

Plant material timelines

Growing nursery stock takes some planning

- Scouting/Surveying/Monitoring
- Harvesting
- After-ripening/curing
- Processing
- Seed treatments
- Nursery culture
- Harvesting
- Storage
- Planting

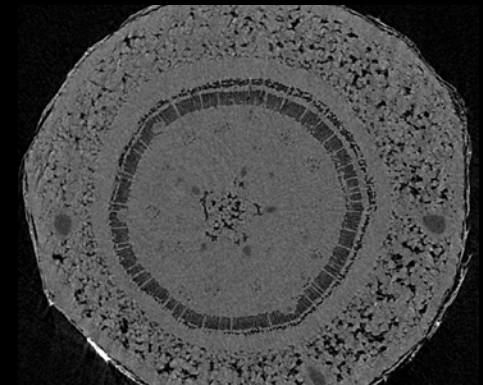
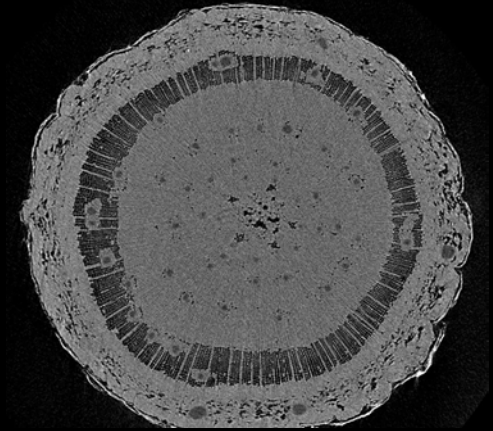
Stock type	Year One												Year Two												Year Three					
	J a n	F e b	M a r	A p r	M a y	J u n	J u l	A u g	S e p	O c t	N o v	D e c	J a n	F e b	M a r	A p r	M a y	J u n	J u l	A u g	S e p	O c t	N o v	D e c	J a n	F e b	M a r	A p r	M a y	
Big Sagebrush seedlings (10 in ³)																														
Seedlings Legend																														
	Seed Collection					Seed Treatments					Growth in Greenhouse					Growth in Outdoor Nursery					Outplanting									
	Seed Cleaning					Sowing & Emergence					Seed Storage					Hardening					Overwinter Storage									

*Other stocktypes will have varying timing

Seedling quality is key

Fitness for purpose

- Morphology
 - Height, stem diameter, root quality, root-to-shoot ratio
- Physiology
 - Nutrition
 - Cold hardiness
 - Water status
 - Carbon acquisition
 - Stress conditioning
 - Non-structural carbohydrates
 - Xylem structure and function
 - Others



Ponderosa pine

Seed use efficiency

Munro's Globemallow

Direct Seeding

- 40 ha (100 ac)
- 1.6 kg PLS ha⁻¹ desired
- 110 seeds m⁻²*
- 44 million seeds
- 143000 seeds kg⁻²** (317,000 lb⁻¹)
- 308 kg seeds needed
- \$57 kg⁻¹* (\$90 lb⁻¹)
- \$12,055 seed cost

Outplanting Seedlings

- 40 ha (100 ac)
- 1000 ha⁻¹ desired
- 3 seeds per container
- 275000 seeds
- 143000 seeds kg⁻²
- 1.9 kg seeds needed
- \$57 kg⁻¹*
- \$108 seed cost



*Saved enough seeds to
grow another 14 million
plants (7000 ha)*

*Granite Seed and Erosion Control, Lehi, Utah (pers comm and website: 6 Apr 2015)

** Data from US Forest Service Bend Pine Seed Extractory (7 Apr 2015; Herriman))

Native Americans and Plants

History of:

- Food
- Shelter
- Textiles
- Medicine
- Ceremony



Native Plants on Indigenous Lands

Contemporary Management Needs:

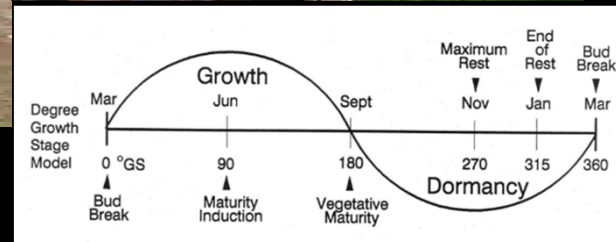
- Restoration
- Reforestation
- Wildlife
- Bioengineering
- Invasive Species
- Disturbance
- Climate Change
- Landscape



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



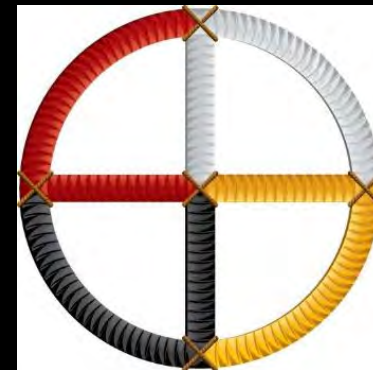
Contemporary Cultural Goals

- 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



Not an Easy Task

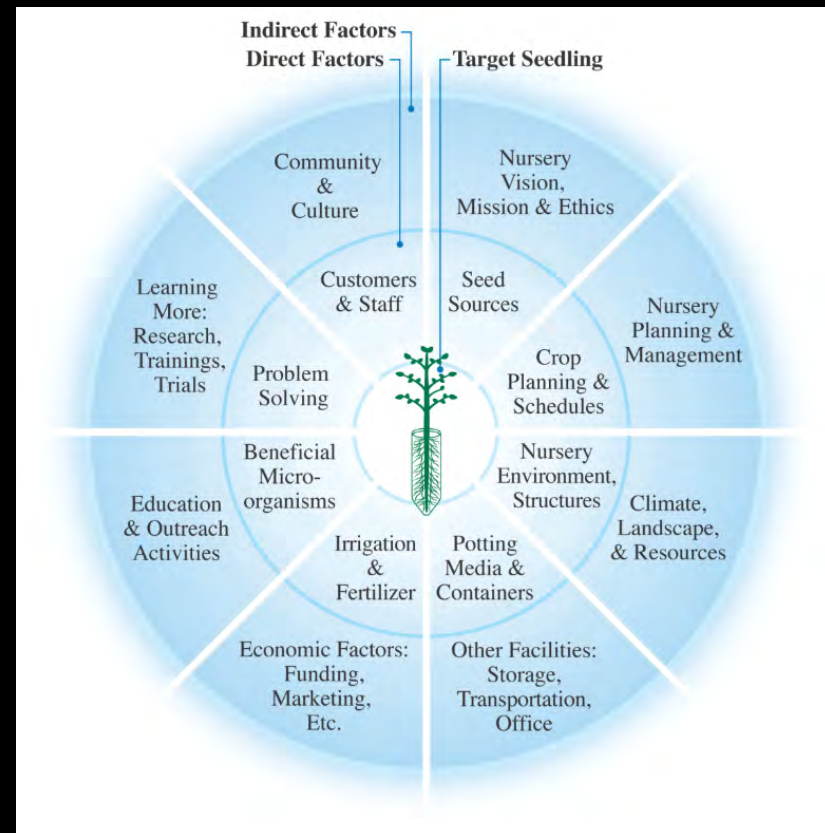
“Successful integration will require a thorough and thoughtful synthesis where concepts are considered within their cultural context and not as bits of knowledge or information to be inserted into the prevailing scientific framework.”

