

The National Clean Plant Network: Improving status and availability of clean stock

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Abstract

The National Clean Plant Network (NCPN) is an association of clean plant centers, scientists, educators, state and federal regulators, large and small nurseries, and growers of specialty crops that work to ensure that plant propagation material is clean and available. The NCPN clean plant centers and programs (Fig.1) produce and distribute asexually propagated plant material free of targeted graft transmissible plant pathogens. Currently there are seven crop networks that focus on fruit trees, grapes, citrus, hops, berries, roses and sweetpotatoes.

Mission Statement

The Network produces and distributes asexually propagated plant material free of targeted graft transmissible plant pathogens to ensure the global competitiveness of specialty crop producers and to protect the environment.

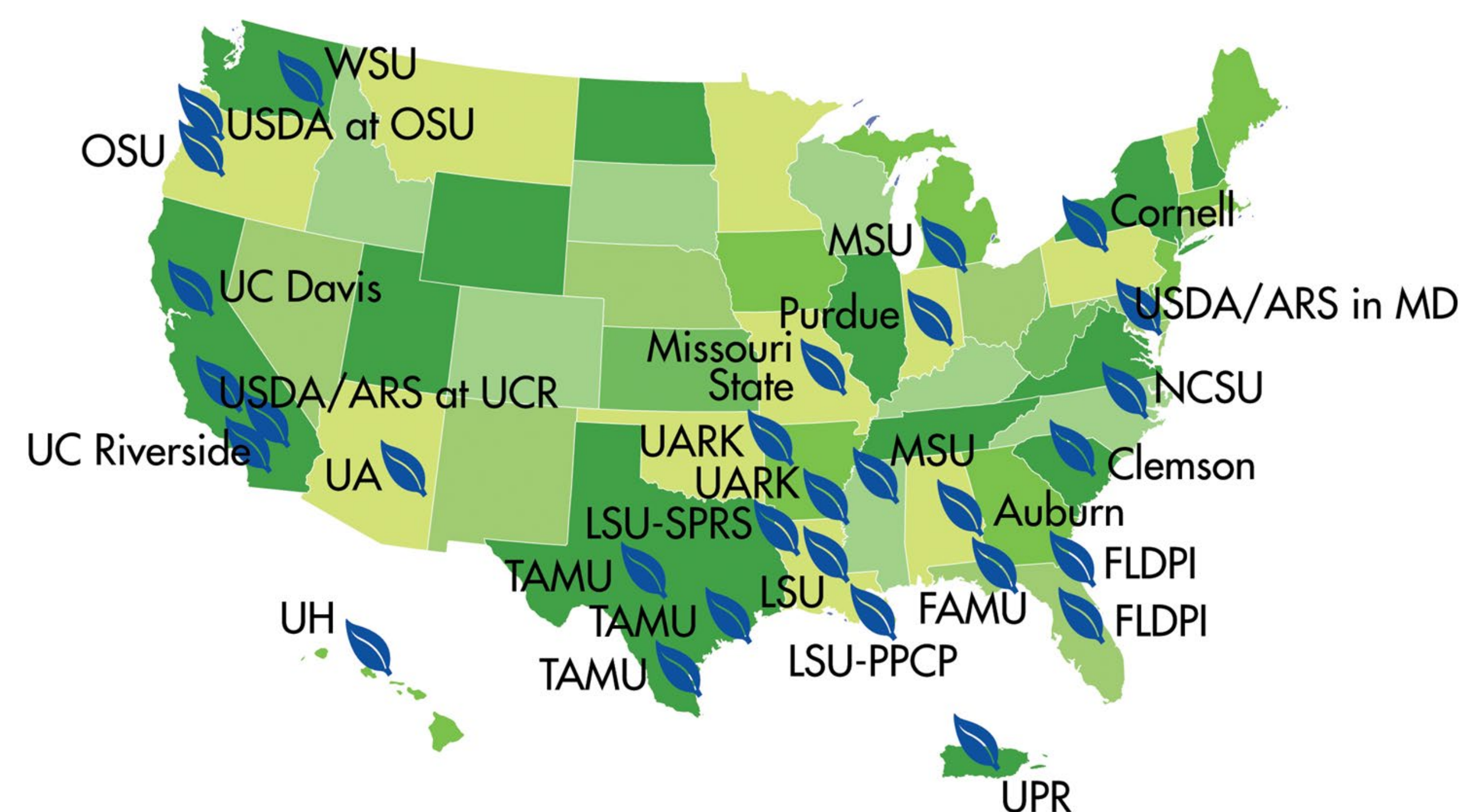


Figure 1. Since its inception in 2008, Network managers directed about \$44,000,000 to support 39 initiatives at 31 clean plant centers and in 19 States and U.S. Territories.

Background

In the Farm Bill of 2008, the USDA was directed to establish the NCPN, a program in which:

- Partnerships of clean plant centers are organized;
- Centers focus on diagnostic and pathogen elimination services;
- Activities produce clean propagative plant material;
- Centers maintain blocks of pathogen-tested plant material in sites throughout the United States.

The Network operates under the auspices of three USDA agencies: the Animal and Plant Health Inspection Service, the Agricultural Research Service and the National Institute of Food and Agriculture which agree to cooperatively support research, quarantine and outreach activities. Network funding supports centers with the expertise and facilities to efficiently produce, maintain, and distribute healthy planting stock. In 2008 stakeholders, industry members, scientists and other interested parties developed the current grape and fruit tree commodity groups. In 2010, berries, citrus and hops joined the Network, and in 2015, sweetpotatoes and roses were added. Advisory committees that include industry representatives and researchers from throughout the country are an essential part of the equation for communicating priorities to the NCPN. Each specialty crop commodity group has its own governing body with representatives from industry, state and federal regulatory agencies, and research and extension areas in different regions of the country.

