous nature makes ‘Stillwater’ an excellent plant for soil stabilization in sites that are saturated up to 3 inches of standing water. The rhizomes also form a matrix for many beneficial bacteria making this plant an excellent choice for wastewater treatment.

**Area of Adaptation:** ‘Stillwater’ Baltic rush is a facultative wetland plant, adapted to areas throughout the Northwest and Intermountain regions (USDA Plant Hardiness Zones 4-6) with poorly drained soils that are saturated or have up to 3 inches of standing water. It will tolerate up to one-month periods of inundation. Suitable sites for ‘Stillwater’ will be found in MLRAs A3, A5, B6, B8-10, B13, D21, D25, and E43-51. ‘Stillwater’ is not recommended for elevations above 4,500 ft.

**Availability of Plant Materials:** Foundation seed will be maintained by the USDA-NRCS Plant Materials Center and is available in limited quantities to interested parties for increase purposes.

**References:**

Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Williams, K. 1993. A study of Baltic rush (*Juncus balticus* Willd.) in the Western U.S. Aquatic Botany 42 (3): 627-634.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-39

**Prepared by:**

M.S. Jones, USDA NRCS Plant Materials Center, 1691 A South 2700 West, Aberdeen, Idaho, 83210; and T. Trow, USDA NRCS, 3244 Elder Street, Boise, Idaho, 83705.

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**Signatures for release of:**

**‘Stillwater’ Baltic rush (*Juncus balticus*)**

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\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
Boise, Idaho

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Nevada State Division of Agriculture  
Reno, Nevada

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

**Exhibit 540-40 Outline for an Official Plant Release Notice for a Tested and Selected Release**

*Note: The following outline is for both tested and selected class releases. In general, additional details should be provided for tested class releases.*

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
<CITY, STATE>

and

<NAME OF COOPERATOR(S)>  
<CITY, STATE>

NOTICE OF RELEASE OF <NAME>GERMPLASM <COMMON NAME>  
SELECTED/TESTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service, U.S. Department of Agriculture and <Cooperator Name> announce the release of a selected/tested ecotype of <common name> (<Scientific name Author>).

As a selected/tested release this plant will be referred to as <Name Germplasm common name> [Note that pre-varietal names must include the term ‘Germplasm’ as described in the National Plant Materials Manual]. It has been assigned the Plant Introduction Number <XXXXXX> [if applicable] and the NRCS accession number XXXXXX . <Name>Germplasm is released as a selected/tested class of certified seed (natural track) [if applicable].

This alternative release procedure is justified because...[state reasons for making a selected/tested release].

**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.

**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.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-40

**Method of Breeding and/or Selection:** Identify how many collections/accessions were involved in initial evaluations of selected/tested material, any breeding methods used, what traits were selected for, how selection was made, and the time period over which initial evaluations were conducted.

Provide detailed information about advanced evaluations performed on tested release, including number and location of evaluation sites, time period, selection methods used, data compiled for evaluated traits. There should be more information for tested class releases on breeding/selection and evaluations made as appropriate.

**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.

**Conservation Use:** State conservation applications for which the plant release is recommended. Indicate which traits make this plant suitable for particular functions.

**Anticipated 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. The Area of Adaptation for tested class releases should be better defined than for selected class releases based on additional plantings and evaluations which are made with tested class releases.

**Availability of Plant Materials:** State which generation of seed will be maintained by the Plant Materials Center and where seed or other propagules of the plant release can be obtained.

**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.

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**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-40

**Signatures for release of :**

**<Name> Germplasm <common name> (<Scientific name>)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Cooperating Agency  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-41

### Exhibit 540-41 Sample of an Official Plant Release Notice for a Tested and Selected Release

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
ABERDEEN, IDAHO

and

NEVADA STATE DIVISION OF AGRICULTURE  
RENO, NEVADA

#### NOTICE OF RELEASE OF STILLWATER BALTIC RUSH SELECTED/TESTED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture and the Nevada Division of Agriculture announce the release of a selected/tested ecotype of Baltic rush (*Juncus balticus* Willd.) for the intermountain west region.

As a selected/tested release, this plant will be referred to as Stillwater Germplasm Baltic rush to document its original collection location. It has been assigned the NRCS accession number 9057632. Stillwater Germplasm is released as a selected/tested class of certified seed (natural track).

This alternative release procedure is justified because existing commercial sources of Baltic rush are inadequate. The commercial sources that do exist have not been tested for performance in ecosystem restoration, enhancement, and construction of wetlands. The potential for immediate use is high, and commercial potential beyond specific wetland uses is probably limited. No commercial cultivars of Baltic Rush have been released at this time.

**Collection Site Information:** Stillwater Germplasm was originally seed collected in 1990 from native plants located within the boundaries of the Stillwater National Wildlife Refuge, northwest of the town of Fallon, Churchill County, Nevada. Elevation is approximately 3,900 feet; the soils are mostly poorly drained calcareous loams.

**Description:** Stillwater Germplasm Baltic rush is a perennial, rhizomatous, facultative wetland plant. Stems are upright, round, wiry, and grow up to 3 feet tall. Leaf sheaths are clustered at the base, bladeless or nearly so. The inflorescence consists of panicles borne laterally on the culms. Plant spread from rhizomes can exceed 2 feet in a single growing season.

**Method of Breeding and/or Selection:**

(FOR SELECTED CLASS)

From Baltic rush collections found in Land Resource Region (LRR) D North, which includes Major Land Resource Regions (MLRAs) 21, 23, 24, 25, 26, and 27. A total of 14 Baltic rush collections from the Aberdeen PMC Service Area were evaluated at the PMC from 1991 to 1993. All collections were evaluated for survival, vigor, overall growth and spread, potential seed production, and above ground biomass production. The Stillwater collection outperformed all other collections from D North and ranked second overall for all collections of Baltic rush. It also ranked first in aboveground biomass production for all accessions tested from the Aberdeen PMC Service Area. Stillwater Germplasm Baltic rush was selected for its above ground biomass production, rapid spreading from rhizomes, vigor, height, and potential seed production.

See attached advanced testing documentation for additional information.

(FOR TESTED CLASS)

A total of 60 Baltic rush collections from the Aberdeen PMC Service Area were initially evaluated in 1991 for survival, vigor, overall growth and spread, potential seed production, and above ground biomass production. Stillwater Germplasm and three other top accessions were chosen for further evaluation.

In advanced evaluations replicated over four years and three generations (G0, G1, and G2), the Stillwater collection outperformed the other 3 accessions in rate of spread, above ground biomass production, seed abundance, and rhizome production. Plantings were evaluated at five sites in the Aberdeen PMC Service Area.

See attached advanced testing documentation for additional information.

**Ecological Considerations and Evaluation:** Stillwater Germplasm Baltic rush is a selection of naturally occurring germplasm and has undergone minimal purposeful selection. Stillwater Germplasm does not differ significantly in rate or spread, seed production, and vigor from naturally occurring Baltic rush. Stillwater Germplasm was “OK to release” when evaluated through the “Worksheet for Conducting and Environmental Evaluation of NRCS Plant Releases”.

