Plant material timelines

Growing nursery stock takes some planning

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

*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

Photo: Dr. R. Brandon Pratt, University of California
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

*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)

Saved enough seeds to grow another 14 million plants (7000 ha)
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
"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
The Target Plant Concept:
A holistic approach to native plant restoration

- Nursery - Client Partnership
- Outplanting Site
- Quality Not Appearance

Three key, often overlooked approaches — these guide the process.

1. Outplanting Objectives?
2. Site Conditions?
3. Limiting Factors?
4. Mitigating Measures for Limiting Factors?
5. Species and Genetic Sources?
6. Stocktype?
7. Outplanting Tools and Techniques?
8. Outplanting Window?

Eight questions based on objectives and site characteristics. Answers define the target plant material.

Grow target plants in nursery

Outplant and evaluate survival and growth up to 5 years

Landis & Wilkinson 2014
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

![Photosynthesis diagram with labels: No competition, Long root systems, Short root systems]
• Not an easy task?
• It can be done!!
• It is being done!!

Incorporating TEK in the TPC

Medeiros 2003
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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