Outreach

Members of the Network Education and Outreach Committee develop and deliver educational materials to nurseries, growers, and regulators; communicate on the availability, benefits, and importance of using clean propagative material; and inform constituents of emerging issues of concern such as new pathogens and new detection techniques.

Benefits of Clean Plant Programs

Planting with high quality clean planting stock is key to the cost-effective production of horticultural crops. The most efficient approach to producing healthy planting stock is through programs which screen valuable plant selections for viruses and other diseases that can be spread by contaminated plant stock. Quarantine services provided by clean stock programs reduce the chance of introduction of exotic pests that can be difficult and costly to control.

Healthy planting stock:

- Is easier to propagate
- Requires fewer chemical inputs
- Produces higher crop yields and better crop quality
- Is necessary for U.S. agriculture to remain internationally competitive and economically viable

Grapevines

Several studies have documented the economic benefits of planting virus-tested, clean planting stock in grapevines. In the Finger Lakes region of New York, a study found losses due to grapevine leafroll disease over the lifetime of a vineyard ranging from about \$25,000 to \$41,000/ha were reduced to only \$1,800/ha when certified vines were used at planting (Atallah et al. 2012). In California's North Coast, the benefits of the Grapevine leafroll associated virus-3 testing and cleaning program were found to be more than \$20 million per year (Fuller et al. 2018).

Fruit Trees

In fruit trees, the economic benefit of the Clean Plant Center Northwest located at Washington State University in Prosser, WA was determined to be approximately \$227 million annually (Cembali et al. 2003). The benefits to nurseries, producers, and consumers reported by this study were based on avoided yield loss and quality decline.

While more economic studies are needed for the other specialty crops in the Network, the high value and success of these programs demonstrated by the currently available economic studies warrants continued support and development of these programs.

Clean Plant Center Operations

Diagnostics

Plants are rigorously screened for targeted viruses and other selected pathogens upon introduction to the program and then re-tested on a regular basis. When pathogens are detected, the introduced material proceeds through pathogen elimination therapy and subsequent retesting.