**Anticipated Conservation Use:** The potential uses of Stillwater Germplasm Baltic rush include erosion control, constructed wetland system applications, wildlife food/cover, wetland creations and restorations, and for increasing plant diversity in wetland and riparian communities. Its tendency to spread rhizomatously makes the Stillwater selection an excellent plant for soil stabilization in sites that are saturated up to 2 or 3 inches of standing water. The rhizomes also form a matrix for many beneficial bacteria making this plant an excellent choice for wastewater treatment.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-41

**Anticipated Area of Adaptation:** Baltic rush is a facultative wetland plant, commonly found around the borders of wetlands, and meadows throughout the intermountain west (Brown, 1947). It inhabits poorly drained soils that are saturated or have up to 2 or 3 inches of standing water (Williams, 1993). It will tolerate periods of inundation. Stillwater Germplasm is potentially adapted for use throughout the above areas.

**Availability of Plant Materials:** G0 seed (equivalent to Breeder seed) will be maintained by the USDA-NRCS Plant Materials Center and is available in limited quantities to interested parties for increase purposes.

**References:**

Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Williams, K. 1993. A study of baltic rush (*Juncus balticus* Willd.) in the Western U.S. Aquatic Botany 42 (3): 627-634.

**Prepared by:**

M.S. Jones, USDA NRCS Plant Materials Center, 1691 A South 2700 West, Aberdeen, Idaho, 83210; and T. Trow, USDA NRCS, 3244 Elder Street, Boise, Idaho, 83705.

**Signatures for release of:**

**Stillwater Germplasm Baltic rush (*Juncus balticus*)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
Boise, Idaho

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Nevada State Division of Agriculture  
Reno, Nevada

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-42

### Exhibit 540-42 Outline for an Official Plant Release Notice for a Source-Identified Release

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
<CITY, STATE>

and

<NAME OF COOPERATOR(S)>  
<CITY, STATE>

NOTICE OF RELEASE OF <NAME>GERMPLASM <COMMON NAME>  
SOURCE-IDENTIFIED CLASS OF NATURAL GERMPLASM

The Natural Resources Conservation Service, U.S. Department of Agriculture and Cooperator Name announce the release of a source-identified ecotype of <common name> (<Scientific name Author>).

As a source identified release, this plant will be referred to as <Name> Germplasm <common name>. [Note that pre-varietal names must include the term ‘Germplasm’ as described in the National Plant Materials Manual.] It has been assigned the NRCS accession number XXXXXX. <Name>Germplasm <common name> is released as a source identified type of certified seed (natural track).

This alternative release procedure is justified because...[state reasons for making a source identified release].

**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.

**Ecotype 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.

**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.

**Anticipated Conservation Use:** State conservation applications for which the plant release would be useful. Indicate which traits make this plant suitable for particular functions.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-42

**Potential Area of Adaptation:** Provide information regarding potential areas suitable for establishment and growth of the released material. Include as many details as possible on soil type, hydrology (if applicable), elevation, precipitation, hardiness/heat tolerance zones, and MLRA designations.

**Availability of Plant Materials:** State where collections of material can be made, and contact names for obtaining necessary collection permits/permission.

**References:**

List any sources used in preparation of notice.

Example:

Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Williams, K. 1993. A study of baltic rush (*Juncus balticus* Willd.) in the Western U.S. Aquatic Botany 42 (3): 627-634.

**Prepared by:**

Provide name(s) and address(es) of individuals responsible for preparation of notice.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-42

**Signatures for release of :**

**<Name> Germplasm <common name> (*Scientific name*)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Cooperating Agency  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

**Exhibit 540-43 Sample of an Official Plant Release Notice for a Source-Identified Release**

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
ABERDEEN, IDAHO

and

NEVADA STATE DIVISION OF AGRICULTURE  
RENO, NEVADA

**NOTICE OF RELEASE OF STILLWATER GERMPLASM BALTIC RUSH  
SOURCE IDENTIFIED CLASS OF NATURAL GERMPLASM**

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture and the Nevada Division of Agriculture announce the release of a source identified ecotype of Baltic rush (*Juncus balticus* Willd.) for Land Resource Region (LRR) D North.

As a source identified release, this plant will be referred to as Stillwater Germplasm Baltic rush to document its original collection location. Stillwater Germplasm Baltic rush is released as a source identified type of certified seed (natural track). It has been assigned the NRCS accession number 9057632.

This alternative release procedure is justified because there are no existing commercial sources of Baltic rush. Propagation material of specific ecotypes is needed for ecosystem restoration, enhancement, and construction of wetlands. The potential for immediate use is high, and commercial potential beyond specific wetland uses is probably limited.

**Collection Site Information:** Stands are located within the boundaries of the Stillwater National Wildlife Refuge, northwest of the town of Fallon, Churchill County, Nevada. Very little variability among Baltic rush stands was observed within the boundaries of the NWR. This variability was judged to be inconsequential. Therefore, any collection of Baltic rush located within the NWR boundary would be considered a constituent of this source identified release. Elevation is approximately 3,900 feet, and the soils are mostly poorly drained calcareous loams.

**Ecotype Description:** Baltic rush is a perennial, rhizomatous, facultative wetland plant (Williams, 1993). Stems are upright, round, wiry, and grow up to 3 feet tall. Leaf sheaths are clustered at the base, bladeless or nearly so. The inflorescence consists of panicles borne laterally on the culms.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-43

**Ecological Considerations and Evaluation:** Stillwater Germplasm Baltic rush is native plant material which has undergone no purposeful selection. Stillwater Germplasm does not differ in rate or spread, seed production, and vigor from naturally occurring Baltic rush. Since Stillwater Germplasm is native material it is not expected to behave any differently in the environment than other native plant material. Stillwater Germplasm was “OK to release” when evaluated through the “Worksheet for Conducting and Environmental Evaluation of NRCS Plant Releases”.

**Anticipated Conservation Use:** The potential uses of Stillwater Germplasm Baltic rush include erosion control, constructed wetland system applications, wildlife food/cover, wetland creations and restorations, and for increasing plant diversity in wetland and riparian communities.

**Potential Area of Adaptation:** Baltic rush is facultative wetland plant, commonly found around the borders of wetlands, and meadows throughout the intermountain west (Brown, 1947). It inhabits poorly drained soils which are saturated or have up to 2 or 3 inches of standing water (Williams, 1993). It will tolerate periods of inundation. Stillwater Germplasm would be an excellent choice for use throughout the ecoregion defined as LRR D North.

**Availability of Plant Materials:** To make collections of Stillwater Germplasm Baltic rush, contact the Refuge Manager, Stillwater National Wildlife Refuge, U.S. Fish and Wildlife Service, P.O. Box 1236, Fallon, NV 89406-1236, (702) 423-5128.

### References:

Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Williams, K. 1993. A study of Baltic rush (*Juncus balticus* Willd.) in the Western U.S. Aquatic Botany 42 (3): 627-634.

### Prepared by:

M.S. Jones, USDA NRCS Plant Materials Center, 1691 A South 2700 West, Aberdeen, Idaho, 83210; and T. Trow, USDA NRCS, 3244 Elder Street, Boise, Idaho, 83705.

**Signatures for release of:**

**Stillwater Germplasm Baltic rush (*Juncus balticus*)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
Boise, Idaho

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Nevada State Division of Agriculture  
Reno, Nevada

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-44

### Exhibit 540-44 Outline for an Official Plant Release Notice for a Germplasm Release

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
<CITY, STATE>

and

<NAME OF COOPERATOR(S)>  
<CITY, STATE>

NOTICE OF RELEASE OF <NAME>GERMPLASM <COMMON NAME>

The Natural Resources Conservation Service, U.S. Department of Agriculture and <Cooperator Name> announce the germplasm release of <Name> Germplasm <common name> (<Scientific name Author>). <Name> Germplasm <common name> has been assigned the Plant Introduction number <XXXXXX>.

