Nursery produced native plant seedlings: a valuable tool in the toolbox of landscape and cultural restoration

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The findings and conclusions in this presentation are those of the author and should not be construed to represent any official USDA or U.S. Government determination or policy.

Choosing the right plant material for landscape scale restoration

Seeds or Seedlings?

It depends!

The right plant material in the right place at the right time…

General considerations:

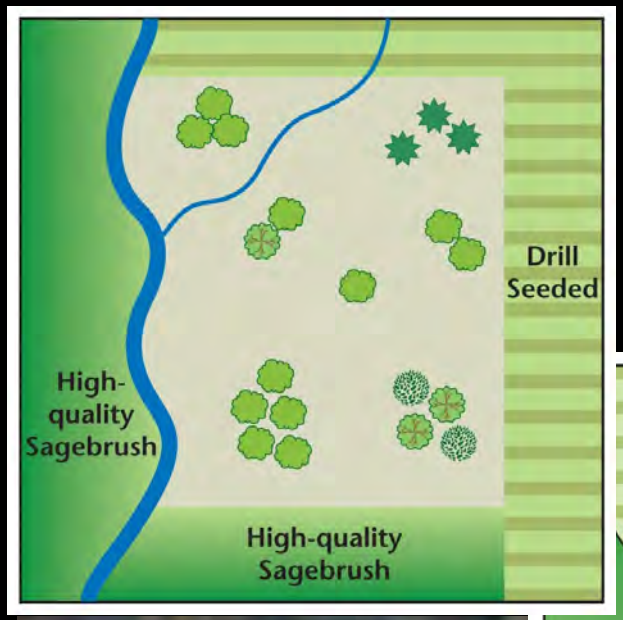
- Area covered
- Budget
- Timing
- Available resources

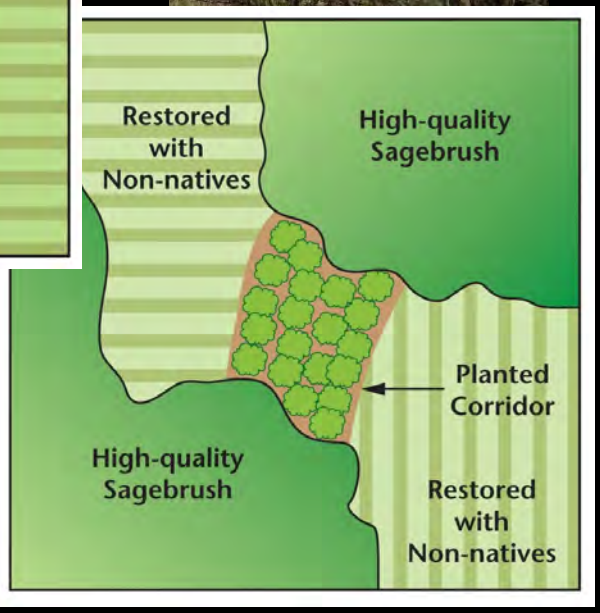
Photo from Finch and Tomosy (2014)

Choosing the right plant material for restoration

Depends on project objectives:

- High priority areas
- Ecosystem services
- Biological diversity
- Cultural/Traditional needs
- Threatened and Endangered Species
- Wildlife





From Stanturf et al. (2014)

Why use nursery stock?

1-2.5 cm height

Example: Ponderosa pine

15-30+ cm height

Another tool in the toolbox!

- Nursery vs. nature:
  - Phenotypic plasticity
  - Species specific
  - Tradeoffs
    - Site prep
    - Timing
    - Root development
    - Genetics
    - Others

Why use nursery stock?

Another tool in the toolbox!

- Nursery Plants Can Provide Rapid Results:
  - Vertical structure
  - Ecological functions
  - Physical screening

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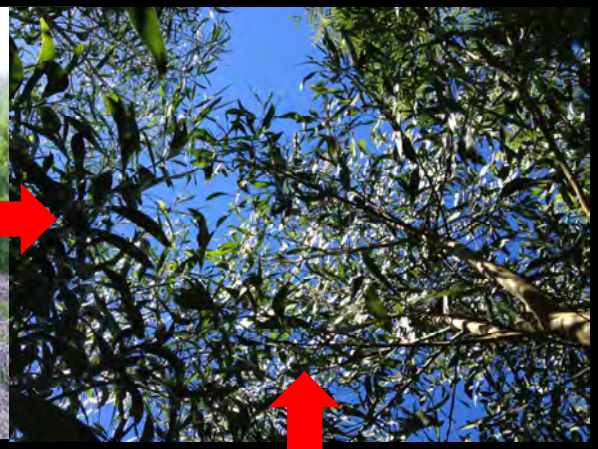


Akiapola'au (*Hemignathus munroi*)

Another tool in the toolbox!

