

Nursery resources for tribes growing native plants

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United States Department of Agriculture

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Land Acknowledgment

- Moscow Forestry Sciences Laboratory is located on the homelands of the Nez Perce (Nimiipu)



What is RNGR?

(Reforestation, Nurseries, & Genetic Resources)

- Unique, innovative collaboration across all three Deputy Chief Areas in the USDA Forest Service
 - National Forest Systems
 - State & Private Forestry
 - Research & Development
- Use expertise to develop and deliver resources to improving plant materials
- Technology used worldwide



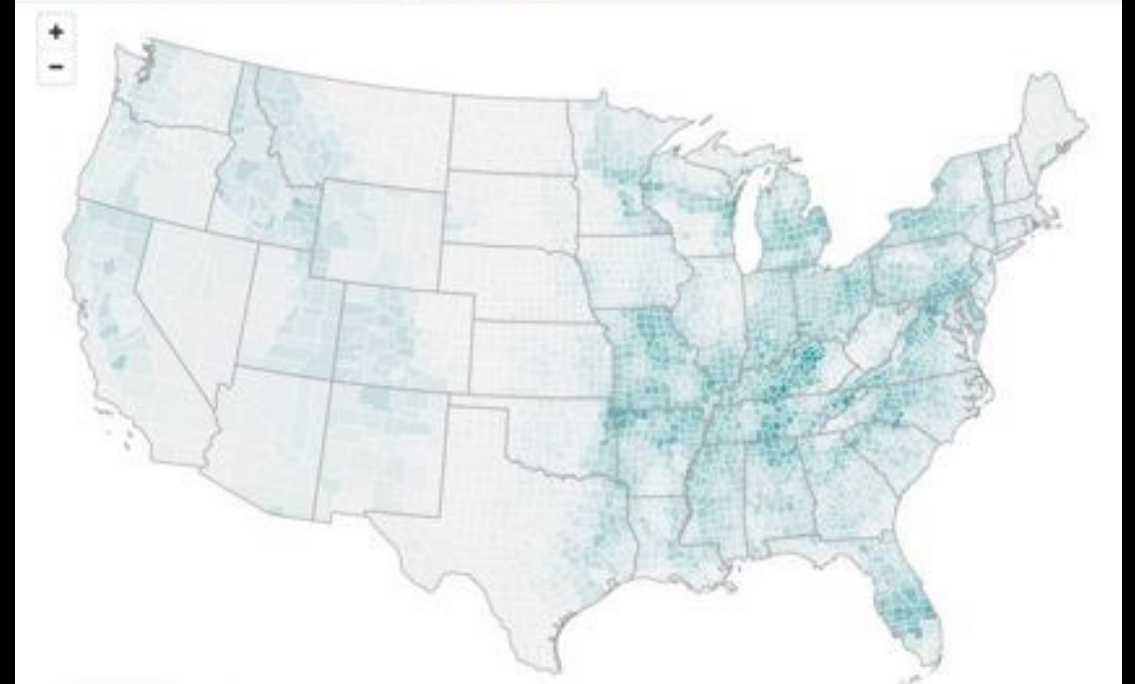
Why RNGR?

And why might I be here presenting at the Intertribal Ag Council meeting?

- Agriculture – the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and *other products*
- Growing trees and native plants for reforestation and restoration *is* agriculture

Reforestation Needs

- In the US, estimates range from 1.3 to 7.6 million acres are in need of reforestation
- That's a lot of land!