**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.

**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.

**Method of Breeding and Selection:** Identify how many collections/accessions were involved in initial evaluations, methods of breeding used, what traits were selected for, how selection was made, and the time period over which initial evaluations were conducted.

Provide detailed information about advanced evaluations, including number and location of evaluation sites, time period, selection methods used, data compiled for evaluated traits.

State what further breeding/selection work may be required to develop the material to cultivar level.

**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.

**Anticipated Use:** State potential applications for the plant. Indicate which traits make this plant suitable for particular functions.

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-44

**Area of Adaptation:** Provide information regarding areas suitable for establishment and growth of the released material (as is appropriate for a germplasm class release). Include such details as soil type, hydrology (if applicable), elevation, precipitation, hardiness/heat tolerance zones, and MLRA designations.

**Availability of Plant Materials:** State where germplasm material will be maintained and where seed or other propagules of the plant release can be obtained.

**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.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-44

**Signatures for release of:**

**<Name> Germplasm <common name> (<Scientific name>)**

---

\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Cooperating Agency  
City, State

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

**Exhibit 540-45 Sample of an Official Plant Release Notice for a Germplasm Release**

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
ABERDEEN, IDAHO

and

NEVADA STATE DIVISION OF AGRICULTURE  
RENO, NEVADA

NOTICE OF GERMPLASM RELEASE OF ID4X GERMPLASM BALTIC RUSH

The Natural Resources Conservation Service, U.S. Department of Agriculture and the Nevada Division of Agriculture announce the germplasm release of ID4X Germplasm Baltic rush (*Juncus balticus* Willd.). ID4X Germplasm Baltic rush has been assigned the Plant Introduction number 457632.

**Collection Site Information:** ID4X Germplasm is a composite of four accessions (9057628, 9057629, 9057630, 9057631) collected in 1988. Accession 9057628 was collected in White County, Nevada at an elevation of approximately 2,000 feet. Accession 9057629 was collected in Rich County, Idaho at an elevation of 4,500 feet. Accessions 9057630 and 9057631 were collected in Churchill County, Nevada, at elevations of 3,900 feet and 5,000 feet, respectively. The four original accessions were selected because of their vigorous growth. The soils at each collection site are mostly poorly drained calcareous loams.

**Description:** ID4X Germplasm Baltic rush is a perennial, very weakly rhizomatous, facultative wetland plant. Stems are upright, round, wiry, and grow up to three feet tall. Leaf sheaths are clustered at the base, bladeless or nearly so. The inflorescence consists of panicles borne laterally on the culms. The four accessions that make up the ID4X Germplasm composite tolerate extremely high levels of ammonia (greater than 500 mg/L).

**Method of Selection:** A total of 60 Baltic rush collections from the Aberdeen PMC Service Area were initially evaluated in 1989-90 for survival, vigor, overall growth and spread, seed ripening date, potential seed production, and above ground biomass production in two wastewater constructed wetland systems. The four accessions had noticeably better aboveground biomass production than most other accessions at higher levels of ammonia (250 mg/L); they were selected with five other top accessions for further evaluation.

Advanced evaluations were conducted in constructed cells in which the ammonia levels could be manipulated. The four accessions that make up ID4X Germplasm continued to grow in ammonia levels up to 500 mg/L, while growth of the other five accessions started to decline at 350 mg/L ammonia. Plants from the four accessions were allowed to cross to form the ID4X Germplasm,

## Part 540.8 – Exhibits for Part 540, Subpart B

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Exhibit 540-45

but no attempt to select for other characteristics has been made. Propagation of ID4X Germplasm plants is achieved by seed collection and germination; cutting the small rhizomes or making divisions from adult plants are not effective reproduction methods. Further breeding work on ID4X Germplasm is necessary, since plants do not flower uniformly and therefore seed production is minimal.

See attached advanced testing documentation for additional information.

**Environmental Impact Assessment:** Germplasm Baltic rush germplasm class release has not exhibited any adverse environmental effects or potential for excessive spread in the evaluations which were conducted. ID4X Germplasm did not meet the assessment of a plant which could become invasive based on guidelines adopted by the NRCS Plant Materials Program.

**Ecological Considerations and Evaluation:** ID4X Germplasm Baltic rush is a selection of naturally occurring germplasm and has been undergone purposeful selection for improved ammonia tolerance. Additional evaluations may be warranted depending on how this release is used in further breeding or development work. ID4X Germplasm has been selected for improved ammonia tolerance, but does not differ significantly in rate or spread, seed production, and vigor from naturally occurring Baltic rush. Stillwater Germplasm was “OK to release” when evaluated through the “Worksheet for Conducting and Environmental Evaluation of NRCS Plant Releases”.

**Anticipated Use:** ID4X Germplasm Baltic rush offers potential for vegetative cover creation of bacterial habitat in high ammonia (500 mg/L) constructed wetland sites. The composite release should be reselected for individual plants with uniform flowering and seed ripening periods to maximize seed production.

**Area of Adaptation:** ID4X Germplasm Baltic rush is a facultative wetland plant, potentially adapted to constructed wetland systems throughout the Northwest and Intermountain regions (USDA Plant Hardiness Zones 4-6) containing up to three inches of standing water. It will tolerate up to one-month periods of inundation.

**Availability of Plant Materials:** Germplasm seed will be maintained by the USDA-NRCS Plant Materials Center and is available in limited quantities to interested parties for research purposes.

### References:

Brown, B. B. 1947. Wetland Plants of the Intermountain West. Mountain Publishers. Aberdeen, ID.

Williams, K. 1993. A study of Baltic rush (*Juncus balticus* Willd.) in the Western U.S. Aquatic Botany 42 (3): 627-634.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-45

**Prepared by:**

M.S. Jones, USDA NRCS Plant Materials Center, 1691 A South 2700 West, Aberdeen, Idaho, 83210; and T. Trow, USDA NRCS, 3244 Elder Street, Boise, Idaho, 83705.

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**Signatures for release of:**

**ID4X Germplasm Baltic rush (*Juncus balticus*)**

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\_\_\_\_\_  
Name  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
Boise, Idaho

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director  
Nevada State Division of Agriculture  
Reno, Nevada

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name  
Director, Ecological Sciences Division  
United States Department of Agriculture  
Natural Resources Conservation Service  
Washington, D.C.

\_\_\_\_\_  
Date

Exhibit 540-46 Sample Release Brochure



**'Catskill'  
dwarf sand  
cherry**





An improved conservation plant developed by the Big Flats Plant Materials Center, Corning, NY

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**For More Information**  
Visit our Plant Materials Internet site at <http://Plant-Materials.nrcs.usda.gov> to find more information on solving conservation problems using plants.

USDA NRCS  
Big Flats Plant Materials Center  
RD # 1, Box 360A, Rt. 352  
Corning, NY 14830  
phone: (607) 562-8404  
fax: (607) 562-8516

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To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326 W. Whitten Building, 14th and Independence Avenues SW, Washington, DC 20250 or call 202-720-5964 (Voice and TDD). USDA is an equal opportunity provider and employer.

**March 1999**

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**Hardiness**  
Zones 3b to 6b

**Propagation**  
Propagation of sand cherry can be done either by seed or cuttings. It is intended for nurseries to produce this plant from seed, but hardwood cuttings are a viable alternative. Harvest fruit when fully mature in late July, by handstripping; cleaning the seed of all the pulp is desirable. 'Catskill' seed needs to have a stratification period of 120 days. Stratified seed can be early spring sown in the nursery bed. Hardwood cuttings have been successfully rooted using a rooting hormone with thiram.