Pathogen Elimination Therapies

To produce clean plant stock, Network centers use therapy techniques like microshoot tip culture (Fig. 2) and thermal therapy for the removal of economically important pathogens. Clean plant centers continually work on methodologies that improve the efficiency of pathogen elimination therapy.

Foundation Collections

A major Network goal is to establish and maintain Foundation plantings of the seven specialty crops and provide material to nurseries and growers. To serve industry needs, Foundation collections are maintained at centers throughout the United States and are regularly monitored for disease by visual inspections, biological testing and laboratory testing.

Importation and Distribution

New cultivars are imported to clean plant centers and then quarantined to reduce the risk of introducing pests and diseases that can be difficult and costly to control. After testing and pathogen elimination therapy, clean plant centers distribute clean, tested propagation material to nurseries and growers throughout the United States (Fig. 3).



Figure 2. Grape explants in tissue culture ranging in age from one day to approximately six to eight months.



Figure 3. Dormant grape cuttings from clean plant stock are bundled, labeled and prepared for distribution to growers and nurseries.

NCPN Specialty Crops and Programs

Programs (Fig.1) for each of the seven specialty crops in the Network are listed below.

Grapes

Wine, table, raisin and juice grapes are included in grape selections maintained at Foundation vineyard at multiple facilities. Clean plant centers in NCPN Grapes:

- Headquarters: Foundation Plant Services at the University of California, Davis
- Clean Plant Center Northwest, Washington State University, Prosser
- Cornell University
- Missouri State University
- Florida A & M University

Fruit Trees

NCPN Fruit Trees ensures the availability of virus tested propagative material for temperate climate fruit and nut trees of the genera *Malus*, *Prunus*, *Pyrus*, *Cydonia* and *Chaenomeles*. Clean plant centers in NCPN Fruit Trees:

- Headquarters: Clean Plant Center Northwest, Washington State University, Prosser
- Foundation Plant Services, University of California, Davis
- Southeast Budwood Program, Clemson University

Citrus

NCPN Citrus has established or enhanced quarantine and germplasm programs in all the major citrus producing states. Clean plant centers in NCPN Citrus:

- Headquarters: Citrus Clonal Protection Program, University of California, Riverside
- USDA-ARS National Clonal Germplasm Repository for Citrus and Dates, Riverside
- University of Arizona, Yuma Agricultural Center, Yuma, AZ
- Citrus Center, Texas A & M University-Kingsville
- Florida Bureau of Citrus Budwood Registration
- Louisiana State University Agricultural Center
- USDA-ARS Exotic Pathogens of Citrus Collection, Beltsville, Maryland
- Auburn University, Alabama
- University of Hawaii
- University of Puerto Rico

Berries

NCPN Berries centers produce clean planting stock for berry crops in the genera *Fragaria*, *Rubus*, and *Vaccinium*. Clean plant centers in NCPN Berries:

- Headquarters: USDA-ARS Horticultural Crops Research Unit, Corvallis, Oregon
- University of Arkansas, Fayetteville
- North Carolina State University, Raleigh
- Foundation Plant Services, University of California, Davis

Hops

Currently there is one center in the network, which serves all hop growing regions in the U.S.:

- Clean Plant Center Northwest at the Washington State University, Prosser

Sweetpotato

NCPN Sweetpotato centers provide clean, tested propagation material to certified seed growers, commercial growers and other clean plant centers throughout the United States and the world. Clean Plant Centers in NCPN Sweetpotato:

- Louisiana State University Agricultural Center
- North Carolina State University
- University of Arkansas at Pine Bluff
- Foundation Plant Services, University of California, Davis
- University of Hawaii at Manoa
- Mississippi State University

Roses

The Foundation collection is maintained at Foundation Plant Services. Clean Plant Centers in NCPN Roses:

- Foundation Plant Services, University of California, Davis
- Texas A & M University

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