

# **Tolko Industries (Okanagan) Mountain Pine Beetle Impact Analysis**

***Summary Document  
Version 1***

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## 1 Model Extent and Purpose

### Goals:

- Demonstrate the potential to use spatial forest estate modeling to assist with decision making around the mountain pine beetle issue by:
  - Exploring a possible future scenario related to mountain pine beetle impacts.
  - Providing output that describes the changes to the land base and associated impacts to non timber resource objectives.
  - Providing output to indicate the rate of recovery that would occur after impacts occur.
- Understand the power and limitation of the tool/process to assist with decision-making.

Geographic Scope: Tolko operating area in Okanagan TSA as of July 1, 2004 (includes Weyerhaeuser trade area). Only the existing Tolko operating areas will be modeled for timber harvesting – shared LU/watersheds will have objectives applied on a prorated basis.

Temporal Scope: Modeling will explore impacts and recovery over the next 20 years (2004-2024) using single year periods.

## 2 Timber Harvesting Land Base Definition

The timber harvesting land base recently defined in the Okanagan Shuswap IFPA analysis will be used once unstable terrain identified in terrain mapping is also removed. This version of the THLB is considered to best reflect the land base over which Tolko will be implementing harvesting. The crown forested land base (CFLB) will also be obtained from the IFPA work.

## 3 Inventory Data

The 2004 vegetation files provided by the Southern Interior Region will be used. These files have been updated to Jan 1, 2002 for disturbance and Jan 1, 2004 for attributes. Prior to modeling, disturbance will be updated to Jan 1, 2004 using Tolko's logged block GIS data. Data was obtained from 'Results' to provide attributes for recently updated openings.

### Additional inventories used:

- 2003 Okanagan BEC files
- Landscape Units from LRMP
- 2004 Parks and Protected Areas
- Okanagan Shuswap LRMP RMZ files
- Fly Hills Pine Marten 'Blocks' (subdivides LRMP RMZ)
- 2004 Interim Ungulate Winter Range Planning Cells (subdivides LRMP RMZ)
- 2003 OGMAs for Salmon Arm and Vernon Areas
- TRIM derived Slope Classes (0-30%, 30-50% and 50%+)
- Planning Cells
- Beetle hazard and incidence (2004)
- Watersheds, subbasins, sensitive area designations (H35 areas)

The fields shown below are included in the modeling resultant. These fields have been included because they are required for modeling (affect harvesting constraints) or they are important reporting fields.

Theme	Layer Name	Key Fields to Use in resultant
Tolko Operating Area	operator_dis	oper (call it Tolko_op)
Biogeoclimatic Variant	abec_bc	beclabel (no ID)
Landscape Units	o_lu	lu_name (no ID)
Watersheds / H35 line	watersheds	subbasin, basin, cws (no ID)
Planning Cells	pcell_tok	Pcell
Fish RMZ	fish_rmz	fish (call if FishRMZ) (no ID)
Broodstock Collection Sites	o_bd_stk	bd_stock (no ID)
Goat RMZ	goat	ID, goat_hab, plateau (call if goat_plateau)
Moose RMZ	moose	Moose ID
Pine Marten RMZ	p_martn	poly_num (call it Pine_Mar_Poly)
Visuals RMZ	o_vqo	vac, rvqo, vqo_zone, O_VQO_ID
Parks	bc_parks	pa_name (no ID)
Woodlots	sir_woodlots	ID, ten_type
Lake Classification Project	lake_name	ID, l_class, l_vqo
Caribou RMZ	caribou_nov	ID, rmz_type (call it Caribou)
Moose Management Units	moo_mu	ID, MMU
Mule Deer Winter Range (2004 Interim)	md_wr	ID, mdwr, md_snow,
Grizzly	gbmu	gbmu_name
Recreation Trails Buffers	rec_trails	name (call it Trail_name), category (call it Trail_Cat)
Waster Intakes	bwater_supply	bwater_supply (no ID)
Forest Cover	fc_veg	feature_id, fc_tag, inv_typgrp, site_index, proj_age, spc_1, crown_clos, NPD_desc
THLB/CFLB	ok_netdown	Class (call it Land_type)
Beetle Risk	beetle_risk	beetle_risk
2002 FDP	fdp_2002_tok	lic_name, c_status, alt_status, log_year
Combined Blocks Layer	all_blocks	Status (Call it Tolko_bk_stat), Age (call it Tolko_SR_age)
OGMAs	ok_ogmas	OGMA
Slope theme	tolko_slp_cls	slope_class (0-30, 31-50, 51+)
Terrain Stablilty	Ttsm_tok	slpstab_cls = 5

