MPB Decision Support Tool (DST)  
Prototype Development  

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MPB Ecology Program Workshop

4 topics to be Addressed:
MPB Ecology Program Workshop

4 topics to be Addressed:

• *MPB Monitoring Program*
MPB Ecology Program Workshop

4 topics to be Addressed:

- *MPB Monitoring Program*
- *MPB DST Development*
4 topics to be Addressed:

- **MPB Monitoring Program**
- **MPB DST Development**
- **MPB DST Enhancement Plan**
4 topics to be Addressed:

- **MPB Monitoring Program**
- **MPB DST Development**
- **MPB DST Enhancement Plan**
- **MPB DST Demo**
MPB Monitoring
MPB Monitoring

MPB Monitoring Program:
MPB Monitoring Program:
• Detailed Plot Monitoring Program
  – Quantify tree and non-tree responses to MPB attack
MPB Monitoring Program:

- **Detailed Plot Monitoring Program**
  - Quantify tree and non-tree responses to MPB attack

- **Basic Plot Monitoring Program**
  - Monitor the spread of MPB in attacked stands
MPB Monitoring Program:

- 240 existing PSP’s selected from among SRD and Company plot programs
MPB Monitoring Program:

• 240 existing PSP’s selected from among SRD and Company plot programs

• Selection Criteria:
  – Known to be in stands already attacked by MPB
  – Located in areas and stand types at high risk for MPB attack
MPB Monitoring

Detailed Plot Monitoring Program
Detailed Plot Monitoring Program

- 149 of 240 plots measured in 2008
MPB Monitoring

Detailed Plot Monitoring Program

• 149 of 240 plots measured in 2008
• 20 of 149 remeasured in 2010
Detailed Plot Monitoring Program

- 149 of 240 plots measured in 2008
- 20 of 149 remeasured in 2010
- Assessed:
  - Trees, saplings, regeneration
  - Non-tree vegetation
  - Ecosite
  - MPB attack (# & location of pitch tubes)
  - Cone serotiny
  - Lichen presence and abundance
Basic Plot Monitoring Program
Basic Plot Monitoring Program

• 122 of 240 plots measured in 2009 or 2010
Basic Plot Monitoring Program

- 122 of 240 plots measured in 2009 or 2010
- 20 of 122 remeasured in 2010
Basic Plot Monitoring Program

• 122 of 240 plots measured in 2009 or 2010
• 20 of 122 remeasured in 2010

• Assessed:
  – Abundance (number of trees) and Severity (number of pitch tubes) of MPB attack
  – Assessed in PSP’s, and in stands surrounding PSP’s
DST Objective is to:

“ ........ project stand conditions under a range of mortality, secondary structure and regeneration scenarios ........ “
DST Development Steps
1. Describe Existing Stands
DST Development Steps

1. Describe Existing Stands

2. Define Levels of MPB Attack
DST Development Steps

1. Describe Existing Stands
2. Define Levels of MPB Attack
3. Define Salvage Treatments
DST Development Steps

1. Describe Existing Stands

2. Define Levels of MPB Attack

3. Define Salvage Treatments

4. Define Regeneration Assumptions
1. Describe Existing Stands
2. Define Levels of MPB Attack
3. Define Salvage Treatments
4. Define Regeneration Assumptions
5. Post-Attack Stand Projections
DST Development Steps

1. Describe Existing Stands
2. Define Levels of MPB Attack
3. Define Salvage Treatments
4. Define Regeneration Assumptions
5. Post-Attack Stand Projections
6. DST Application Development
1. Describe Existing Stands

2. Define Levels of MPB Attack

3. Define Salvage Treatments

4. Define Regeneration Assumptions

5. Post-Attack Stand Projections

6. DST Application Development

7. User Feedback and DST Enhancement
1. Describe Existing Stand Conditions
1. Describe Existing Stand Conditions

<table>
<thead>
<tr>
<th>Stratum Number</th>
<th>Ecosite</th>
<th>Natural Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b, c</td>
<td>Any</td>
</tr>
<tr>
<td>2</td>
<td>d (c)</td>
<td>UF</td>
</tr>
<tr>
<td>3</td>
<td>d (c)</td>
<td>LF</td>
</tr>
<tr>
<td>4</td>
<td>e (d)</td>
<td>SA/UF</td>
</tr>
<tr>
<td>5</td>
<td>e (d)</td>
<td>LF</td>
</tr>
<tr>
<td>6</td>
<td>f (e)</td>
<td>UF</td>
</tr>
<tr>
<td>7</td>
<td>f (e)</td>
<td>LF</td>
</tr>
<tr>
<td>8</td>
<td>h (f)</td>
<td>Any</td>
</tr>
</tbody>
</table>

Mesic Moisture Regime: Drier → Wetter
Rich Nutrient Regime: Poorer → Any
1. Describe Existing Stand Conditions

Result:
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata

Represent the most common ‘typical’ stand types found in the 8 project strata
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata

Represent the most common ‘typical’ stand types found in the 8 project strata

Attributes
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata

Represent the most common ‘typical’ stand types found in the 8 project strata

Attributes

1 layer vs 2 layer
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata

Represent the most common ‘typical’ stand types found in the 8 project strata

Attributes

   1 layer vs 2 layer

   Species composition by layer
1. Describe Existing Stand Conditions

Result:

18 unique ‘Stand Types’ across the 8 Strata

Represent the most common ‘typical’ stand types found in the 8 project strata

Attributes

1 layer vs 2 layer

Species composition by layer

Plot data and Ecosite Guides used for densities, heights, Site Index
1. Describe Existing Stand Conditions

In Terms Growth Models Can Understand

GYPSY

Stand Age
Site Index
Density by Species

MGM

Stand Age
Site Index
Density by Species
Height: Mean, Std. Dev.
DBH: Mean, Std. Dev.
2. Define Levels of MPB Attack
2. Define Levels of MPB Attack

- 0%
- 25%
- 50%
- 100%
3. Define Salvage Treatments
3. Define Salvage Treatments

No:
No removal of trees, no matter the degree of attack

Yes:
Removal of all attacked trees, no matter the degree of attack
4. Define Regeneration Assumptions
4. Define Regeneration Assumptions

Where undisturbed by salvage, understory continues to grow
4. Define Regeneration Assumptions

Areas disturbed by salvage recruit natural Pine regeneration at rates observed in FGYA RLP study
4. Define Regeneration Assumptions

Option:

Supplemental planting of 2000 *Pine* trees/ha in salvage - disturbed areas
4. Define Regeneration Assumptions

Option:

Scarification / site preparation to promote natural regeneration

Only after salvage in 100% MPB attack
5. Post Attack Stand Projections
5. Post Attack Stand Projections

Existing Condition
- Stratum, Stand Type, Age

Beetle Kill
- 0 %, 25 %, 50 %, 100 %

Alberta’s Growth Models:
- GYPSY
- MGM

Regeneration Assumptions
- Natural, Planting, Site Prep

Salvage Treatments
- No, Yes
6. DST Application Development
6. DST Application Development

- Web-based application
6. DST Application Development

- Web-based application

- Users are given User ID’s and Passwords by System Administrator
6. DST Application Development

- Web-based application

- Users are given User ID’s and Passwords by System Administrator

- Archived ‘Answer Database’ containing results from all MGM and GYPSY projections
6. DST Application Development

- Users specify:
6. DST Application Development

• Users specify:
  • Model preference (MGM vs GYPSY)
6. DST Application Development

- Users specify:
  - Model preference (MGM vs GYP SY)
  - Stratum (one of 8 possible)
6. DST Application Development

- Users specify:
  - Model preference (MGM vs GYPSY)
  - Stratum (one of 8 possible)
  - Stand Structure (pre-defined for each Stratum)
6. DST Application Development

• **Users specify:**
  - Model preference (MGM vs GYPSY)
  - Stratum (one of 8 possible)
  - Stand Structure (pre-defined for each Stratum)
  - Data Version
6. DST Application Development

- Users specify:
6. DST Application Development

- Users specify:
  - Current Age Class (75, 120, 160)
6. DST Application Development

- Users specify:
  - Current Age Class (75, 120, 160)
  - MPB Mortality Level (0, 25, 50, 100%)
6. DST Application Development

• Users specify:
  • Current Age Class (75, 120, 160)
  • MPB Mortality Level (0, 25, 50, 100%)
  • Intervention (determined by MPB %)
6. DST Application Development

• **Users specify:**
  
  • Current Age Class (75, 120, 160)
  
  • MPB Mortality Level (0, 25, 50, 100%)
  
  • Intervention (determined by MPB %)
    • No Salvage (Base Run)
6. DST Application Development

- **Users specify:**
  
  - Current Age Class (75, 120, 160)
  
  - MPB Mortality Level (0, 25, 50, 100%)
  
  - Intervention (determined by MPB %)
    - No Salvage (Base Run)
    - Salvage (implies Natural PL Regen)
6. DST Application Development

- **Users specify:**
  - Current Age Class (75, 120, 160)
  - MPB Mortality Level (0, 25, 50, 100%)
  - **Intervention (determined by MPB %):**
    - No Salvage (Base Run)
    - Salvage (implies Natural PI Regen)
    - Salvage + Supplemental Planting
6. DST Application Development

- **Users specify:**
  - Current Age Class (75, 120, 160)
  - MPB Mortality Level (0, 25, 50, 100%)
  - **Intervention (determined by MPB %)**
    - No Salvage (Base Run)
    - Salvage (implies Natural PL Regen)
    - Salvage + Supplemental Planting
    - Salvage + Supplemental Planting + Site Preparation (only for 100% Kill and Salvage)
6. DST Application Development

- Application queries the ‘Answer Database’ for Scenarios specified by the user
6. DST Application Development

- Application queries the ‘Answer Database’ for Scenarios specified by the user
- Reports results from the run that projects the Scenario specified by the user
6. DST Application Development

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- Reports results from the run that projects the Scenario specified by the user

- Tabular and graphic output of:
6. DST Application Development

- Application queries the ‘Answer Database’ for Scenarios specified by the user.

- Reports results from the run that projects the Scenario specified by the user.