- Nursery Plants Can Provide Rapid Results:
  - Vertical structure
  - Ecological functions
  - Physical screening

New Forests (2015) 46:855–867
DOI 10.1007/s11056-015-9492-6

CrossMark

Stocktype and grass suppression accelerate the restoration trajectory of *Acacia koa* in Hawaiian montane ecosystems

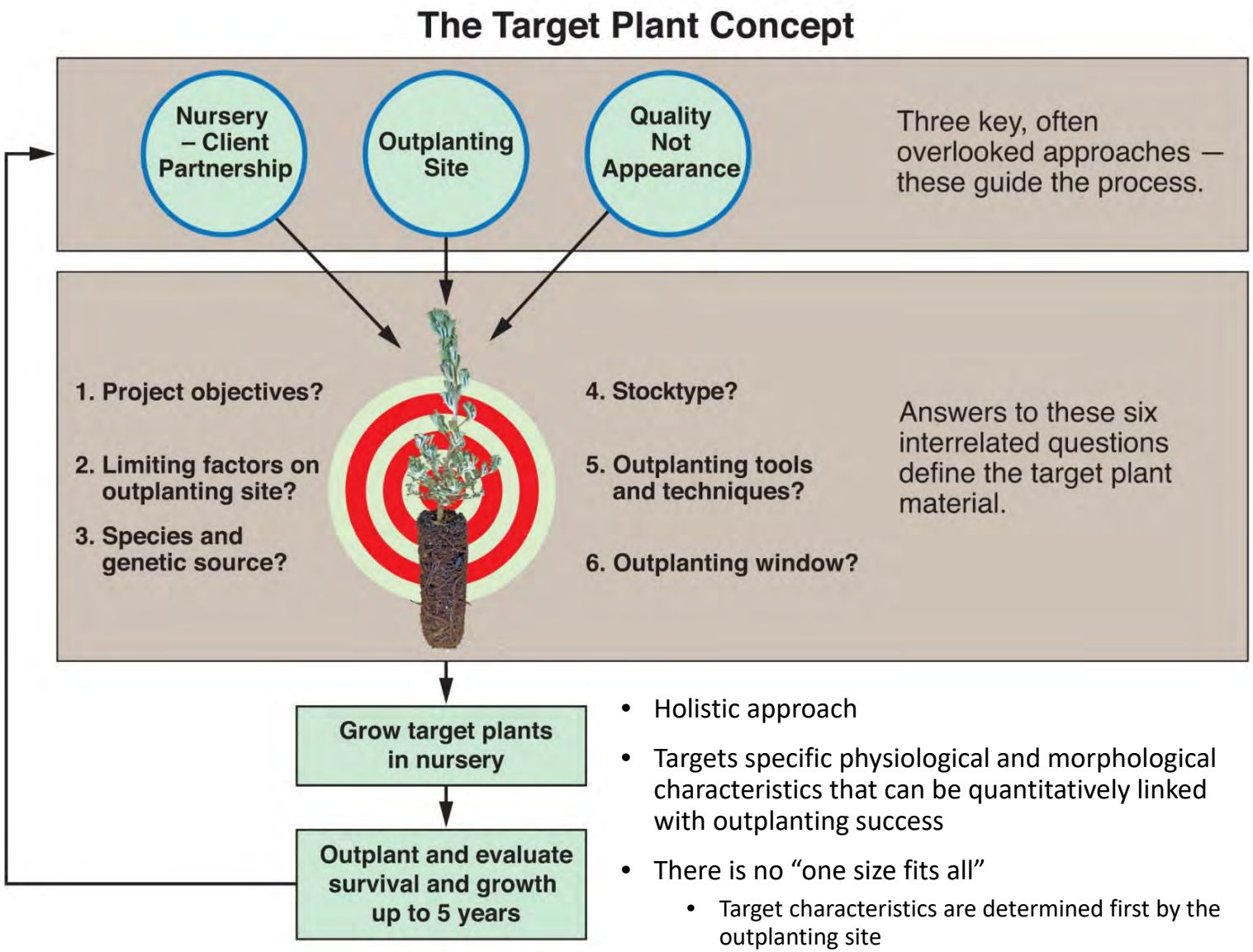
Jeremiah R. Pinto[1] · Anthony S. Davis[2] · James J. K. Leary[3] · Matthew M. Aghai[2]