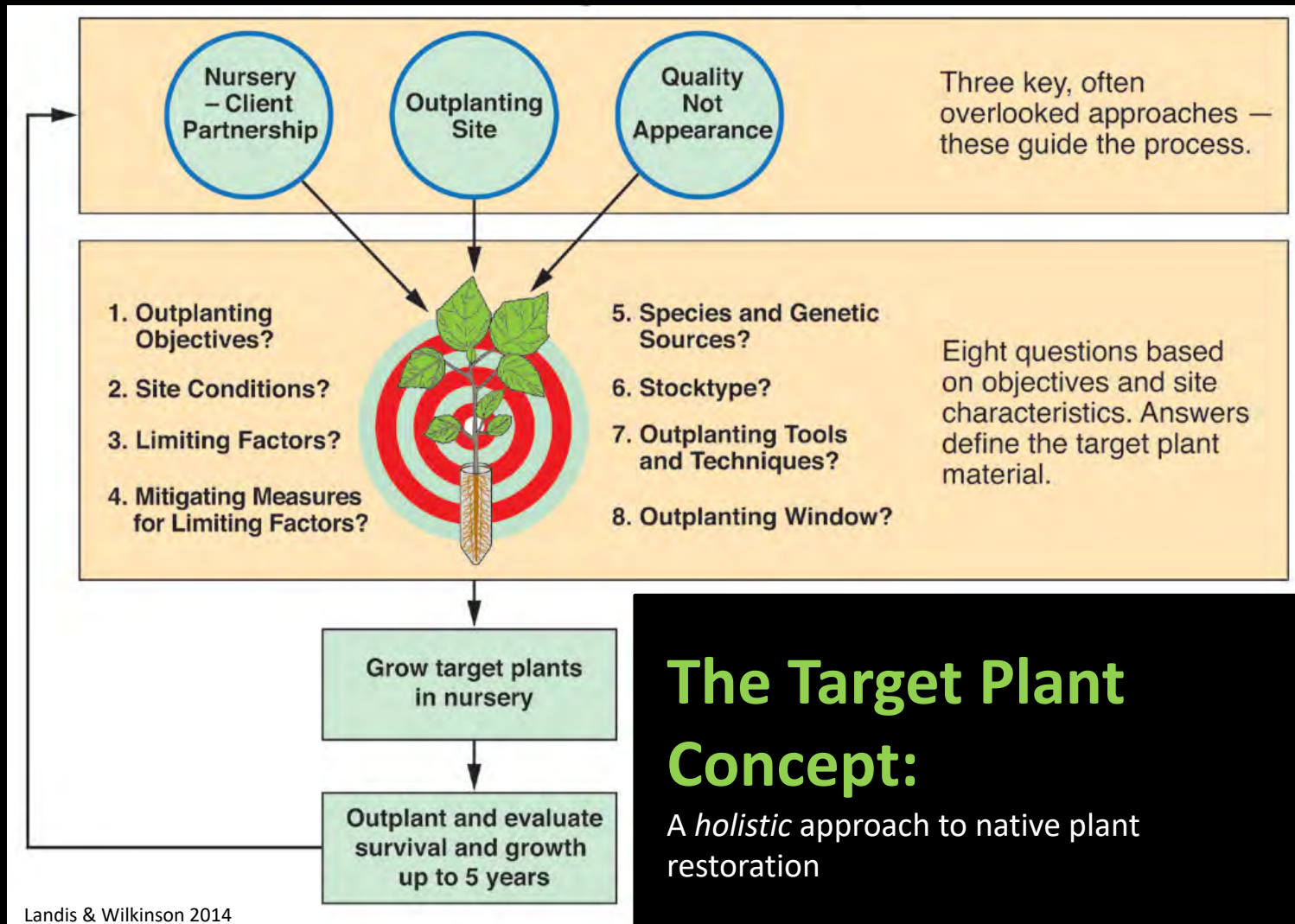
From: Indigenous peoples restoration network (SER online)

Acknowledging There Is No “One Size Fits All” Approach

Create space for:

- Creativity
- Adaptability
- Expansion
- Inclusion





Incorporating TEK in the TPC

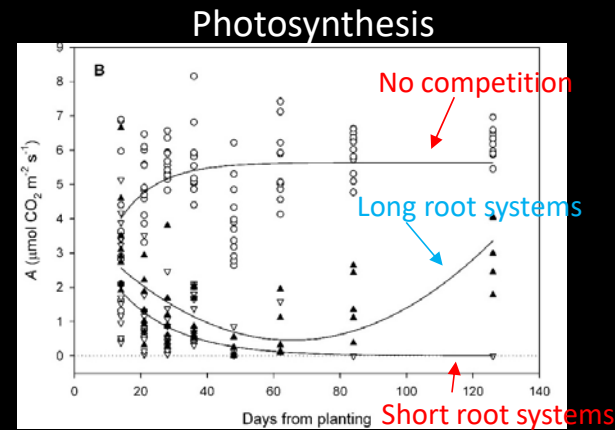
- An *opportunistic* approach to native plant use in restoration

Concept attributes:

1. Objectives
2. Site evaluation
3. Limiting factors
4. Mitigating measures
5. Genetics
6. Plant material
7. Tools & techniques
8. Outplanting window

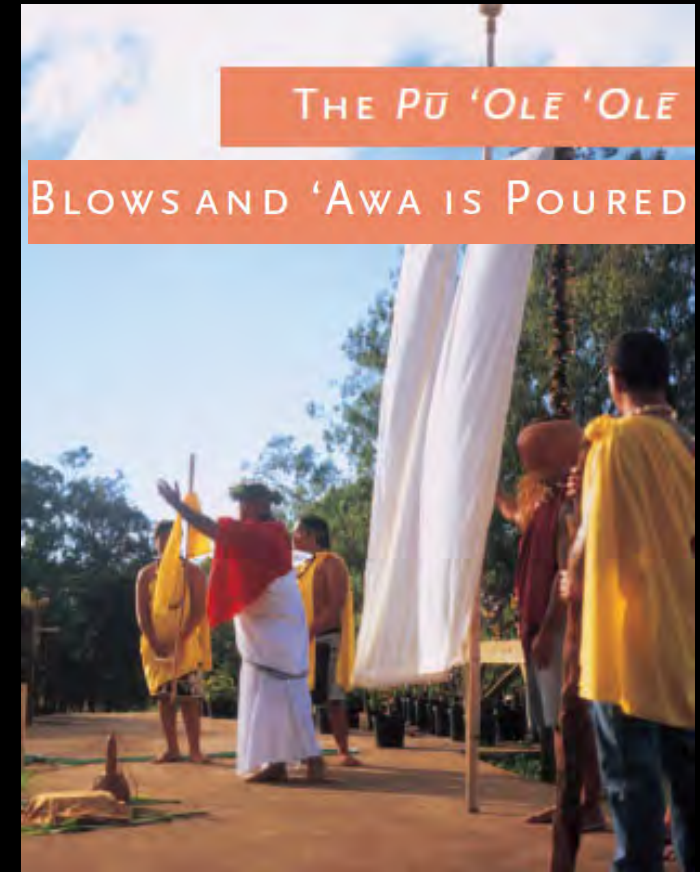
Indigenous inputs:

- Consultation
- Trophic level consideration
- Education opportunities
- Traditional plant selection
- Ceremony



- Not an easy task?
- It can be done!!
- It is being done!!

Incorporating TEK in the TPC



Medeiros 2003

Target Plant for success

How do we tackle the large amount of restoration and reforestation work we have ahead of us?

How do we incorporate the use of culturally significant plants respectfully?

- Nursery-produced plants are an excellent tool in the toolbox
 - Know how to use the tool correctly for the best success
 - Use the TPC to help guide the process
- Realize that cultural and scientific knowledge can work *together*
 - Using a holistic approach and valuing each contribution
- Know that criteria are interdependent
 - If one thing changes, everything must be reevaluated
- Respect that this is a continually evolving process
 - Constantly learning
- Engage community



Thank You!



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Forest Service
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