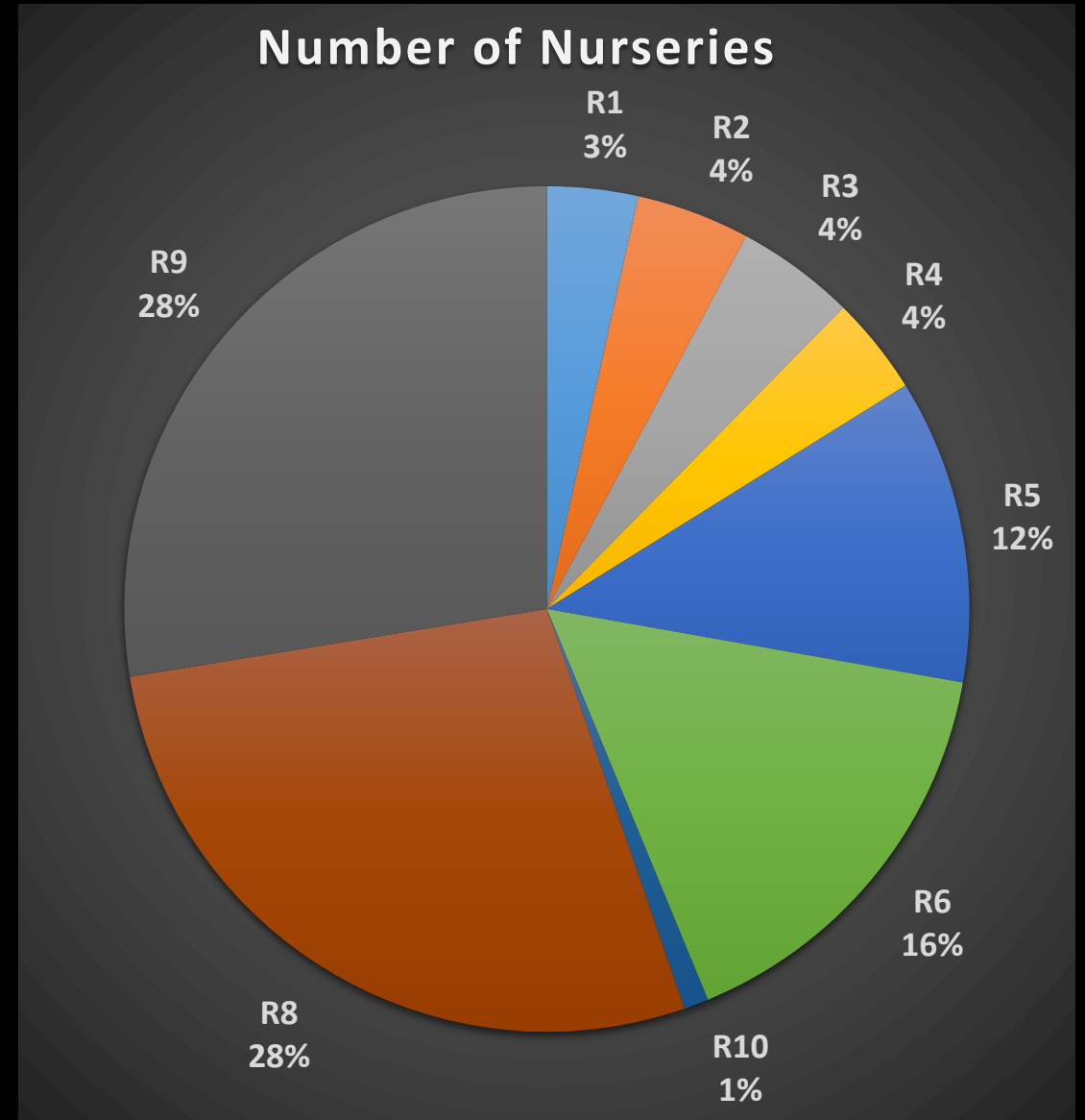
Restoration Needs

- Currently, countries have committed to restoring over 1 billion hectares of land worldwide
- That's a lot of land!
- Doesn't represent the total amount of land in *need* of restoration



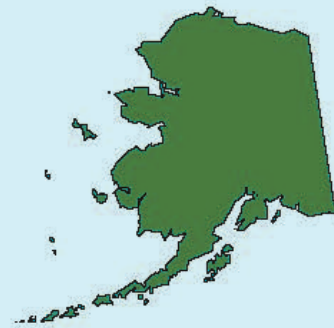
Why RNGR?

- Approximately 1500 native plant nurseries in the U.S.
- Produce more than one billion seedlings annually
- Most lack local information resources
- RNGR works to fill the gap



Estimated from number of listings in the National Nursery and Seed Directory (www.RNGR.net)

The National RNGR Team



Diane Haase
Western Nursery
Specialist



Kas Dumroese
Researcher/
National Nursery
Specialist



Jeremy Pinto
Researcher/
Tribal Nursery
Specialist

Western Region



Matt Horning
Geneticist

- Western Territories (Not pictured)
- American Samoa
 - Guam
 - Palau
 - Federated States of Micronesia
 - Northern Mariana Islands
 - Republic of the Marshall Islands

Northeastern Region



Carrie Pike
Northeast Nursery
Specialist



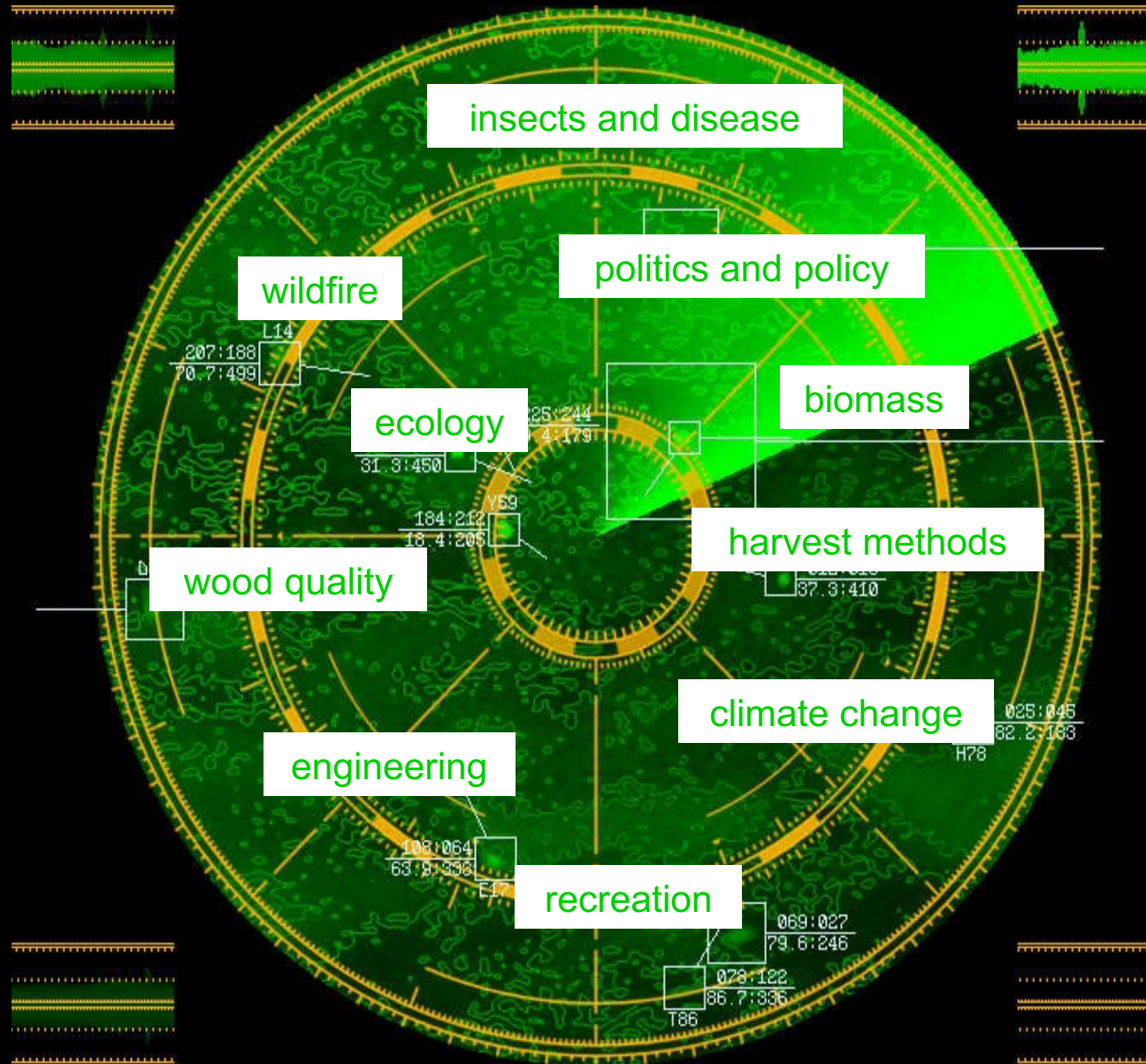
Lindsey Colegrove
Southern Nursery
Specialist