The Target Plant Concept

- Holistic approach to plant material development and deployment
- Targets specific physiological and morphological characteristics that can be quantitatively linked with outplanting success
- There is no “one size fits all”
  - Target characteristics are determined first by the outplanting site

Why do we like the TPC so much?

- Comprehensive
  - Roadmap
- Adaptable
  - Forestry
  - Restoration
  - Cultural
    - https://youtu.be/SMDx6Jw5_QQ
  - Climate change
    - https://www.fs.usda.gov/detailfull/r5/climatechange/?cid=fseprd1009664&width=full
  - Research questions



- Holistic approach
- Targets specific physiological and morphological characteristics that can be quantitatively linked with outplanting success
- There is no “one size fits all”
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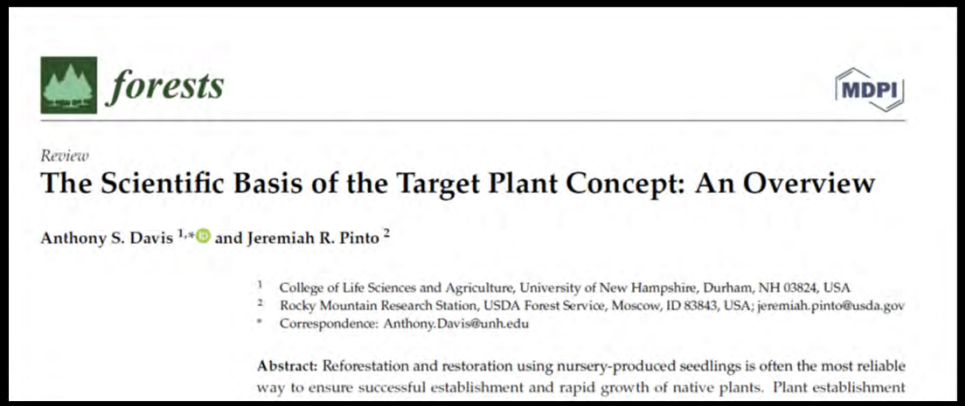
The Target Plant Concept:

A *holistic* approach to native plant restoration

Forests Journal Special Issue:
The Scientific Basis of the Target Plant Concept
https://www.mdpi.com/journal/forests/special_issues/Scientific_Basis_Target_Plant_Concept