- **Tabular and graphic output of:**
  - Mensurational stand growth parameters for 100 year projection period.
6. DST Application Development

- Application queries the 'Answer Database' for Scenarios specified by the user

- Reports results from the run that projects the Scenario specified by the user

- Tabular and graphic output of:
  - Mensurational stand growth parameters for 100 year projection period
  - Wood quality parameters for first 10 years of projection
6. DST Application Development

- Users can:
6. DST Application Development

• Users can:

  • View results (tabular)
6. DST Application Development

• **Users can:**

  • View results (tabular)

  • Report results (tabular + graphic)
6. DST Application Development

- Users can:
  - View results (tabular)
  - Report results (tabular + graphic)
  - Save Scenario specifications
6. DST Application Development

- Users can:
  - View results (tabular)
  - Report results (tabular + graphic)
  - Save Scenario specifications
  - Export results to Excel
6. DST Application Development

• Users can:

  • View results (tabular)
  • Report results (tabular + graphic)
  • Save Scenario specifications
  • Export results to Excel
  • Print results report to PDF
7. User Feedback and DST Enhancement
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• User group given opportunity to use DST
7. User Feedback and DST Enhancement

- User group given opportunity to use DST

- User feedback solicited with on-line Response Facility
7. User Feedback and DST Enhancement

- User group given opportunity to use DST
- User feedback solicited with on-line Response Facility
- User Feedback Workshop
7. User Feedback and DST Enhancement

- User group given opportunity to use DST
- User feedback solicited with on-line Response Facility
- User Feedback Workshop
- Enhancement Plan developed to address User Feedback issues
DST Enhancement Plan
Suite of Stand Types Available
Suite of Stand Types Available

- Sw and Fb understories not currently in DST
Suite of Stand Types Available

- Sw and Fb understories not currently in DST

- ‘No Salvage’ may become an important management prescription if Sw and Fb can be shown as important in supporting medium-term timber supplies
DST Enhancement Plan

Applicability of Starting Conditions
Applicability of Starting Conditions

- Starting densities, ages, heights did not always reflect the kinds of stands that users need to address
Applicability of Starting Conditions

• Starting densities, ages, heights did not always reflect the kinds of stands that users need to address

• Currently no ability to enter ‘custom’ starting conditions to reflect local conditions
DST Enhancement Plan

Regeneration response in Unsalvaged Stands
DST Enhancement Plan

Regeneration response in Unsalvaged Stands

• Currently, no natural regeneration of PI after MPB attack in the absence of Salvage
Regeneration response in Unsalvaged Stands

• Currently, no natural regeneration of PI after MPB attack in the absence of Salvage

• Based largely on BC published literature
Regeneration response in Unsalvaged Stands

• Currently, no natural regeneration of PI after MPB attack in the absence of Salvage

• Based largely on BC published literature

• Current assumptions are conservative and likely an under-estimate of natural regeneration expected after MPB
DST Enhancement Plan

Shelf-Life of MPB killed timber
Shelf-Life of MPB killed timber

• Currently, post-MPB Wood Quality parameters are based on published observations in BC
Shelf-Life of MPB killed timber

• Currently, post-MPB Wood Quality parameters are based on published observations in BC

• Anecdotal evidence that Alberta responses are different
DST Enhancement Plan

Shelf-Life of MPB killed timber

• Currently, post-MPB Wood Quality parameters are based on published observations in BC

• Anecdotal evidence that Alberta responses are different

• More severe Checking, faster Fall Down
DST Enhancement Plan

Non-tree vegetation responses in MPB Stands
Non-tree vegetation responses in MPB Stands

• DST does not currently report any non-tree vegetation responses after MPB
DST Enhancement Plan

Non-tree vegetation responses in MPB Stands

• DST does not currently report any non-tree vegetation responses after MPB

• 2010 field measurement provide first opportunity to describe non-tree vegetation response after MPB
DST Enhancement Plan

Non-tree vegetation responses in MPB Stands

• DST does not currently report any non-tree vegetation responses after MPB

• 2010 field measurement provide first opportunity to describe non-tree vegetation response after MPB

• Use/application of non-tree vegetation trends have not been defined
DST Enhancement Plan

MPB attack and mortality assumptions
MPB attack and mortality assumptions

- DST currently only addresses 4 discrete levels of MPB attack (0, 25, 50, 100%)
MPB attack and mortality assumptions

- DST currently only addresses 4 discrete levels of MPB attack (0, 25, 50, 100%)

- An intermediate level of 75 – 80% is required since that is a ‘typical’ level being observed in Alberta
DST Enhancement Plan

Validation of GYPSY 3 Layers
DST Enhancement Plan

Validation of GYPSY 3 Layers

• DST projections required a 3-layer version of GYPSY
DST Enhancement Plan

Validation of GYPSY 3 Layers

• DST projections required a 3-layer version of GYPSY

• Developed by Huang in response to DST request
Validation of GYPSY 3 Layers

• DST projections required a 3-layer version of GYPSY

• Developed by Huang in response to DST request

• GYPSY 3-Layers continues to be un-validated, and is not considered ‘approved’ by Aberta SRD