**Availability**  
Nursery owners may obtain propagated material from the Big Flats Plant Materials Center, Corning, New York, to start their seed block for commercial production. For the names of commercial nurseries that sell 'Catskill' sand cherry or for more information on its use, contact your local NRCS or Soil and Water Conservation District office.

**'Catskill' Sand Cherry**

'Catskill' dwarf sand cherry (*Prunus pumila* var. *depressa*), is a native shrub with a prostrate growth habit. It is intended for use in shoreline and streambank stabilization, where low growing vegetation is preferred, and for riparian buffer plantings. The accession was selected from a stand of sand cherry growing along the Delaware River. Its growth habit makes this species adapted to areas with ice flow problems. It may also have urban conservation uses and potential as an ornamental plant for beautification and landscaping.

'Catskill' was released by the USDA Natural Resources Conservation Service and Pennsylvania Game Commission.



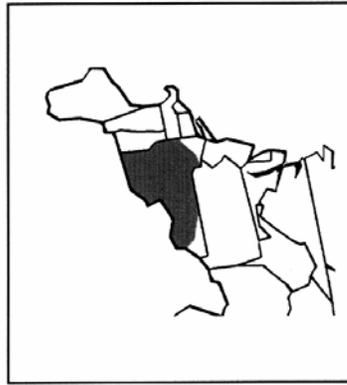
**Description**

'Catskill' sand cherry (PI-591700) is a native woody plant which attains a height of 12 - 18 inches, with a spread of approximately 8 - 10 feet. As the branches spread, they have the tendency to root or "layer." It is non-invasive and grows about 5 inches per year. It grows on gravelly or sandy beaches along streams. The simple leaves are long and narrow and medium green in color. It has new shoots which are reddish in color and shiny, often having adventitious roots forming along their length as they contact the ground. It has a massive primary root system. This massive root system allows sand cherry to tolerate drought conditions.

**Adaptation**

'Catskill' sand cherry is found from Ontario to the New York-Pennsylvania border. It is adapted to sandy and gravelly soils along streams, but has performed well on silt loam. It may also perform well on sites with calcareous soils. This plant will tolerate periodic flooding of short duration.

**Area of Adaptation for 'Catskill'**



**Establishment**

Planting 1 - 0 nursery bare root stock is preferred. Older plants tend to get too large for easy handling and planting. Planting should be in the spring, prior to June 1, or in the fall after October 10. The stock should be dormant at the time of planting. This plant has a strong root system which should be properly placed in the planting hole. Avoid J-rooting by digging holes of sufficient size. Do not add peat moss, fertilizer or manure. The recommended planting density is one plant per 20 square feet. The plants should be planted in blocks rather than scattered among other vegetation. Do not plant where reed canary grass or reedgrass is present since the competition will be too great. If used in ornamental settings, containerized plants can be planted in the spring to early summer.

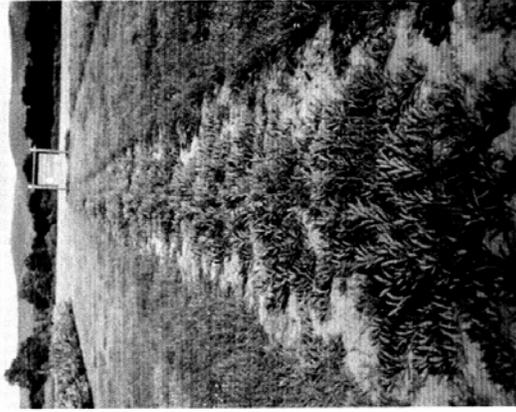
**Maintenance**

Straw or other biodegradable mulch is recommended around each seedling for weed control. Plastic mulch or weed control fabric is recommended in ornamental landscaping sites.

Herbicides or mowing are not recommended because there is no way to spray or mow under the canopy. There are no major pest or disease problems observed. Once established, dwarf sand cherry requires no management.

**Ornamental Features**

This native plant is attractive in an ornamental landscape. The leaves are deciduous, pale green above and whitish below. This plant is very attractive in the spring with small white flowers and purple fruit (1/2 to 5/8 inch diameter) in the summer.



**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-47

**Exhibit 540-47 Application for Seed Storage at the National Seed Storage Laboratory**

**STORAGE APPLICATION**

**USDA-ARS  
NATIONAL SEED STORAGE LABORATORY  
1111 S. MASON ST.  
FORT COLLINS, CO 80521-4500  
(970) 495-3200**

Sent for Crop Registration:

Cultivar \_\_\_\_\_  
Germplasm \_\_\_\_\_  
Genetic Stock \_\_\_\_\_  
Parental Lines \_\_\_\_\_

**UNTREATED SEED REQUIRED!!**

Name of Donor Contact Person \_\_\_\_\_ Telephone No. \_\_\_\_\_

Institution or Company \_\_\_\_\_

Address \_\_\_\_\_

Genus \_\_\_\_\_ Species \_\_\_\_\_ Common Name \_\_\_\_\_

Amount Requested: 7,500 seeds for Populations/Synthetics (Cultivar & Germplasm); 5,000 seeds for each pure line (Cultivar, Parental Inbred, Germplasm, and many Genetic Stocks\*). \*50-500 Seeds for special genetic stocks

**UNTREATED SEED REQUIRED!!**

Name and/or Number \_\_\_\_\_ Other Identifiers \_\_\_\_\_

PVP Applied For or Granted? Yes \_\_\_ No \_\_\_ Number \_\_\_\_\_

Plant Patent applied for or granted? Yes \_\_\_ No \_\_\_ Number \_\_\_\_\_

Reproductive System:

Approximate percent self fertilization under normal field conditions:

Pureline \_\_\_\_\_; Population/Synthetic \_\_\_\_\_; or Parental Inbred \_\_\_\_\_

Percent Germination determined by Donor \_\_\_ Date of Test \_\_\_\_\_

If genetic stocks, will they require special handling? Yes \_\_\_ No \_\_\_ If yes,

identify contact person who will supply new seed source \_\_\_\_\_

and address \_\_\_\_\_

Material already assigned a PI No.? Yes \_\_\_ No \_\_\_ If yes, give PI No. \_\_\_\_\_

Seed already provided to active collection? Yes \_\_\_ No \_\_\_ If yes, give date \_\_\_ location \_\_\_\_\_

and amount of seed \_\_\_\_\_ Year seed harvested \_\_\_\_\_

The policy of the National Plant Germplasm System (NPGS) is that all material deposited in the NPGS will be freely distributed to scientists for research purposes. For material registered in Crop Science, the donor is expected to maintain and distribute seed for a minimum of 5 years following registration.

Signature \_\_\_\_\_ Date \_\_\_\_\_

CONTINUED ON REVERSE SIDE

TO BE COMPLETED BY NSSL: DATE RECEIVED \_\_\_\_\_

SERIAL NO. \_\_\_\_\_

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**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-47

**DESCRIPTIVE INFORMATION** - In order for each entry to be properly identified, donors are asked to prepare an abstract and pedigree of each entry. Key features in the abstract 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. Give the scientific names of pest organisms. Avoid comparisons with other cultivars or lines unless these are part of the parentage or the comparisons are important for rating disease and insect resistance levels. All accessions deposited at the NSSL will be recorded in the Germplasm Resources Information Network (GRIN) database of the National Plant Germplasm System.