Vic Vankus
National Seed Lab
Director

Southern Region

- Southern Territories (Not pictured)
- Puerto Rico
 - Virgin Islands



*Nurseries, seed,
and seedlings*

...much too often off the radar.

Seedlings are the
building blocks for
nearly all healthy
forests and
landscapes



Quality Seedling Production Requires Skill and Knowledge

- Plant physiology, morphology, and phenology
- Genetics
- Environment
- Soil quality
- Water management
- Seed technology
- Species characteristics
- Ecotype differences
- Culturing techniques
- Pest Management
- Storage and handling
- Customer relations
- Administration and budgeting



RNGR Activities

- Technical Assistance
- Publications and Presentations
- Annual Nursery Conferences
- Training and Workshops
- Research
- National Seed Laboratory
- International Assistance
- Online Resources
- Assistance to Tribes



Ecological Restoration

“Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.”

- Often by human activity
- Can initiate or accelerate ecosystem recovery

SER online: <https://www.ser-rrc.org/what-is-ecological-restoration/>

Native Americans and Plants

History of:

- Food
- Shelter
- Textiles
- Medicine
- Ceremony



Traditional Ecological Knowledge (TEK)

“TEK refers to the knowledge base acquired by indigenous and local peoples over many hundreds of years through direct contact with the environment. It includes an intimate and detailed knowledge of plants, animals, and natural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture, and forestry, and a holistic knowledge, or ‘world view’ which parallels the scientific discipline of ecology.”

Traditional Ecological Knowledge: Concepts and Cases. Inglis (ed) 1993

Native Plants on Indigenous Lands

Contemporary Management Needs:

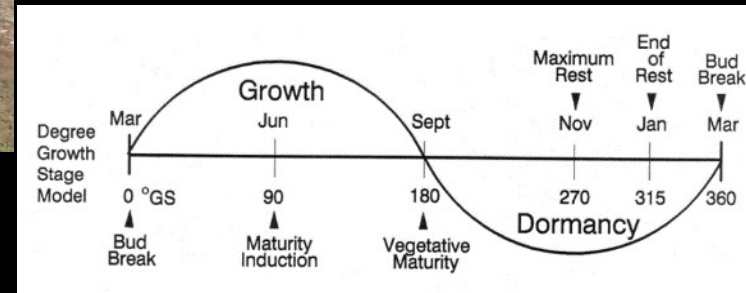
- Restoration
- Reforestation
- Wildlife
- Bioengineering
- Invasive Species
- Disturbance
- Climate Change
- Landscape



Contemporary Management

Assisted with Modern Tools and Concepts:

- Greenhouses
- Climate control
- Irrigation systems
- Mechanical equipment
- Plant physiology
- Fertilizers
- Target plants
- Etc.



(Fuchigami and Nee 1987; Burr 1990)

Native Plants on Native Lands

Additional Needs

- Cultural
 - Preservation
 - Education
 - Availability
 - Economic
 - Food
 - Medicine
 - Textiles



Native Plants & Land Management in Indigenous Communities

Historical Management Goals

- Food
- Shelter
- Textiles
- Medicine
- Ceremony



Contemporary Management Goals

- **Restoration**
- Reforestation
- Wildlife
- Climate change
- Invasive species concerns
- Disturbance



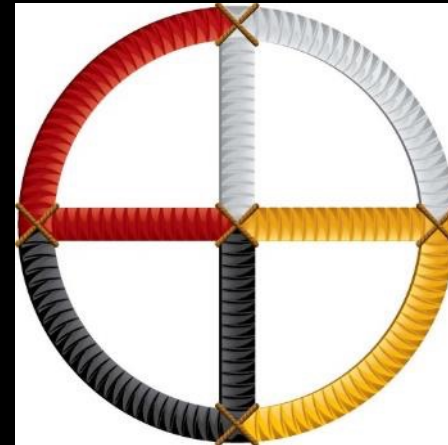
Contemporary Cultural Goals

- Preservation
- Education
- Food
- Medicine
- Textiles
- Economics



Restoration Using Nurseries & Potential Conflicts with Traditional Ideals

- TEK absent
- Plant Production Concerns:
 - Artificial
 - Spirituality
 - Connectedness
 - Trophic levels
 - Medicine
 - Textiles
 - Genetics



Finding a Balance

Goal:

- Successful use of plant materials on Indigenous lands

Means:

- Use both science and Traditional Ecological Knowledge
- Build trust
- Engage community





RNGR Tribal Nursery Emphasis



Since 2001

- Technical Assistance
 - On-site visits, phone, & email
- Publications
- Intertribal Nursery Council Meetings, Workshops, & Training Sessions