forests MDPI

Review

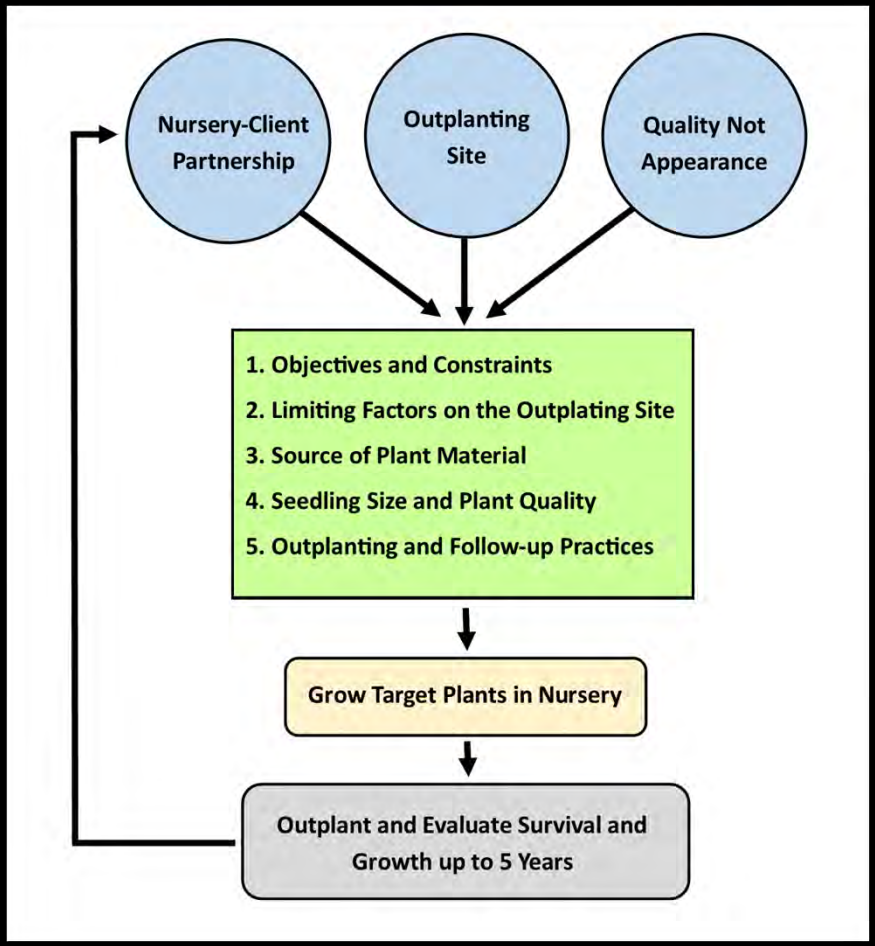
The Scientific Basis of the Target Plant Concept: An Overview

Anthony S. Davis [1,*] and Jeremiah R. Pinto [2]

[1] College of Life Sciences and Agriculture, University of New Hampshire, Durham, NH 03824, USA
[2] Rocky Mountain Research Station, USDA Forest Service, Moscow, ID 83843, USA; jeremiah.pinto@usda.gov
* Correspondence: Anthony.Davis@unh.edu

Abstract: Reforestation and restoration using nursery-produced seedlings is often the most reliable way to ensure successful establishment and rapid growth of native plants. Plant establishment

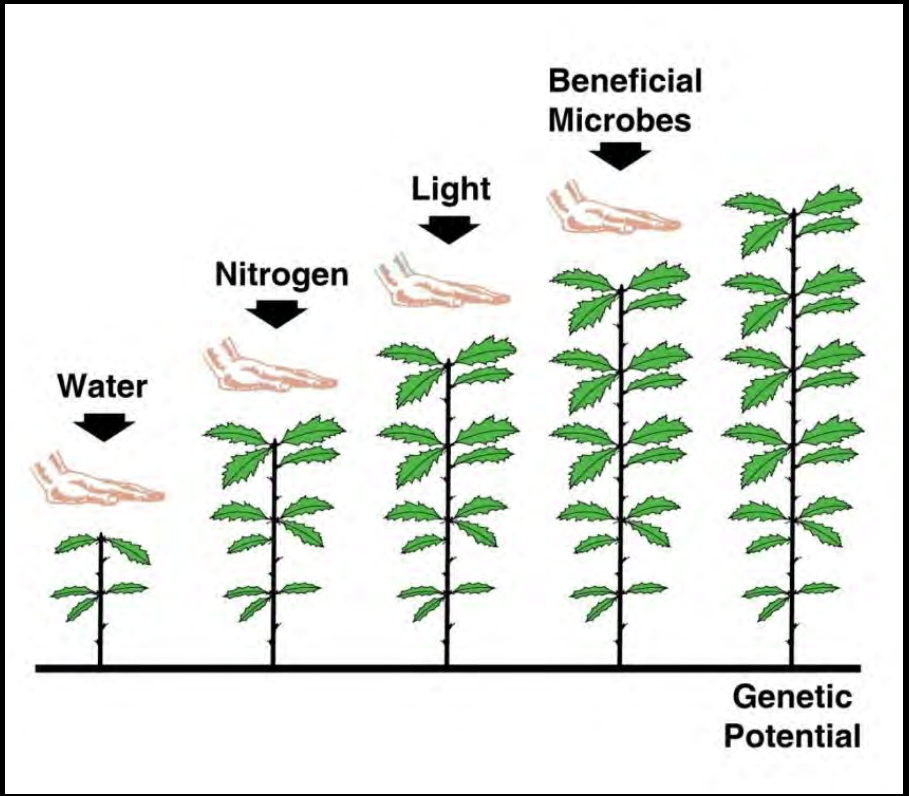
https://www.mdpi.com/1999-4907/12/9/1293



