Protocols for Sagebrush Seed Processing and Seedling Production at the Lucky Peak Nursery

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USDA Forest Service
Presentation
1. Seed Processing
2. Production of 1-0 BR Seedlings
3. Production of CTR Seedlings
4. Seed Storage
5. Collection NOT Presented (Client Process)
Why We are Processing Sagebrush Seed and Producing Seedlings:
1. Public lands experiencing uncharacteristically severe wildfires
   (2007 Murphy Fire in southern ID burned 600M ac)
2. “Nature abhors a vacuum”
   (accelerating re-establishment of desirable, native vegetation)
Basin big sagebrush

Mountain big sagebrush

Wyoming big sagebrush
Initial Seed Processing: Drying

- Early winter collection (Nov, Dec)
- Contains leaves, twigs, stems, seed, snow
- Dry on screen trays
- Aeration to prevent molding
- Can take several days
- Appears to be no problem with “too dry”
Initial Seed Processing: Manual Extraction

- Dry material is processed over Hance Model 36 Scalper
- Two screens (Top > seed size; Bottom < seed size)
- Hand-rubbing separates seed from stems
- M2B Clipper could be substituted for Scalper
Initial Seed Processing: Manual Extraction

• Process to 12-20% purity
• Suitable for aerial seeding
• Daily production = 100 gal (2 barrels) material
• “Not good enough:” inefficient, inconsistent results, untimely; difficult to meet clients’ time-critical deadlines (e.g. direct seeding, payment to collectors)
Initial Seed Processing: Mechanical Extraction

1. Literature Search
   - Debearder (N/A at LPN)
   - Hammermill (N/A at LPN)

2. Equipment Available at LPN
   - Wintersteiger Small Plot Combine
   - Field Harvest of Native Grasses/Forb Seed
Initial Seed Processing: Mechanical Extraction
• Combine functions as “Portable Seed Plant” (hammermill, scalper)
• Machine does work, we monitor performance
Initial Seed Processing: Mechanical Extraction
Process to 12-20% purity

• Suitable for aerial seeding
• Daily Production = 900 gal material (18 barrels material)
• “Predictable results:” efficient, consistent, timely; able to meet clients’ time-critical project deadlines (e.g. December aerial seeding)
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>65 (est.)</td>
<td>58 (est.)</td>
<td>12</td>
<td>93</td>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>Mechanical</td>
<td>2054</td>
<td>1830</td>
<td>12</td>
<td>93</td>
<td>5</td>
<td>410</td>
</tr>
<tr>
<td>Total</td>
<td>2119</td>
<td>1888</td>
<td></td>
<td></td>
<td>6</td>
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</table>
Final Seed Processing: Mech. Separation

• MTDC dry conifer dewinger separates seed from bloom
• Rubber flaps gently rub material
• Vacuum attached (to remove fine material)
Final Seed Processing: Air Separation

- Westrup Air Separator separates filled seed from empty seed and fine trash
- Final product is virtually pure seed (suitable for seedling production)
## Calendar of Seed Ripening/Processing Results

<table>
<thead>
<tr>
<th>Flower Date</th>
<th>Ripening Date</th>
<th>Pre-Ripe Color</th>
<th>Ripe Color</th>
<th>Lbs Seed/100 Lbs Material</th>
<th>Seeds/Lb</th>
<th>BR Plants / 1 Lb Seed</th>
<th>CTR Plants / 1 Lb Seed</th>
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</thead>
<tbody>
<tr>
<td>July</td>
<td>Nov</td>
<td>Light Brown</td>
<td>Black</td>
<td>4</td>
<td>2,000,000</td>
<td>100,000</td>
<td>100,000</td>
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</tbody>
</table>

## Sagebrush Timetable (One-Year Old Seedlings)

<table>
<thead>
<tr>
<th>Seed Collection</th>
<th>Aerial Seeding</th>
<th>BR Seeding</th>
<th>CTR Seeding</th>
<th>Seedling Packing</th>
<th>Field Planting</th>
</tr>
</thead>
</table>
BR Sagebrush Seedling Production: Seed Preparation