2001 Durango, CO
Southern Ute Tribe



2010 Arlington, WA
Stillaguamish Tribe



2019 Tulsa, OK
Muskogee Tribe

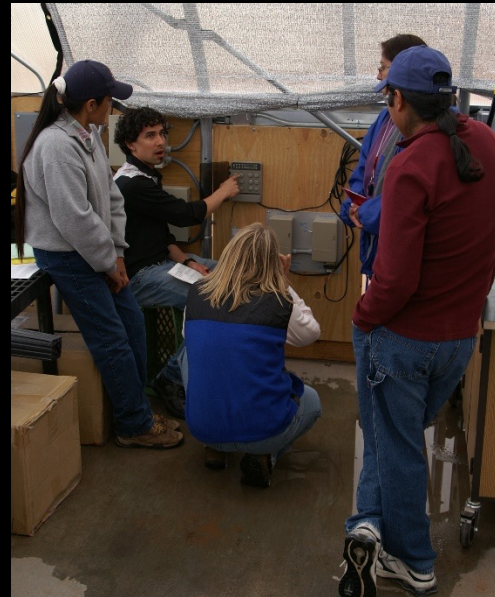
Technical Assistance to Tribes

Goal:

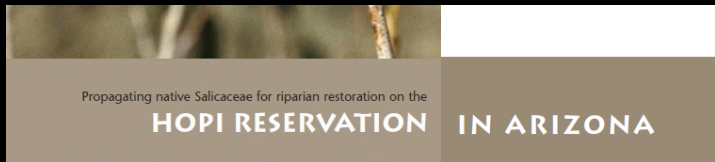
- Quality seedlings for the restoration & reforestation of tribal lands

Outcomes:

- Consultations
- Cultural Plant Propagation Center
- Plant materials programs
- Equipment surplus transfers
- Cooperative agreements
- Plant materials to NFS
- Pollinators
- USDA Climate Hub
- CCAA Program
- Publications



Publications



Propagating native Salicaceae for riparian restoration on the HOPI RESERVATION IN ARIZONA

IN ARIZONA

Thomas D Landis, David R Dreessen, Jeremy R Pinto, and R Kasten Dumroese

ABSTRACT

The USDA Forest Service, USDA Natural Resource Conservation Service (NRCS), and the Hopi Tribe Office of Range Management have been working together on native plant restoration projects in northeastern Arizona. The aggressive exotic plants, Russian olive (*Elaeagnus angustifolia* L. [Elaeagnaceae]) and salt cedar (*Tamarix ramosissima* Ldb. [Tamaricaceae]), have invaded many wetland and riparian areas on the Hopi Reservation, excluding willows (*Salix* L.), cottonwoods (*Populus* L.), and other native plants. The tribe has been mechanically removing the invasion and has asked for help in propagating native species to plant in these project areas. Although much information is available on how to collect willows and cottonwoods and propagate them, some unique challenges exist on Hopi lands. Some species are common, while others are very rare and in some cases only a few individual plants exist. The scattered locations of streams, wetlands, and seeps must be considered during plant material collections to ensure that both genetic and sexual diversity are adequately represented. Another challenge is the dissemination of target plant stock types that are appropriate on the diverse hydrologic conditions on the various project sites. Collected plant material was taken for the NRCS Plant Materials Center in Los Lunas, New Mexico, for both seed and vegetative propagation.

KEY WORDS
restoration, culturally significant plants, invasive species, Intertribal Nursery Council, Salt Cedar

NOMENCLATURE
USDA NRCS (2006)

OPINION: Old man cottons, like those on Salt Cedar, from the Hopi Reservation in Arizona, can be used to determine the size of disease spots during winter dormancy, and ensure that disease collectors collect both sides. Photo by Thomas D Landis.

The Hopi Reservation is located in northeast Arizona (Figure 1A) where the tribe has been working to eradicate exotic salt cedar (*Tamarix ramosissima* Ldb. [Tamaricaceae]) and Russian olive (*Elaeagnus angustifolia* L. [Elaeagnaceae]) from streams and wetlands. Comprising about 2% of the reservation, these riparian and wetland communities are ecologically and culturally valuable for livestock grazing, wildlife habitat, traditional gathering, and ceremonial use (Lomax 2001). Although the initial eradication was successful, the salt cedar are reappearing. At the first intertribal Nursery Council meeting in 2001, the tribe asked the USDA Forest Service for help in propagating willows (*Salix* L. [Salicaceae]) and cottonwoods (*Populus* L. [Salicaceae]) to plant in these areas.

During initial visits to project areas on the reservation, we identified the principal riparian trees and shrubs: Fremont cottonwood, Colorado willow, arroyo willow, and arroyo willow (Table 1). Tribal members also took us to remote sites where we found small stands of beaked cottonwood and quaking aspen (Table 1). It is important to note that none of the wetland and riparian areas on the Hopi Reservation are geographically isolated and above-contingency (Figure 1A). In addition, the aggressive invasion of salt cedar and Russian olive (Figure 1B) has severely reduced and degraded the balance of native willow and cottonwood.

From our field observations we expected that several of the native stands—especially willow areas, and those only a single individual (Figure 1C)—would be useful. Our extended arroyo willow along shaded cottonwood appeared to contain female plants, while a small grove of beaked cottonwood and deer ferns showed both sexes (Table 1). Removal of the salt cedar and olive has been completed in some areas. This area has also been fenced to cattle and is ready for replant.

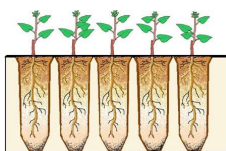
NATIVE PLANTS

Case studies

STACKED PROPAGATION

a new way to grow native plants from root cuttings

David R Dreessen, Thomas D Landis, and Jeremy R Pinto



ABSTRACT

Stacked propagation is a novel method of growing quaking aspen (*Populus tremuloides* Michx. [Salicaceae]) and other plants that reproduce from underground stems or root cuttings. Because the mother plant is not damaged, it is particularly well suited for rare plants or those that can't be propagated by normal methods. Our initial trials indicate that hundreds of vigorous plants can be produced by this method in each propagation cycle.