Understanding limiting factors on the outplanting site

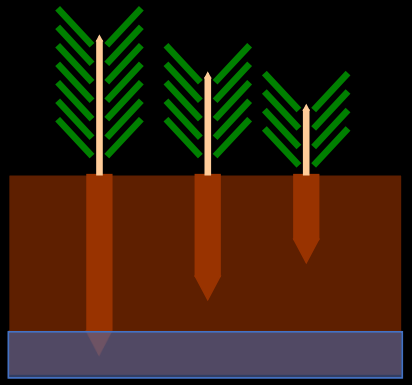
Concept of limiting factors :

- *Always*, more than one
- Effect is sequential & cumulative
- Take home message: make list & prioritize



- Atmospheric
  - Light
  - Temperature
  - Carbon dioxide
  - Humidity
  - Pathogenic fungi
  - Insect pests
  - Weeds
- Edaphic
  - Water***
  - Temperature***
  - Mineral nutrients
  - Pathogenic fungi
  - Insects
  - Beneficial microorganisms
- Human
  - Perceptions
  - Education
  - Need

Stocktype choice



Stocktype choice

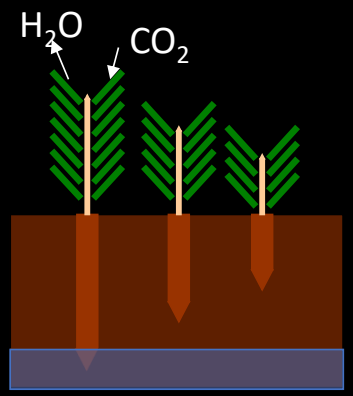
Considerations:

- Outplanting site!
- Leveraging the nursery's strength
- Economics
  - Bareroot: lower survival, cheaper cost => plant more?
  - Container: higher survival, more expensive => plant fewer?
- Stocktype studies*

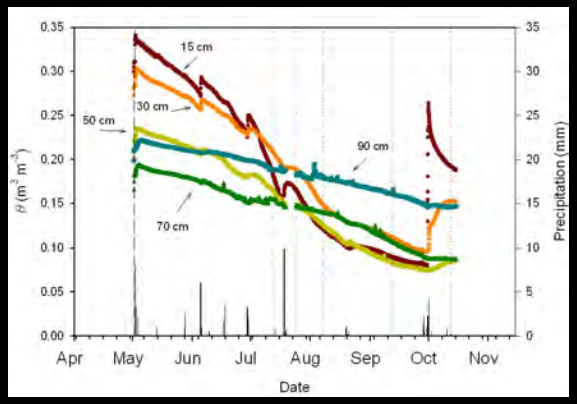
Stocktype Studies

Ponderosa pine

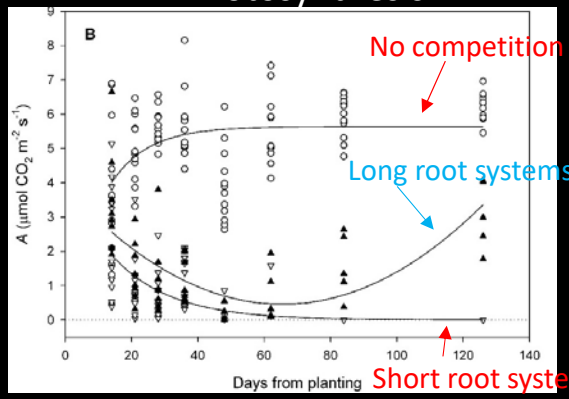
- Stocktype trial
- Rooting length
- Seasonal drought



Volumetric Soil Moisture



Photosynthesis



333

Photosynthetic response, carbon isotopic composition, survival, and growth of three stock types under water stress enhanced by vegetative competition

Jeremiah R. Pinto, John D. Marshall, R. Kasten Dumroese, Anthony S. Davis, and Douglas R. Cobos