Abstract: (The abstract can be no more than 1000 characters in length.)

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Pedigree: (The pedigree should not exceed 500 characters.)

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**GROWTH HABIT -**

Annual (Spring \_\_\_\_ Winter \_\_\_\_ Facultative \_\_\_\_)

Biennial \_\_\_\_ Perennial \_\_\_\_ Woody \_\_\_\_ or Tree \_\_\_\_

**FORM RECEIVED** - Seed \_\_\_\_ Plants \_\_\_\_ or Cuttings \_\_\_\_

Revised 9/97

## **Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-48

### **Exhibit 540-48 Seed Storage Policy of the National Seed Storage Laboratory**

UNITED STATES DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH SERVICE

NATIONAL SEED STORAGE LABORATORY  
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 Seed Storage Laboratory, 1111 South Mason Street, Fort Collins, Colorado 80521-4500.

**Part 540.8 – Exhibits for Part 540, Subpart B**

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Exhibit 540-49

**Exhibit 540-49 Form SCS-ECS-001, Plant Materials Allocation and Distribution**



**Part 540.8 – Exhibits for Part 540, Subpart B**

Exhibit 540-50

**Exhibit 540-50 Form SCS-ECS-596, Distribution and Delivery (D&D) Record**

SCS-ECS-596	Distribution and Delivery Record Plant Materials Center	U. S. Dept. of Agriculture Soil Conservation Service
Order No:		
D&D To:		Ship To:
Order Date: PM-1 No.		
Ship Date: Number of Packages:		Ship Via:

Accession/ Release	Scientific Name/ Common Name	Seed Lot/ Origin	Cert. Class & Type	Age	Date Tested	Purity	Total Via	Quantity Shipped		U/M
								Bulk	PLS	

Remarks:

\*\*\*\*\*  
PLEASE SIGN AND RETURN ONE COPY TO:  
USDA, SCS, Plant Materials Center  
\*\*\*\*\*

Ordered By: \_\_\_\_\_ Order Filled By: \_\_\_\_\_

Rec'd By: _____ Title _____ Date _____	Approved By: _____ Name/Title _____ Date: _____
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## **PART 541 - INFORMATION MANAGEMENT**

### **PART 541.0 GENERAL**

The NPL maintains overall responsibility of Information Management activities in the PM program. A National PM Information Steering Committee is appointed by the NPL and provides recommendation and assistance to the information needs of the Program. As a minimum, the committee will consist of a PMC Manager, a PMS, NPMC Manager, and the PM Information Coordinator.

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 with regard to computer security, passwords, etc. according to the NRCS General Manual.

### **PART 541.1 PLANT MATERIALS OPERATION AND MANAGEMENT DATABASES**

#### **541.10 Plant Materials Operations and Management System (POMS)**

The objective of the POMS activities is to facilitate rapid and cost effective accumulation, processing, and dissemination of data to assist in realizing NRCS objectives. POMS refers collectively to all nationally developed and supported Integrated Resource Management (IRM) activities of the NRCS Plant Materials Program.

*[Note: POMS includes PEAS and ECS-008 databases as well as other national PM databases currently under development. Because of changes in PEAS and ECS-008 the issue of data collection is still being developed. This section will be developed and amended at a later date.]*

### **PART 541.2 REPORTING ACTIVITIES**

#### **541.20 Annual Report on PM Activities and Accomplishments (ECS-008)**

The Annual Report on PM Activities is an annual summary of activities and accomplishments for the PMCs and PMS's which is collected through the ECS-008 or current PM reporting system. Collection of this data is done electronically. Information contained in the ECS-008 is used by the NPL in preparing program assessments and summaries.

Collection of data through the ECS-008 is initiated by the NPL. The Deputy Chief for Science and Technology sends the request for information to each STC. This request is typically passed on to PMCs and PMSs. This information is then entered into the electronic ECS-008 data collection system. States that do not have a PMC or PMS will coordinate the collection of this data with the PMCs and PMSs which serve the state.

The due date for ECS-008 data is December of each year. The exact date will vary each year.

### 541.21 Plant Materials Progress Report of Activities

#### (a) General

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. The majority of this report can be generated electronically through POMS databases.

The PMC manager and PMS prepare the report. The report provides information on new plant materials developments to NRCS field offices and cooperating agencies and groups. Detailed information from initial evaluations is not to be included in the PM Progress Report of Activities. The PM Progress Report should be concise and brief and no longer than 10 pages in length.

#### (b) Content

The PM Progress Report may include the following sections:

- Introduction - This section can remain relatively static and should introduce the reader to the purpose, objectives, description, and personnel working at or relevant to the PMC. Content may include a brief history of the PMC and service area covered by the PMC.
- Study Summaries - Each study, e.g., plant selection or technology development, should briefly describe the study objectives, locations of off-site plantings, and other developments which have occurred in that study. Special consideration should be given to describe the impact that study will have to Field Offices and to implementing conservation practices. Include a summary of results from initial and advanced evaluation projects. Summaries of field plantings will be included under appropriate studies.
- Field Production - This section should briefly describe the PMC releases currently in production as well as advanced evaluations in production.
- References - This section should list new technical notes, journal articles, and other reports developed since the last report which provided detailed results of PMC testing.

#### (c) 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 will be distributed to later than April 1 of the year following the report year.

#### (d) Distribution

Minimum distribution includes the State Office(s), appropriate Field Offices, all other PMCs and PMSs, and the NPL. Other suggested distribution includes, NRCS Institutes, Centers

and Interdisciplinary Resource Teams (IRT), NACD, Resource Conservation and Development (RC&D) offices, cooperators, elected officials.

Two (2) paper copies and an electronic file copy should be sent to the NPMC for archiving and for inclusion on the Internet.

The issuing PMC is to maintain file copies of each report as well as an electronic copy.

### **541.22 PMC Annual Technical Report**

#### **(a) General**

The PMC Annual Technical Report 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 PMS as appropriate. The majority of this report can be generated electronically through the POMS database.

#### **(b) Contents**

The PMC Annual Technical Report will contain at least:

- study titles, numbers, and brief description of the study
- summarized data presented in tabular form for each study for the reporting period.
- a brief summary (1/2 page or less) of the tabular data for each study.

#### **(c) Frequency**

The PMC Annual Technical Report 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.

#### **(d) Distribution**

Minimum distribution includes the PMS(s) which serve the PMC, other PMCs and PMSs with closely related activities, and the NPL. Other suggested distribution includes cooperators that might have a direct interest in the technical nature of the study.

Two (2) paper copies and an electronic file copy should be sent to the NPMC for archiving and for inclusion on the Internet.

The issuing PMC is to maintain file copies of each report as well an electronic copy.

### **541.23 Periodic Reports**

#### **(a) General**

The NPL or PM Information Coordinator may be required to compile Program information periodically. PMCs or PMSs may also need to prepare Progress Reports or summaries of studies or activities.

### **(b) Types and Formats of Periodic Reports**

Examples of recurring reports which may need to be compiled include:

- Outreach Activities - support provided to underrepresented or disadvantaged groups.
- Pesticide Usage and Disposal - quantities and dollars spent or projected to be spent on pesticide or chemical disposal.
- Civil Rights issues - consists of Civil Rights concerns and violations
- 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.

Formats for these reports are usually determined by the person of office compiling the report, or by the person or office requesting the report.

### **(c) Frequency**

The frequency and due dates of these reports depends on the type of report and how much information is requested.