Dreessen DR, Landis TD, Pinto JR. 2004. Stacked propagation: a new way to grow native plants from their root cuttings. *Native Plants Journal* 1(3):286-292.

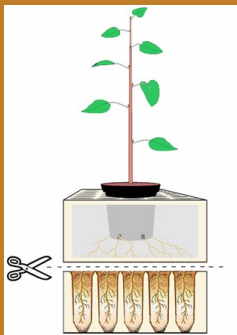
KEY WORDS
Populus tremuloides, vegetative propagation, restoration

NOMENCLATURE
USDA NRCS (2006)

Quaking aspen with splendid fall color. Photo by Thomas D Landis.

NATIVE PLANTS | FALL 2006

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Protocols



Forest Ecology and Management 241 (2011) 1876–1884

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Establishment and growth of container seedlings for reforestation: A function of stocktype and edaphic conditions

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Container seedlings
Seedling establishment and growth

ABSTRACT

A properly selected stocktype can greatly enhance reforestation success through increased survival and growth following outplanting. Implementing a robust stocktype trial using stocktypes of equal quality can ensure results lead to the best choice. Six container types, differing primarily in depth and volume, were used to evaluate the performance of ponderosa pine (*Pinus ponderosa* Laws. var. *ponderosa*) seedlings out-planted on two sites that varied in volumetric soil moisture content (V), average temperature, and total precipitation (precip. and snow). Seedlings in container types were cultured specifically to achieve uniform seedling quality. After two growing seasons, seedlings planted at the mesic site showed high survival (≥95%) and incremental growth gains of 142, 100, and 794% for height, root-collar diameter (RCD), and stem volume, respectively; container types exhibited differences in total height, RCD, and stem volume with larger containers generally yielding the largest seedlings. Seedlings planted at the xeric site experienced 83% survival, smaller growth gains (25, 46, and 220% for height, RCD, and stem volume, respectively), and also exhibited differences in height, RCD, and stem volume. Regression analysis revealed that for each site, initial seedling morphological characteristics were better at predicting absolute height, RCD, and stem volume after the first year than after the second year, with initial seedling height effecting the best predictive power ($R^2 = 0.66$, mesic site; and $R^2 = 0.70$, xeric site). Second-year absolute growth prediction was poorest on the mesic site ($R^2 = 0.21$). Regression analysis indicates that initial seedling characteristics best predictive value with time, especially on the mesic site, as seedlings grew out of their initial, container-induced characteristics and become more limited by current environmental and genetic factors. Conversely, on a xeric site, where absolute growth was reduced, traits determined by the container type persisted longer. Selecting stocktypes for mesic site conditions may only be limited by the minimum growth gains desired. Conversely, xeric sites may benefit from deep-planted quality seedlings or carefully planted long-rooted, large-container seedlings.

Published by Elsevier B.V.

1. Introduction

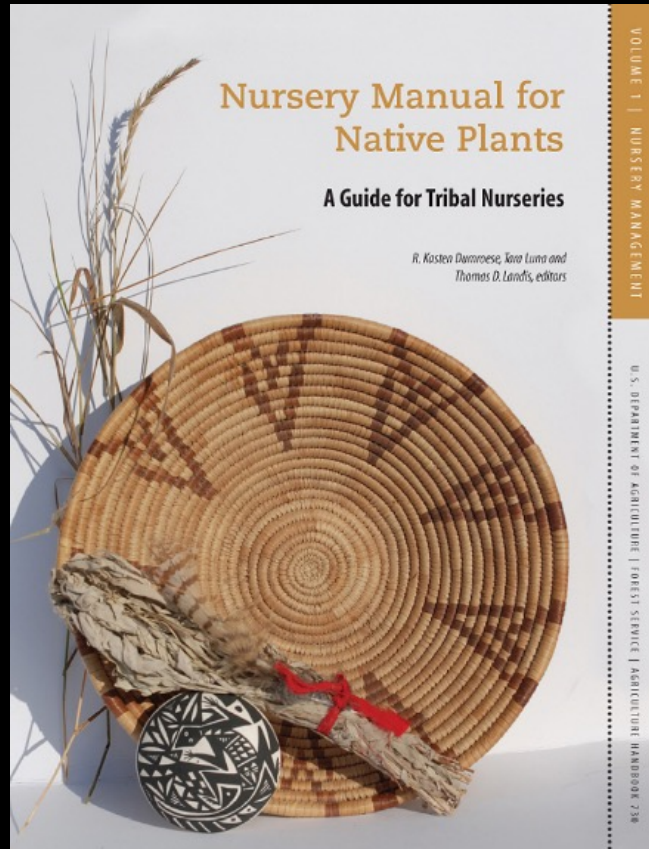
Reforestation using nursery-produced seedlings can be an effective means of ensuring successful establishment and rapid growth following outplanting. Plantation establishment success often hinges on decisions and considerations made prior to planting, such as seedling stocktype, seedling morphology, genetics, site limiting factors, site preparation, the outplanting window, and planting technique (Scagel et al., 1998). The best seedling stocktype for a particular site may differ depending on how these decisions and considerations are made. To simplify this complex situation, the Target Plant Concept was proposed. This concept provides a

means of overcoming the critical variables of forest establishment by focusing on morphological and physiological seedling characteristics that are linked to outplanting success (Rose et al., 1990; Landis and Dumroese, 2006). The premise behind the Target Plant Concept is that it identifies seedling characteristics that increase outplanting survival and growth under a particular set of site conditions (Rose et al., 1990).

