

Plant Genetic Resources

The Plant Genetic Resources (PGR) serve as the basic materials for research and development to sustain agricultural productivity. They provide useful traits

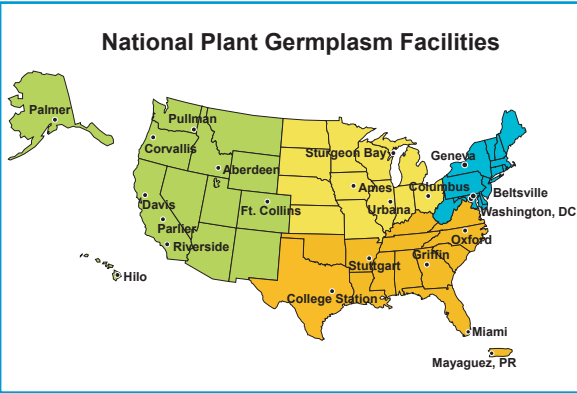


and genes for food, feed, fiber, medicinal, aesthetic, industrial, and energy uses. Threatened globally by human and natural forces, their conservation is fundamental to the prosperity and future of mankind.

Plant germplasm is commonly conserved in the form of seeds or vegetable propagules such as roots, tubers, whole plants, or tissues. Germplasm is comprised of both the genetic material that controls heredity and the tissues, organs, and organisms which express inherent genetic variation.

National Plant Germplasm System

The U.S. National Plant Germplasm System (NPGS), a network of Federal and State Institutions and Research Units coordinated by the U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS), is dedicated to providing plant germplasm and valuable information to researchers worldwide. Information is publicly available via the Germplasm Resources Information Network (GRIN) database at www.ars-grin.gov.



Acquisition is accomplished through foreign and domestic explorations or via exchange with other germplasm collections, botanical gardens, and collectors. Most U.S. crops have international origins. Fostered by a long-standing tradition of free exchange, acquisitions must comply with national and international laws, intellectual property rights, and farmers' rights. Observation of new materials under quarantine conditions may be required to ensure plant and seed health. Identifying information (i.e. passport data) is entered into the GRIN database.



Maintenance activities relate to propagation and management of quality germplasm. Availability of an accession is determined by both viability and quantity. Seed increase growouts are scheduled when viability or supply levels fall below a predetermined level. Seed for distribution is stored in temperature and humidity controlled rooms at 39 °F (4 °C) and 25% relative humidity. Original seed is stored separately at 0 °F (-18 °C). Standard viability-testing protocols are used for crops such as maize. Many taxa, especially of wild species, do not have established practices for growing them and/or testing viability. Research efforts are devoted to developing these methods and to determining optimal testing intervals. Seed is deposited at the National Center for Genetic Resources Preservation (NCGRP) in Fort Collins, CO as a safety backup.



Plant Genetic Resources Management Activities

Regeneration of seed supplies requires controlled pollination techniques to prevent pollen contamination and to preserve the material's original genetic profile. Most NCRPIS crops are cross cross pollinated. As a result, the Station manages one of the most extensive controlled pollination programs in the United States. Combined with careful harvesting techniques and post-harvest handling, the integrity and quality of the collections are maintained for future use.

Hand pollination methods are used for the flowers of maize and domesticated sunflowers. The flowers of carrots, chicory, cucumbers, forage legumes, herbs, medicinals, melons, oilseed brassicas, ornamentals, pumpkins, and wild sunflowers are pollinated in the field or greenhouses by insects. The NCRPIS uses a variety of pollinating insects including alfalfa leaf cutter bees, bumble bees, honey bees, Osmia or mason bees, and flies. These insects require intensive efforts to ensure their health, effectiveness, and availability.



Plants and seeds are tested with physical, visual, biochemical, and molecular methods to ensure that they are free from disease pathogens and insect pests during regeneration activities and prior to distribution.

Characterization and evaluation information is collected by NCRPIS staff and germplasm researchers on agronomic performance, biochemical, genetic, phenotypic, and aesthetic traits and qualities. Digital images are captured to provide useful detail on plant and seed structures, and permanent information for reference use. Analysis of highly heritable traits supports taxonomic identification and quality assurance. Information on their adaptation, maturity, and reactions to biotic or abiotic stress is valuable to researchers. For example, a regional network of collaborators evaluates woody ornamental introductions for adaptation to Midwestern