### **(d) Distribution**

Distribution depends on the type of report and in part by the person preparing or the person who requested the information.

**PART 542 - PLANT SCIENCE REFERENCE SECTION****PART 542.0 ACRONYMS FOUND IN THE NPMM**

<b>Acronym</b>	<b>Meaning</b>
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 (known referred to as 'Business Plan')
ARS	Agricultural Research Service
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFT	Conservation Field Trials
CRIS	Current Research Information System
CRP	Conservation Reserve Program
D&D	Distribution and Delivery
DC	District Conservationist
EEO	Equal Employment Opportunity
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
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

## Part 542 - Plant Science Reference Section

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<b>Acronym</b>	<b>Meaning</b>
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
NPL	National Program Leader, Plant Materials
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
OGC	Office of General Council
OSHA	Occupational Safety and Health Administration
OTT	Office of Technology Transfer
PAS	Public Affairs Specialist
PCB	Polychlorinated Biphenyls
PEAS	Plant Materials Evaluation and Automation System
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
PMS	Plant Materials Specialist
PO	Plan of Operations (now referred to as 'Business Plan')
POMS	Plant Materials Operations and Management System
PRP	Potentially Responsible Party
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

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(190-V-NPMM, Third Ed., June 2000)

**PART 542.1 TERMS COMMONLY USED IN PLANT MATERIALS WORK (GLOSSARY)**

The following list of terms, although not complete, defines some terms commonly used by plant scientists.

**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

**Accession** - Plant material (plant, seed, or vegetative part) collected and assigned a number to maintain its identity during evaluation, increase, and storage.

**Acid Equivalent** - The theoretical yield of parent acid from an active ingredient.

**Active Ingredient** - The chemical compound in a product that is responsible for the herbicidal (or other chemical) affect.

**Advanced Evaluation** - The more intensive testing of plants that have been selected as being superior in one or more attributes to the initial evaluation.

**Aggressiveness** - Seedling vigor related to ease of establishment. Also capacity of well-established plants to compete with or outcompete associated grasses, legumes, or woodies.

**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.

**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.

**Allopolyploid** - A polyploid containing genetically different sets of chromosomes; for example, sets from two or more species.

**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.

**Annual** - A plant that completes its life cycle from seed in a single year or growing season.

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**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 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".

**Assembly** - A systematic collection of plants (seed or vegetative material) of one or more species to be evaluated for a planned purpose.

**Autopolyploid** - A polyploid arising through multiplication of the complete haploid set of one species.

**Backcross** - The crossing of a hybrid with either of its parents. In genetics, the crossing of a heterozygote with a homozygous recessive.

**Band Applications** - An application to a continuous restricted area such as in or along a crop row, rather than over the entire field area.

**Bare-root** - A plant harvested from a field without any soil on its roots.

**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** - 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.

**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".

**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.

**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".

**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 also "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 use to select or modify a plant to yield new progeny with desired characteristics.

**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.

**C-3 Plants** - Species having a photosynthetic pathway which 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".

**CAM Plants** - Abbr. 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".

**Carrier** - A liquid or solid material added to a chemical compound or seed to facilitate its application in the field.

**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.

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**Certified Seed** - The progeny of breeder, foundation, or registered seed that is so handled as 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 so as to assure genetic identity. See also “seed certification classes”.

**Chasmogamous** – Plant type in which the perianth of flowers opens for pollination to occur. See also “cleistogamous”.

**Cleistogamous** – plant type in which flowers self-pollinate inside the closed buds.

**Climax** – (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.

**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 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** - An assemblage of one or more populations of plants and/or animals in a common spatial arrangement.

**Community (Plant Community)** - 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.

**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”.

**Concentration** - The amount of active ingredient or acid equivalent in a given volume of liquid or in a given weight of dry material.

**Conservation Field Trial** - Is 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; typically coordinated by the PMS; qualitative or quantitative data may be collected.

**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.

**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.

**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.

**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.

**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.

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**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 establishment, management and production of plant materials. They may be conducted on or off the center at any stage of the evaluation process.

**Defoliant** - A compound that causes the leaves or foliage to drop from a plant.

**Demonstration Plantings** - A planting used primarily to promote use and acceptance of new technology or releases; no evaluations are done and no data is collected.

**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.

**Diluent** - Any liquid or solid material serving to dilute an active ingredient in the preparation of a formulation.

**Diocious** - Having staminate and pistillate flowers occurring on different plants, that is, having distinct male and female plants (e.g. buffalograss).

**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 base of plants.

**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.

**Dormancy** - 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.

**Dormant Seeding** - Planting seed during late fall or early winter after temperatures become too low so that seed germination occurs the following spring.

**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. Syn. 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. Syn. 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 which 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. Syn. 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** - Energy-driven complex of one or more organisms and their environment. Organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space. 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. 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. A community of organisms and the environment in which they live. A system of ecological relationships in a local environment, including relationships between organisms, and between the organisms and the environment itself. Syn.: ecological system.

**Ecotone** - Transitional zone between two vegetational types or vegetational regions. A transition area of vegetation between two communities, having characteristics of both kinds of neighboring vegetation as well as characteristics of its own. Varies width depending on site and climatic factors. A transition line or strip of vegetation between two communities, having characteristics of both kinds of neighboring vegetation as well as characteristics of 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 as well as 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 as well as characteristics of own. (4) A locally adapted population within a species which has certain genetically determined characteristics; interbreeding between ecotypes is 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”.

**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.

**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.

**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.

**Exotic** - A term describing an organism introduced from another country or continent.

**Facultative Weed** - Weed found growing both wild and in association with human activity.

**Field Evaluation Planting (FEP)** - Old name for off-center evaluations; term not currently used by the PM program. See “off-center evaluations”.

**Field Plantings** - 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 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.

**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.

**Forb** - Any non-woody plant that is not a grass, sedge, or rush.

**Foundation Seed** – The progeny of breeder or foundation seed that is so handled as 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”.

**Frost-Free Period** - The period, number of days or both between the last frost in spring and the first frost in fall.

**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** - The total amount of genetic variation present in a population or species. Having a heterogeneous constitution, reacting differently to diverse external condition. (Applied to a breeding population, variety, or species.). The genetic constitution of an individual or group.

**Genetic Drift** - Chance occurrences in small populations which lead to changes in gene frequencies from generation to generation. 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. A change in gene frequency that occurs in small populations as a result of random sampling error during reproduction. 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** - The totality of genes and gene complexes of a given population at a given time. The sum of all genetic information carried by all individuals of an interbreeding population. 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** - 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. The genetic constitution, latent or expressed, of an organism, as contrasted with the phenotype. 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 and development of a young plant from seed.

**Germplasm** – Genetic material that determines the morphological and physiological characteristics of a species.

**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 Manure Crop** – A crop that is plowed under while still living to increase organic matter in soil.

**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.

**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.

**Hard Seed** - Seeds that remain hard at the end of a prescribed germination test because they have not absorbed water due to an impermeable seed coat.

**Herbaceous** - A vascular plant that does not develop woody tissue.

**Heritability** - The proportion of observed variability due to heredity; the remainder is due to environmental causes.

**Heterosis** - Hybrid vigor such that the F<sub>1</sub> 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).

**Historic Climax Plant Community** - 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. 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.

**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.

**Hybrid** - offspring of a cross between genetically dissimilar individuals. First-generation progeny resulting from the controlled cross-fertilization between individuals that differ in one or more genes.