Over the years, the number of available seedling stocktypes has increased dramatically, especially for container seedlings. It is well known that varying container volume, which usually also causes changes in seedling density, modifies seedling phenotype; this occurs even among seedlings of the same seed source grown the same year (Scarratt, 1972; Landis et al., 1990; Scagel et al., 1998). If a larger phenotype is desired, seedlings are grown in larger containers. Whether these larger containers are deeper or wider, they require more medium, more fertilizer, and more grow-

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Research



Nursery Manual for Native Plants

A Guide for Tribal Nurseries

R. Kasten Dumroese, Kara Luna and Thomas D. Landis, editors

VOLUME 1 | NURSERY MANAGEMENT

U.S. DEPARTMENT OF AGRICULTURE | FOREST SERVICE | AGRICULTURAL HANDBOOK 738

Manuals

Intertribal Nursery Council

Forum for:

- Technology transfer
- Conservation education
- Reforestation
- Restoration
- Peer-to-peer information sharing



Impact:

- Providing Tribes with nursery technical knowledge to improve seedling quality and outplanting establishment success

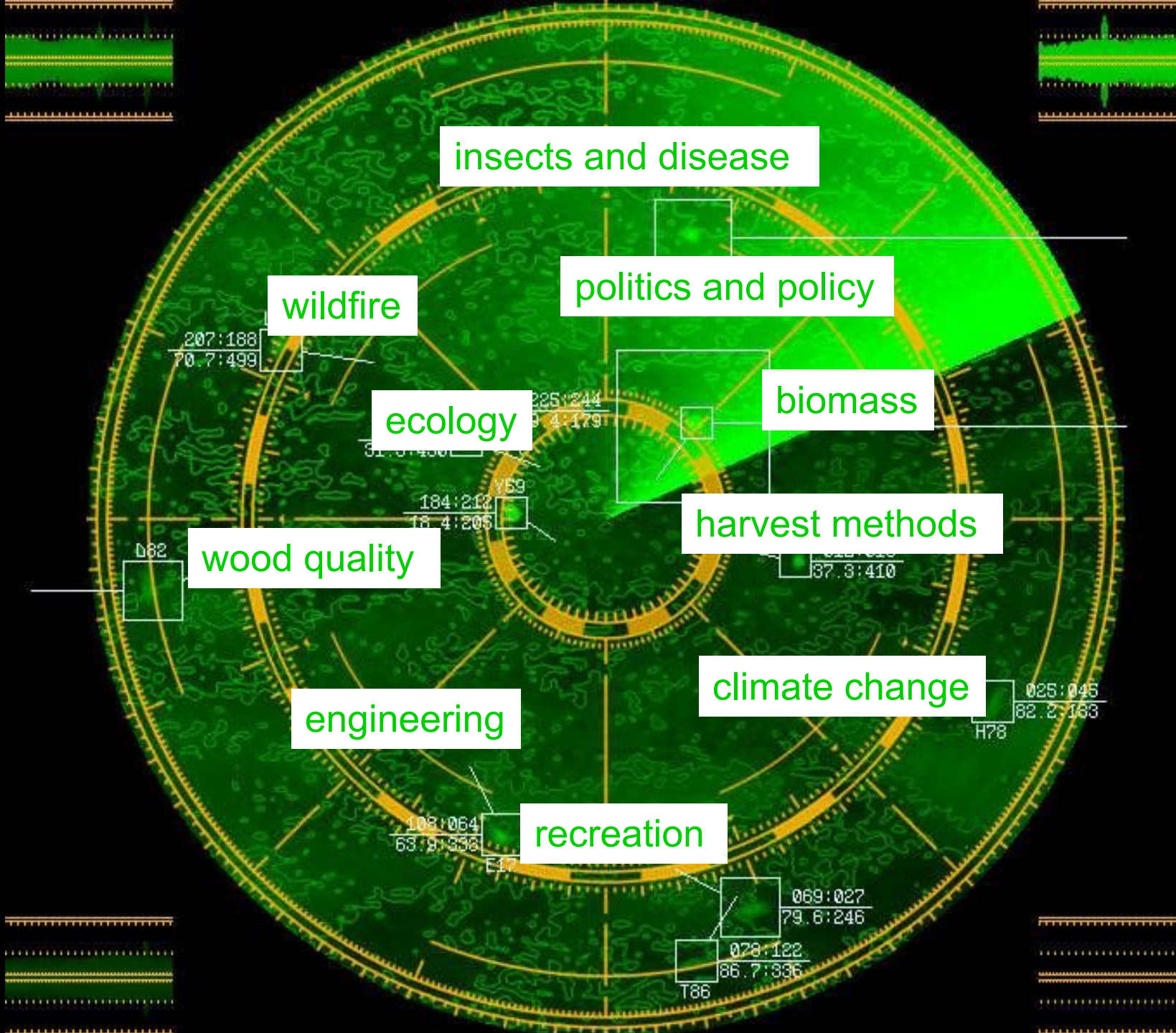


Student involvement

INC Member Concern: succession planning

- University of Idaho
 - Teaching
 - Graduate students
- Travel scholarships to INC meetings
 - Experience a professional meeting
 - Give presentations