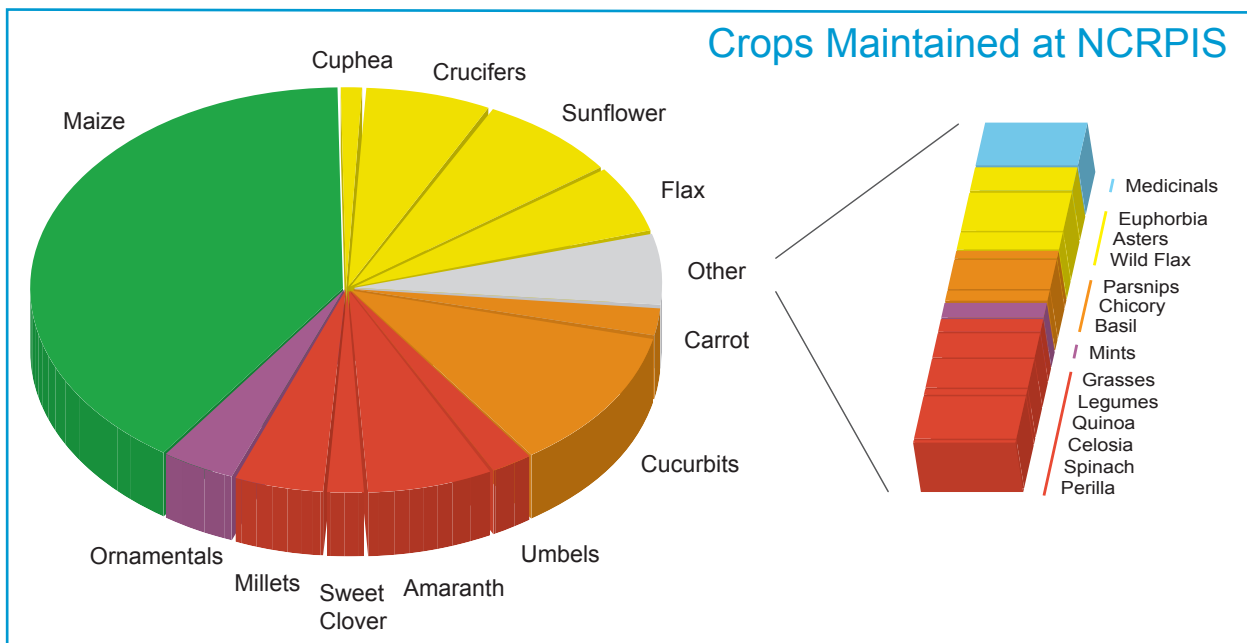
environments as part of the NC7 Trials. Characterization and evaluation data are available to the public via the GRIN database. This greatly increases the value of the collections to researchers and enables them to better target efforts and resources. Information can be accessed at www.ars-grin.gov/npgs/searchgrin.html.



Distribution of available germplasm and information is free to researchers and educators worldwide. Materials can be requested via the GRIN website, email, or postal mail. In return, recipients are asked to provide NCRPIS with information regarding the utility of the germplasm for crop improvement, direct use, and scientific research. This information helps curators understand germplasm users' needs and better target PGR use.

Genetic enhancement activities at NCRPIS focus mainly on the adaptation and release of exotic maize germplasm for temperate U.S. production via the Germplasm Enhancement of Maize (GEM) Project. This, and other enhancement projects, incorporate high value traits into adapted varieties. Desirable traits incorporated thus far include: multiple pest resistance and value-added traits for maize, seed retention for *Amaranthus*, fruit rot resistance in cucumbers, and resistance to several foliar diseases of sunflower.

Research programs conducted by NCRPIS staff contribute to identification of taxonomic and phylogenetic relationships, understanding plant evolution and development, information on traits and properties of the accessions in the collections, and to optimal resource management. NCRPIS staff are also engaged in the development of software applications designed to improve germplasm and information management, and the delivery of information to the public.



North Central Regional Plant Introduction Station (NCRPIS)

- Founded in 1948
- One of four Plant Introduction Stations in the U.S.
- It is a joint venture of:
 - USDA-ARS
 - Agricultural Experiment Stations (AES) of the 12 North Central States
 - member institutions of Multi-State Project NC7
 - Iowa State University (ISU), our host institution
- Located on 100 acres (40 ha) of ISU land, two miles (3.2 km) southwest of the ISU campus.
- Facilities include: climate-controlled rooms for seed storage, insect rearing, IT equipment; greenhouses; laboratories; offices; farm equipment storage.

NCRPIS Employees

- 35 permanent USDA-ARS and ISU staff
- 20 to 60 part-time staff
- Diverse, multidisciplinary expertise in:
 - plant genetic resource conservation
 - molecular biology
 - plant pathology
 - plant physiology
 - entomology
 - information technology
 - farm and facilities support

NCRPIS Mission

- Acquire and conserve genetically diverse crop germplasm and associated information,
- Conduct research that supports germplasm conservation activities,
- Encourage their improvement and use in research and product development and education.

NCRPIS Collections

- Contains over 1,400 plant species
- About 50,000 accessions (types) of:
 - crop cultivars
 - landraces
 - elite lines
 - populations
- wild and weedy crop relatives - valuable for their genetic material.

Curators and Crop Management Activities

Crop Curators direct their expertise and energies to developing collections representative of the breadth of their geographic and genetic diversity. Their practical and scholarly research and service activities serve crop research community needs.

Curator activities at the NCRPIS include acquisition, maintenance, regeneration, characterization and evaluation, distribution, genetic enhancement, and research.

ARS Mission

As the principal in house research arm of the U.S. Department of Agriculture, the Agricultural Research Service has a mission to:

Conduct research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to: ensure high quality, safe food and other agricultural products, assess the nutritional needs of Americans, sustain a competitive agricultural economy, enhance the natural resource base and the environment, and provide economic opportunities for rural citizens, communities, and society as a whole.

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United States Department of Agriculture

Agricultural Research Service

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North Central Regional Plant Introduction Station

**United States Department of Agriculture
 Agricultural Research Service**

**Agricultural Experiment Stations
 of the Twelve North Central States**

Iowa State University