**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”.

**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.

**Initial Evaluation** - 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.

**Inter-Center Strain Trial (ICST)** - Controlled, repeatable evaluations where scientific methods and experimental designs are used to study plants and techniques. Used to determine state and regional plant performance and adaptation.

**Interseeding** - Seeding into an 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. Syn.: exotic. Introduced is not synonymous and should not be confused with the term “invasive species”.

**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** - A species that demonstrates rapid growth and spread, invades habitats, and displaces other species. 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. Example: The hybrid cattail (*Typha xglauca*), 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. Example: Nepal (*Microstegium vimineum*), introduced from Asia, displaces native vegetation in floodplains and other moist environments creating a monoculture in the herbaceous layer. *Microstegium* now occurs in 21 states and Puerto Rico, ranging from Texas to Florida in the south and north into New York State and Illinois. Invasive species should not be confused with “Introduced Species”.

**Kind** - One or more related species or subspecies that singly or collectively is known by one common name; for example, wheat, vetch and sweetclover.

**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 be finish their production cycle in the ground or in containers.

**Linkage** - Association of genetic factors; the genes are in the same chromosome.

**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.

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**Long Range Plan** - A plan which directs plant materials activities of the PMC or within a state or the PMC service area.

**Major Land Resource Areas (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 in extent, that are characterized by a particular pattern of soils, climate, water resources, and land uses.

**Management Site Potential** - The kinds of levels of productivity or values of a range site that can be achieved under various management prescriptions.

**Mass Selection** - Selection of individual plants and propagation of the next generation from the aggregates of that seed.

**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. It may run for an indefinite time or be limited.

**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.

**Monoecious** - Staminate and pistillate flowers borne separately on the same plant.

**Morphology** - A branch of biology dealing with the form and structure of organisms.

**Native Grazing Land** - Land used primarily for 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** - See “native species”.

**Native Species** - A native plant species is one that occurs naturally in a particular region, state, ecosystem, and habitat without direct or indirect human actions. Its presence and evolution in an area are determined by climate, soil, and biotic factors. Synonyms of native include indigenous, endemic, 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.

**Nonselective Herbicide** - A chemical that is toxic to plants, generally without regard to species.

**Noxious Weed** - A weed arbitrarily defined by law as being especially undesirable, troublesome, and difficult to control. Definition varies according to legal interpretations.

**Nurse Crop** - See “companion crop”.

**Off-center Evaluations** - Plantings used by PMCs to evaluate releases or technology off the center; 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.

**Perennial** - A plant that lives more than 2 years.

**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.

**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.

**Photosynthesis** - The metabolic pathway by which plants produce food. See also “C-3 plants”, “C-4 plants”, and “CAM plants”.

**Pioneer Species** - The first species or community to colonize or recolonize a barren or disturbed area in primary or secondary succession.

**Plan of Operations (PO)** - see 'Business Plan'

**Plant Association** - A kind of climax plant community consisting of stands with essentially the same dominant species in corresponding layers.

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**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 Variety Protection Act (PVPA)** - Approved 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.

**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.

**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.

**Potential Natural Community** - The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development.

**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.

**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.

**Race** - A term sometimes used to denote ecotypes.

**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 definition fits the thinking expressed in the definition Range Condition: one of a series of arbitrary categories used to either classify 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** - The process of establishing vegetation by the artificial dissemination of seed. 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

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use range site based on the climax concept, not potential natural community. Syn.: 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. Syn.: retrogression. See also “range degradation”.

**Reciprocal Cross** - A second cross involving the same characters as the first but with the sex of the parents interchanged.

**Reclamation** - Restoration of a site or resource to a desired condition to achieve management objectives or stated goals. 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. 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 following 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 so handled as 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** - Return of land to a form and productivity that conforms 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. Improving a project site to a more desired condition than previously existed, usually as result of a major disturbance. Synonymous with reclamation.

**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** - A crop variety or inbred line that has been evaluated and made available to the public. To make available to the public. To seed again, usually soon after an initial seeding has failed to achieve satisfactory turf establishment.

**Restoration** - The process of restoring site conditions as they were before land disturbance.

**Revegetation** - 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). A general term for renewing the vegetation on a project site, which include restoration and rehabilitation. Refers to the vegetation construction phase of reclamation.

**Riparian Community Type** - A recurring, classified, defined and recognizable assemblage of riparian plant species. A repeating, 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 that 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.

**Seed Certification** - A system whereby seed of plant cultivars (and pre-varietal releases) is produced, harvested and marketed under authorized regulation to insure 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 the seed 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 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.

**Selected Class Release** - (1) Seed that is the progeny of rigidly selected seed or stands of untested parentage that have 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.

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**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.

**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. Syn. 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.

**Sod Seeding** - Direct drilling of seed into sod of existing vegetation with no mechanical seedbed preparation.

**Soil Application** - Chemical applied mainly to the soil surface rather than to vegetation.

**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.

**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.

**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 the use of which an evaluation is being made. (2) A plant which serves as the standard for comparison.

**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.

**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 540.52 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 540.52 of the NPMM for more information on PMC study plans.

**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.

**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.

**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.

**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 which have been through additional testing on more than one generation which 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 four basic sets of chromosomes.

**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.

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**Translocated Herbicide** - An herbicide that is distributed throughout the plant from the point of entry. Syn. Systemic herbicide.

**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. Syn. range condition trend. See and “apparent trend”.

**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.

**Use Groups** - The artificial grouping for the comparative testing of plant materials having similar uses.

**Variety** - (1a) 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 (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 Plant Materials Program 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. Syn. Type.

**Warm-Season Plant** - A plant that completes most of its growth during the warm part of the year, generally late in spring and in summer. Commonly a C-4 plant photosynthetic pathway.

**Wetland Communities** - Plant communities that occur on sites with soils typically saturated with or covered with water most of the growing season.

**PART 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*, 1994. 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*, 1995. 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 Ammophila breviligulata 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 “ssp.” 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. ssp. *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. ssp. *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 1994 *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*, 1995:

- 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 than 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**

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Trehane, P., Brickell, C. D., Baum, B. R., Hettterscheid, W. L. A., Leslie, A. C., McNeill, J., Spongberg, S. A. & Vrugtman, F. 1995. International Code of Nomenclature for Cultivated Plants. 1995 (ICNCP or Cultivated Plant Code) adopted by the International Commission for the Nomenclature of Cultivated Plants. *Regnum Veg.* 133. Quarterjack Publishing, Wimborne UK.

**PART 542.3 LOCATING PLANT MATERIALS INFORMATION ON THE INTERNET**

There is a wealth of information on plant materials available through the Internet. Listed below are Internet sites which are useful starting points for gathering this information. This list is somewhat limited due to the rapid changes which often occur with web sites and web addresses.

When using information from the Internet be careful; some information may not be peer-reviewed or may be more opinion than fact. The sites below are believed to be stable, reliable web sites for information.

**USDA-NRCS Plant Materials Program**

*<http://Plant-Materials.nrcs.usda.gov>*

This site includes general information on the NRCS Plant Materials Program and the activities of the 26 Plant Materials Centers. Technical information on the site includes Plant Fact Sheets for species, commercial sources of conservation plants, and over 1500 technical publications produced by Plant Materials Centers and Plant Materials Specialists. There is also an extensive "Related Web Sites" page with links to over 200 other government and private sources of plant materials and related information.

**USDA-NRCS PLANTS Homepage**

*<http://plants.usda.gov>*

The PLANTS (Plant List of Accepted Nomenclature, Taxonomy, and Symbols) Database is the taxonomic reference used by USDA and other Federal agencies for plant information. The PLANTS database includes checklists, species abstracts, distributional data, crop information, plants symbols, plant growth data, references and other plant information.