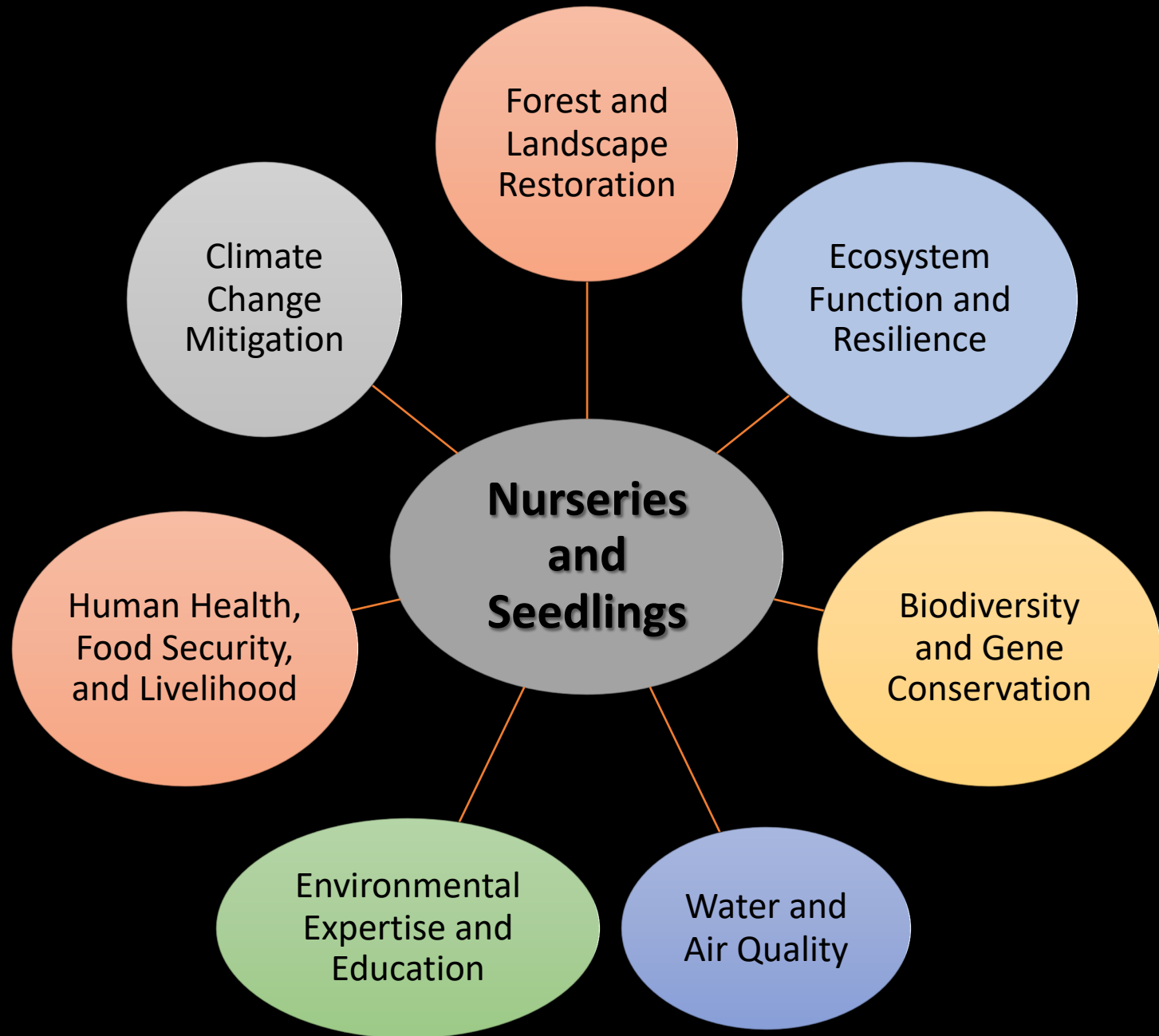




nurseries & seedlings

RNGR works to make sure nurseries, seed, and seedlings are not only “on the radar,” but also...

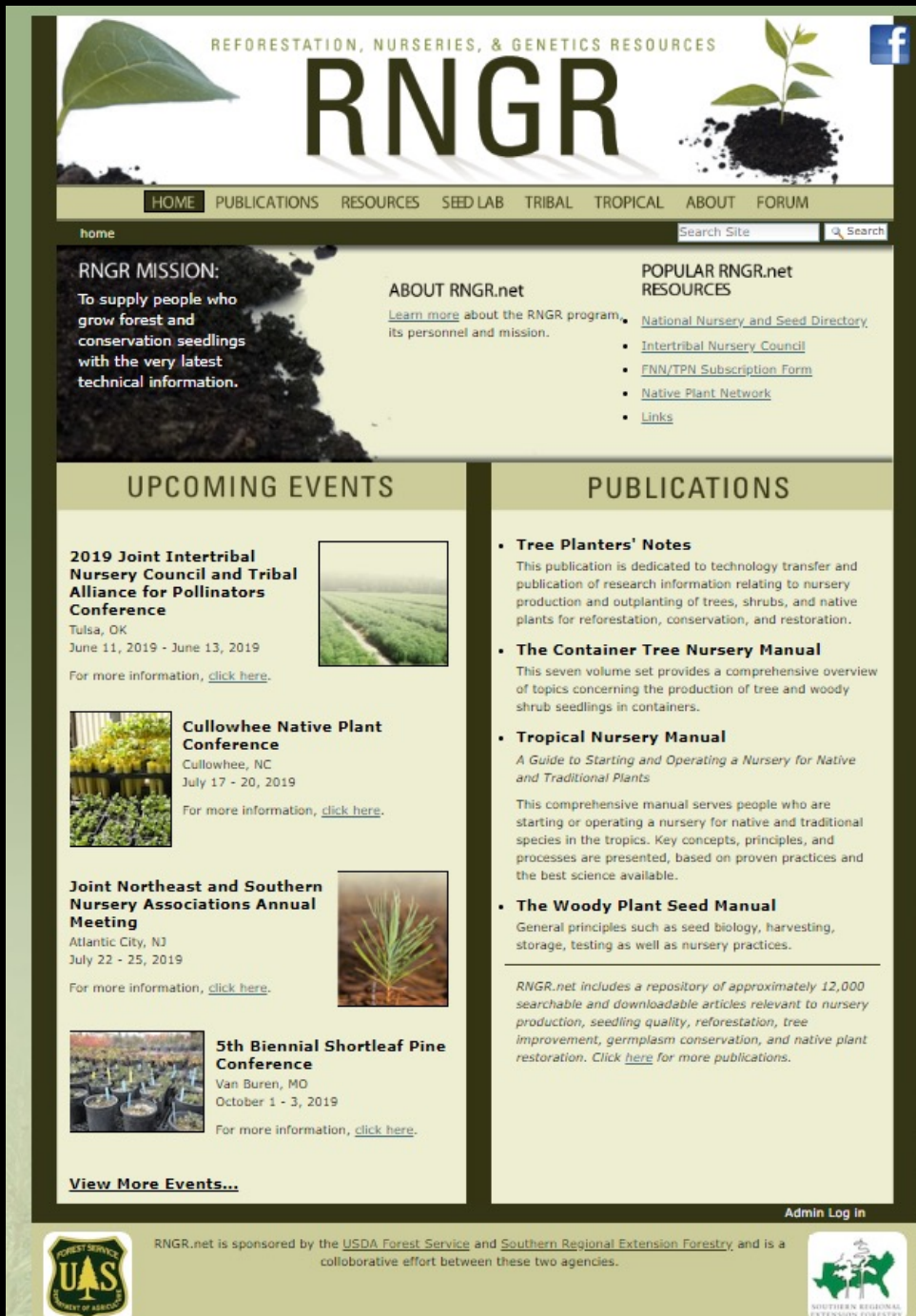
...are recognized
and functioning as
a hub for meeting
ecological,
economic, and
social goals.