1. Prepare seed relative to desired seedling production
   • Use pure seed
   • Seed tests prior to sowing (germination, seeds/lb, purity)
   • Late-May spring sowing (no stratification necessary)
BR Sagebrush Seedling Production: Seed Preparation

2. Prepare seed relative to Oyjord Seed Drill
   • Divide total footage by selected pan revolution
   • Divide total seed volume by same quotient

<table>
<thead>
<tr>
<th>Seedlot</th>
<th>Calc. Total Ft</th>
<th>Total Seed Wt (gr)</th>
<th>Oyjord Setting</th>
<th>Oyjord Pan Distance (ft)</th>
<th>Units</th>
<th>Seed Wt/Unit (gr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS4608MDMB</td>
<td>3300</td>
<td>500</td>
<td>3-26</td>
<td>330</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>BS4106CFWY</td>
<td>400</td>
<td>48</td>
<td>3-20</td>
<td>200</td>
<td>2</td>
<td>24</td>
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</table>
BR Sagebrush Seedling Production: Seed Preparation
3. Prepare seed relative to Oyjord seed drill
   • Mix seed w/ ground alfalfa meal 1:1 (> weight, < static electricity)
   • Add pinch of orange dust (> visibility)
BR Sagebrush Seedling Production: Mechanical Seeding

- Fields are roto-tilled prior to seeding
- Oyjord Seed Drill (standard bareroot conifer seeder)
- 8 drill rows/48” wide seedbed
BR Sagebrush Seedling Production: Mechanical Seeding

- Revolving pan distributes seed
- Talc powder to reduce static
- Red seed mix drops in furrows
- Seeding density: 160-180 seeds/square foot
BR Sagebrush Seedling Production: Mechanical Seeding

• Apply sand mulch immediately following seeding
• Sand mulch depth ¼”
BR Sagebrush Seedling Production:
- Ample irrigation
- Germination w/in 7 days
BR 1-0 Sagebrush Seedling Production (M Seedlings)

<table>
<thead>
<tr>
<th>Year</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
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<tbody>
<tr>
<td></td>
<td>1500</td>
<td>1000</td>
<td>2000</td>
<td>1200</td>
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</table>
Minimum Specifications BR 1-0 Seedling:
• 8” shoot length
• 8” root length
• 3 mm caliper
BR Sagebrush Seedling
Production: Storage
• Fall Harvest (early Nov)
• Irrigate fields < harvest
• Keep foliage dry (molding issue)
• No added moisture in box
• Waxed boxes, no bag
• Freezer store at 25-28F
• Quick freeze; quick thaw
CTR Sagebrush Seedling Production
• Grown in a retractable-roof Cravo greenhouse (well-ventilated)
• Peat/vermiculite media (75/25)
• Pure seed w/ no filler (seeds/cell function of germ)
• Seeding in mid-May
• Mechanically seed w/ Precision Needle Seeder
• Fabric mulch (>moisture retention, moderates soil temperatures 5F); remains in place until germination @ 90%
CTR Sagebrush Seedling Production
- Typically 6.3 cu in container
- Will easily get “leggy;” will easily mold
- Fertilize w/ 4-25-35 (low N); 40 ppm N
- Minimum caliper 2mm
- FY2011 production: 130M
CTR Sagebrush Seedling Production: Storage
• 10 plugs/”baggie”
• 350 seedlings/box
• Seedlings oriented vertically (prevents molding of foliage)
• Non-waxed box w/ bag
• Freezer storage (25-28F)
• Usually pack-out in mid-Nov
CTR Sagebrush Seedling Production: Misc.

Low-Tech Sagebrush Seeder:
Salt Shaker used to “fill-in”

Control Bird Predation:
“Trap and Release” Method
Sagebrush Seed Storage:

- Pure Seed stored in 4 mil bags
- Moisture Content < 10%
- Seed Freezer temp 10F
- Long-term viability appears possible (Seedlot BS61990005):
  - 1999 Germ. = 60%
  - 2009 Germ. = 59%
- Research by RMRS (Nancy Shaw)
Field Performance of 11 Yr-Old BS Seed (2 Rightmost Seedbeds)

Germination: 59%
Seeding Density: 123 seeds per LF
Seedling Density: 11 seedlings per LF
Questions?