**USDA-Natural Resources Conservation Service**

*<http://www.nrcs.usda.gov>*

The NRCS web site provides links to all NRCS offices, sources of publications, technical information, and information for the public.

**USDA Agricultural Research Service**

*<http://www.ars.usda.gov>*

The ARS web site provides links to ARS offices, ARS expertise by subject, research activities, ARS-related information, and information for the public. Go to the Office of Technology Transfer to obtain the latest ARS research summaries from the TEKTRAN system.

**USDA-ARS National Plant Germplasm System**

*<http://www.ars-grin.gov/npgs>*

The National Plant Germplasm System (NPGS) is a cooperative effort by public (State and Federal) and private organizations to preserve the genetic diversity of plants. The Germplasm Resources Information Network (GRIN) contains information on all the plant accessions maintained in the NPGS. This site is useful for locating information on plant collections, materials available for research, and plants assigned a PI or other NPGS accession number.

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### **Forage Information Systems**

*<http://www.forages.css.orst.edu>*

Forage Information Systems, sponsored by Oregon State University, is a global forage information resource on the World Wide Web (WWW), and is envisioned to become a comprehensive information system for all aspects of forages. There are links to other organizations, technical information on all aspects of forage, job listings, plant information, and most anything else you want to know about forage.

**PART 542.4 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 the 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, as well as 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 some container is necessary to prevent desiccation. The most convenient method is to place specimens into Ziploc™ type plastic bags, but 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 which is 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 any 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<sup>TM</sup>.

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 an 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 (PI) 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.

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- 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
- 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 an herbarium for long-term preservation.

The most common practice of arranging specimens in an 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, AZ

August, 1999

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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, MD

This publication may be obtained from the National Plant Materials Center or from the Southern Illinois University, Carbondale Web site at:

"<http://www.science.siu.edu/Herbarium/potpouri/prepare.htm>"

PART 542.5 PHOTOGRAPHING PLANT MATERIALS

United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

# Plant Materials Photography - A BASIC OVERVIEW

National Photographic Specialist  
Washington, DC  
Tim McCabe

# M

aking 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.

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### 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 35mm single lens reflex (SLR) cameras with interchangeable 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 synchronization shutter speed is above the standard 1/60th of a second. Synchronization speeds

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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

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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 - 60mm 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 135mm 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.

## Film

Generally, the slowest black & white or color film that suits the intended use should be chosen. This is a guideline that is applied to all types of photography to insure the best possible reproduction. However, there will be cases when special circumstances dictate other choices.

For color slides used for print reproduction or for projection, I always suggest the use of Kodachrome 25 or 64 films. They offer the best color fidelity for plant photography and provide minimal grain. Plant materials photography with strobe lighting can be done with excellent results using Ektachrome Professional films as well. I do not recommend their use for natural lighting conditions, however, since shadows may be rendered with a blue cast.

For black & white photography, the new Kodak TMAX 100 and 400 films are good choices. TMAX films form images much differently than the older silver halide films. This results in images with greater sharpness and therefore, better reproduction quality. The older Plus-X and Tri-X films are still very useful should the TMAX films not be unavailable. The use of a reputable custom processing lab for all films is essential. The corner drugstore will never do your photography justice.

## Filters

For color photography, a polarizing filter may prove useful. This filter eliminates undesirable reflections from non-metallic surfaces like plant leaves and stems and increases color saturation and intensity. Remember, however, that when using a polarizing filter at maximum rotation you will lose 2 stops of light (you will have to open the lens 2 stops or adjust the shutter speed by 2 settings slower). This also may mean using a tripod when appropriate to eliminate camera shake.

For black & white photography, red and green filters may prove useful when attempting to lighten or darken red or green subject areas for improved contrast. In black & white photography, a filter of the same or nearly the same color as the subject or area of interest will lighten it and a filter that is complementary (opposite) will darken it. The degree to which filters lighten or darken their subjects depends on light intensity, angle of light, and closeness of subject and filter coloration. For example, if you wish to make a black & white photograph of a plant with red flowers against its green leaves, each having nearly the same value (lightness or darkness), a filter may help improve the contrast between them. A red filter will lighten the flower and darken the leaves. A green filter will darken the flower and lighten the leaves. The choice of which filter to use depends upon many factors concerning the plant material being photographed and the photographer would be wise to try both filters if unsure and to refer to a Kodak filter chart designed to assist in color selection.

Color photographs made with color filters fall into the special effects area and generally should be avoided for documentary use.

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### 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. An explanation of these and other composition techniques can be found in the handout *Photographic Composition-A Basic Overview*.

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. Second, the longer (higher focal length) the lens, the shallower the depth-of-field. 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.

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For overall views of plant materials, a wide-angle lens may be appropriate. The photographer will want enough depth-of-field so that all of the 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-16). 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. In black & white photography this is very important since this medium relies upon gradations of gray (white to black) to communicate the appearance of depth to the viewer. It is to some degree less important in color photography because the presence of different colors may often be enough to create the illusion of depth.

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.

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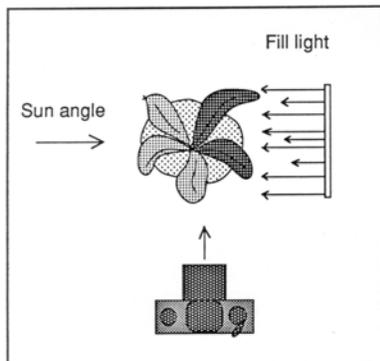
The color of light also directly affects how the plant materials will appear to the viewer. Strong low angle light in early morning or late afternoon is often very warm in color. The hours before

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 effect 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.

Most images appearing in *Plants for Coastal Dunes* were made using cross lighting in the morning or late afternoon hours. By looking at this publication you can gain a general understanding of the qualities these considerations bring to plant materials. 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).

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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 IIR 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.

One final word about exposure. Many NRCS photographers think it is wise to conserve film and use as little as possible. In reality the opposite is true. How many times have you, or others you know, planned a photo trip, spent many hours or days traveling and making pictures only to discover that a little more film used to bracket exposures would have made the trip successful? Professional photographers have discovered that the cheapest expense is film. I cannot suggest more strongly that you bracket exposures and please do not be afraid to use film. I guarantee that your slide shows and publications will benefit by the effort. For those who have never heard of bracketing, it simply means making extra exposures above and below what meter reading you think is correct. It works!

### Plant Cultivar Release Photos

Use the following guidelines for making and submitting photographs for plant cultivar release brochures.

#### *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).



**The best cultivar release cover photos are simple, sharp, and have plain backgrounds.**

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- 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.

Observe pages 11, 13, 17, 18, 22, 26 of the *Plants for Coastal Dunes* publication for examples of the kinds of treatments that may be used. Finally, shoot a variety of photos at different angles and distances to insure that a selection of good images is available.

### *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
- Use Kodachrome 25 or 64 for color and TMAX niques (rule-of-thirds, leading lines, etc.). Pages 100, Plus-X or similar fine-grained film for 1, 18, 20-21, 24, and 28 of *Plants for Coastal* black and white photographs. Black and white *Dunes* have appropriate examples. Photographs should be processed and printed by a reputable professional photo processor.

### ***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 borders 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.

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**Wide-Angle** - Describes a lens whose angular coverage is substantially greater than that of a "normal" 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.**

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