## 4 Growth and Yield Assumptions

TSR2 Analysis Unit definitions, yield projections, and minimum harvest ages will be used. These will provide conservative estimates of managed stand volumes relative to the IFFPA assumptions but this analysis is only focused on existing stands.

Height/age relationships were developed for each AU using SIBEC adjusted site indexes by assuming all sites are zonal. These height age curves will be used for ECA calculations and height based forest cover requirements.

## 5 Integrated Resource Management Assumptions (Landscape level)

### 5.1 LRMP General Resource Management Strategies (Measureable)

#### *5.1.1 Biodiversity*

- OGMA - modeled as spatial no harvest zones as indicated by finalized coverages.
- WTP's / CWD - not modeled as it is a stand level issue.

#### *5.1.2 Fish and Aquatic Habitat*

- LMZ of lakes modeled as per LRMP VQO's.
- Class A lakes have a 210m reserve zone.

#### *5.1.3 Riparian / Wetlands*

- Enhanced Riparian - Reserves required on S4's, S5's and large S6's. Assume the enhanced riparian is addressed in OGMA's and riparian buffering. Riparian reserve zones are identified in the THLB/CFLB coverage and no harvesting will occur in these areas.

#### *5.1.4 Wildlife (Fisher / Marten)*

- No WHA's are included in the model as none exist in Tolko's operating area.
- Fisher/marten guidelines to be left as stand level issues.

#### *5.1.5 Rare Sites / Red and Blue Listed Species*

- There are no forest cover requirements associated with these currently so they are not represented in the model. These issues will be addressed by stand level prescriptions.
- A detailed CDC coverage of rare element occurrences was obtained but it was very limited in scope and did not overlap with the THLB portion of Tolko's operating area. These areas would have been used for netdown if overlap had occurred. The more general CDC coverage of potential areas was too broad for use in a netdown procedure.

### 5.2 LRMP Resource Management Zones (Measurable Objectives)

#### *5.2.6 Caribou RMZ*

- No core habitat areas exist in Tolko's operating area.
- The upper Shuswap LU contains area in the Caribou RMZ - OGMA placement is meant to address the concern in this area.
- Movement corridors - maintain contiguous movement corridors across corridors (30% >16m)

#### *5.2.7 Elk RMZ*

- Does not occur in Tolko operating area or the LU's in which it operates.

#### *5.2.8 Mountain Goat RMZ*

- Winter range (goat\_wr):
  - No plateau habitat exists in Tolko's operating area.
  - Outside of the plateau habitat, the goat\_wr areas have harvest limited to selection (up to 50% BA) or small clearcuts on a 3 pass system using a 150 yr rotation (<5 ha blocks).

