

USDA Forest Service Botany in the News

USDA Forest Service and Agricultural Research Service Crop Wild Relatives Partnership Projects: The Importance of Research Natural Areas, Wilderness Areas, and More

A crop wild relative (CWR) is a plant species occurring in the “wild” that is the congener (species from which the crop was domesticated) or a closely related species (in the same genus) to a particular domesticated crop species. Crop wild relatives may contribute genetic material to the crop species, which may provide for increased disease resistance, fertility, crop yield or other desirable traits. Almost every species of plant that we humans have domesticated and cultivate has one or more crop wild relatives.

Plant characteristics that are valuable to humans are selected for by breeding those that show these characteristics. During the process of domestication, changes occur in the genes (genotype) of the plant. How the plant looks on the outside (phenotype), and some of its internal processes are altered. Plants are modified through cultivation to suit our needs. When we find a cultivar with characteristics we like such as the color, taste, or texture, we maintain it through cultivation. Occasionally we abandon use of the crop wild relatives and in most cases; this ancestor continues to grow in the wild. CWRs are an important socio-economic resource now being eroded or lost through human activities and climate change.



Cranberry and some other crops have few native wild relatives represented in U.S. gene banks. ARS scientists hope to expand representation of those wild relatives to preserve genetic diversity for future crop breeding. From [National Inventory Takes Stock of Crops' Wild Relative](#).

During the last two years, the Eastern Region of the U.S. Forest Service has begun to initiate vital work regarding our essential Crop Wild Relatives (CWR). To see CWR that the USDA Agricultural Research Service (ARS) has identified in the U.S. visit their website, [National Inventory Takes Stock of Crops' Wild Relative](#). Additional study and verification will provide a more insight with regard to the CWR species that the Eastern Region harbors.

The conservation of CWRs is a two-pronged approach, involving both *in situ* and *ex situ* conservation. *In situ* or on-site conservation involves the preservation of genetic resources in natural populations of

species. This conservation strategy protects a species in its natural habitat. It maintains the target species in the locale where it evolved distinctive properties, thus ensuring the ongoing processes of evolution and adaptation. Ideally, reserves are of sufficient size to enable target species to exist in large numbers; population size must be adequate to ensure sufficient [genetic diversity](#). Reserves must then be protected from intrusion or destruction by man, and against other catastrophes of possible.

Ex-situ conservation, or off-site conservation, may also be used on some or all of the population and is essential when *in situ* conservation is difficult, or impossible. Conservation occurs outside of the natural habitat. Plants can be conserved through seed banks or germplasm banks. A cryogenic laboratory can preserve some seeds for a century or more without fertility loss. Plants unable to be preserved in seed banks can be preserved via germplasm in-vitro storage, where cuttings of plants are kept in glass tubes and vessels. *Ex situ* conservation is rarely enough to save a species from extinction and is employed as a last resort or in concert with *in situ* conservation. *Ex situ* conservation removes the species from its habitat, preserving it under semi-isolated conditions whereby evolution and adaptation processes do not occur. The species thus lacks genetic adaptations and mutations that allow it to thrive in its changing natural habitat. *Ex situ* conservation impossible for a great number of the world's endangered flora and fauna.

Thus, *in situ* conservation for our crucial CWRs is an important challenge for both the Forest Service and the ARS. Two Forest Service land designations provide important options and opportunities. In the United States, [Wilderness Areas](#) are designated by law in accordance with the [Wilderness Act of 1964](#) by the [U. S. Congress](#). By 2010, over 750 Wilderness Areas were recognized. Wilderness Areas are [protected areas](#) that are created and managed for research and some forms of recreation within large, unspoiled locations. They serve to preserve [biodiversity](#) and are essential reference areas for



[Horseshoe Bay Wilderness Areas and RNA.](#)

scientific work and [environmental monitoring](#). The National Wilderness Preservation System (NWPS) of the United States protects federally managed Wilderness Areas designated for preservation in their natural condition. The National Wilderness Preservation System coordinates activity within formally designated Wilderness Areas. Wilderness areas are managed by four federal land management agencies: the National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, and Bureau of Land Management. Wilderness is defined as "an area where the earth and community of life are untrammelled by man, where man himself is a visitor who does not remain" and "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions." There are currently 757 designated Wilderness Areas, totaling 109,511,966 acres (44,317,920 ha), about 4.5% of the area of the United States.

The U.S. Forest Service network of Research Natural Areas (RNA) supports the protection of biological diversity at the genetic, species, ecosystem, and landscape scales. Over 430 RNAs have been established nationally; 51 have been established in the North Central and Northeastern states (Eastern Region) of the Forest Service. RNAs are designated to be permanently protected and maintained in a natural condition. Protected natural areas include unique ecosystems or ecological features; rare or sensitive species and their habitat; and/or high-quality examples of widespread ecosystems. To learn more please visit at the [Northern Research Station's Established Research Natural Areas](#). There are also 57 [Candidate Research Natural Areas \(cRNA\) in the Eastern Region](#) that are in various stages of review for possible establishment.



[Alpine Gardens RNA, White Mountain National Forest.](#)

These important and precious biodiversity reserve areas, termed *In Situ* Genetic Resources Reserves by the ARS, thus serve as potential reserve or *in situ* sites for our essential CWRs within the United States. As such, the Forest Service Eastern Region in conjunction with the [Forest Service Northern Research Station](#) have begun to include RNA and cRNA plant species lists within each RNA description. This process will also be initiated for cRNAs within the Eastern Region. This information can currently be viewed by visiting the [Northern Research Station's Established Research Natural Areas](#).

Soon, the [Forest Service Celebrating Wildflowers website](#) will also provide the plant species lists for our Forest Service [Eastern Region](#) Wilderness Areas. This important native plant information will assist ARS, the Forest Service, and partners in the all-important task of conserving our CWRs.

For more information, see [Celebrating Wildflowers, Crop Wild Relatives](#).