Online Resources RNGR.net

- Publications
- Directories
- Calendar
- Links
- RNGR Contact Info
- Discussion Forum
- Native Plant Network

Averages a visit and a download every 11 minutes!



The screenshot shows the RNGR.net website homepage. At the top, there's a header with the text "REFORESTATION, NURSERIES, & GENETICS RESOURCES" and the large "RNGR" logo. A navigation bar below the header contains links: HOME, PUBLICATIONS, RESOURCES, SEED LAB, TRIBAL, TROPICAL, ABOUT, and FORUM. A search bar is located on the right side of the navigation bar. The main content area is divided into several sections. On the left, there's a "RNGR MISSION" section with a background image of a forest. To its right is an "ABOUT RNGR.net" section with a link to "Learn more about the RNGR program, its personnel and mission." Further right is a "POPULAR RNGR.net RESOURCES" section with a list of links: National Nursery and Seed Directory, Intertribal Nursery Council, FNN/TPN Subscription Form, Native Plant Network, and Links. Below these sections are two main columns. The left column is titled "UPCOMING EVENTS" and lists three events: "2019 Joint Intertribal Nursery Council and Tribal Alliance for Pollinators Conference" (Tulsa, OK, June 11-13, 2019), "Cullowhee Native Plant Conference" (Cullowhee, NC, July 17-20, 2019), and "Joint Northeast and Southern Nursery Associations Annual Meeting" (Atlantic City, NJ, July 22-25, 2019). Each event has a small image and a link to "click here" for more information. The right column is titled "PUBLICATIONS" and lists three publications: "Tree Planters' Notes", "The Container Tree Nursery Manual", and "The Woody Plant Seed Manual". Each publication has a brief description and a link to "click here" for more information. At the bottom of the page, there's a footer with the USDA Forest Service logo, a statement that RNGR.net is sponsored by the USDA Forest Service and Southern Regional Extension Forestry, and a small map of the Southern United States.

REFORESTATION, NURSERIES, & GENETICS RESOURCES

RNGR

HOME PUBLICATIONS RESOURCES SEED LAB TRIBAL TROPICAL ABOUT FORUM

home Search Site Search

RNGR MISSION:
To supply people who grow forest and conservation seedlings with the very latest technical information.

ABOUT RNGR.net
[Learn more](#) about the RNGR program, its personnel and mission.

POPULAR RNGR.net RESOURCES

- [National Nursery and Seed Directory](#)
- [Intertribal Nursery Council](#)
- [FNN/TPN Subscription Form](#)
- [Native Plant Network](#)
- [Links](#)

UPCOMING EVENTS

2019 Joint Intertribal Nursery Council and Tribal Alliance for Pollinators Conference
Tulsa, OK
June 11, 2019 - June 13, 2019
For more information, [click here](#).

Cullowhee Native Plant Conference
Cullowhee, NC
July 17 - 20, 2019
For more information, [click here](#).

Joint Northeast and Southern Nursery Associations Annual Meeting
Atlantic City, NJ
July 22 - 25, 2019
For more information, [click here](#).

5th Biennial Shortleaf Pine Conference
Van Buren, MO
October 1 - 3, 2019
For more information, [click here](#).

[View More Events...](#)

PUBLICATIONS

- **Tree Planters' Notes**
This publication is dedicated to technology transfer and publication of research information relating to nursery production and outplanting of trees, shrubs, and native plants for reforestation, conservation, and restoration.
- **The Container Tree Nursery Manual**
This seven volume set provides a comprehensive overview of topics concerning the production of tree and woody shrub seedlings in containers.
- **Tropical Nursery Manual**
A Guide to Starting and Operating a Nursery for Native and Traditional Plants
This comprehensive manual serves people who are starting or operating a nursery for native and traditional species in the tropics. Key concepts, principles, and processes are presented, based on proven practices and the best science available.
- **The Woody Plant Seed Manual**
General principles such as seed biology, harvesting, storage, testing as well as nursery practices.

RNGR.net includes a repository of approximately 12,000 searchable and downloadable articles relevant to nursery production, seedling quality, reforestation, tree improvement, germplasm conservation, and native plant restoration. [Click here](#) for more publications.

Admin Log in

FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

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SOUTHERN REGIONAL EXTENSION FORESTRY

Thank You! Ahehee'!

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rngr.net