### 5.2.9 Mule Deer RMZ

- Need to maintain a distribution of forage and cover within planning cells. An interim planning cell coverage was obtained from Jeff Morgan in mid July 2004. Forest cover constraints will be met in each individual planning cell.
- Shallow Snowpack:
  - Stand level issues only so not modeled (retain as clumps or patches or vet trees across openings to 15% of the area). Non Fd and stems <30cm dbh can be removed from the patches.
- Moderate Snowpack:
  - 33% of the stands must be suitable for snow interception cover at all times,
    - use greatest % Fd, and oldest /tallest stands first
    - use highest crown closure, must be at least 40%,
    - up to 50% can come from nonTHLB if it has >50% Fd, >120 yrs old, CC>40%, and slopes <80%. More is ok if that is where the best attributes are.
  - 2/3rds of retention area can be managed using selection systems (from below) that remove 20% every 40 yrs (200 yr rotation). Flexibility exists when stands are non Fd leading.
- Deep / Very Deep Snowpack
  - 60% of the stands must be suitable for snow interception cover at all times,
    - use greatest % Fd, must be at least 50%, and the oldest/tallest stands first
    - use highest crown closure, must be at least 50%,
  - 1300 ha of suitable Deer WR stands can be accessed irrelevant of forest cover guidelines – locations agreed upon with DEO. (not considered in model)
- Implementation: - only Moderate and Deep snow depths have been considered for modeling. In the moderate and deep snow zones, each winter-range planning cell has been selected, and the forest stands ranked according to suitability (Scoring system shown below). Priority is given to Fd leading stands, oldest stands, and highest crown closure stands. In each cell, the highest ranking stands are selected for winter range until the target percentage is reached within that cell. These selected stands are then established in the model as 'No Harvest' areas, and the rest of the cell is available for harvesting.

#### Mule Deer Winter Range Stand Score Matrix

Inventory Type Grp (Species)	Non Fd [0 pts]	FdH, FdS, FdDec [6 pt]	FdPI, FdPy, FdLw [7 pts]	Fd>80% [8 pts]
Stand Age	0-60 yrs [0 pts]	61-100 yrs [6 pt]	101-140 yrs [8 pts]	>140 yrs [10 pts]
Crown Closure	0-40% [0 pt]	41-60% [2 pt]	>60% [3 pts]	

Example scores:

1. Old Fd leading stand scores 17-21 pts,
2. 65 yrs old Fd leading stand scores 14-19 pts,
3. Old stand with little Fd scores 11-13
4. Young stands with lots of Fd score 8-14

### 5.2.10 Moose RMZ

- In RMZ, minimum of 33% in stands  $\geq$  16m tall, with at least 50% to occur in patches > 20 ha. Can all come from non-THLB if possible.
- In MMU's, minimum of 40%  $\geq$  16m tall (MMU's created using wetlands identified by John Jobst)

### 5.2.11 Pine Marten (Fly Hills RMZ)

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- In each of the identified 'blocks' in the RMZ, maintain 33% >= 19m tall.

### 5.2.12 Grizzly RMZ

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- 10% of each planning unit must be > 19.5 m in height. No planning units are available so constraint will be modeled over the 3 large population ranges.

### 5.2.13 Recreation RMZ – Regionally Significant Trails

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- Category A trails to have a 100m buffer either side where only partial harvesting is permitted (66-75% of BA retained, or patches that leave 90% of the corridor >3m high). For this analysis, no harvesting will be shown in the buffer area with the recognition that operational planning can enter this area.

### 5.2.14 Visuals

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- Zone 1 – Manage to VQO's (FPC scenic areas)

VAC	Visual Quality Objective					
	R		PR		M	
	VEG Ht	% Below VEG	VEG Ht	% Below VEG	VEG Ht	% Below VEG
L	6.5	7.5	6.5	12.5	6.5	13.8
M	5.5	10.0	5.5	15.0	5.5	17.5
H	4.5	12.5	4.5	17.5	4.5	21.3

\* % areas are to be applied in planimetric view.

- Zone 2 – Manage as visually sensitive areas so that activities blend with the natural landscape
- Zone 3 – Manage foreground around trails to reduce impacts. No specific viewpoints but there are visual concerns related to dispersed recreation use (i.e. hiking).

### 5.2.15 Lakeshore Management Zones

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- Manage as per VQO's established in lake classification coverage.
- Walk-in lakes are not currently available as a coverage and the buffer zone will not be addressed.

### 5.2.16 Terrain Stability

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- All Class 5 slope stability class polygons will be excluded from the THLB by the netdown.

## 5.3 Other Integrated Resource Issues

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### 5.3.17 Watersheds

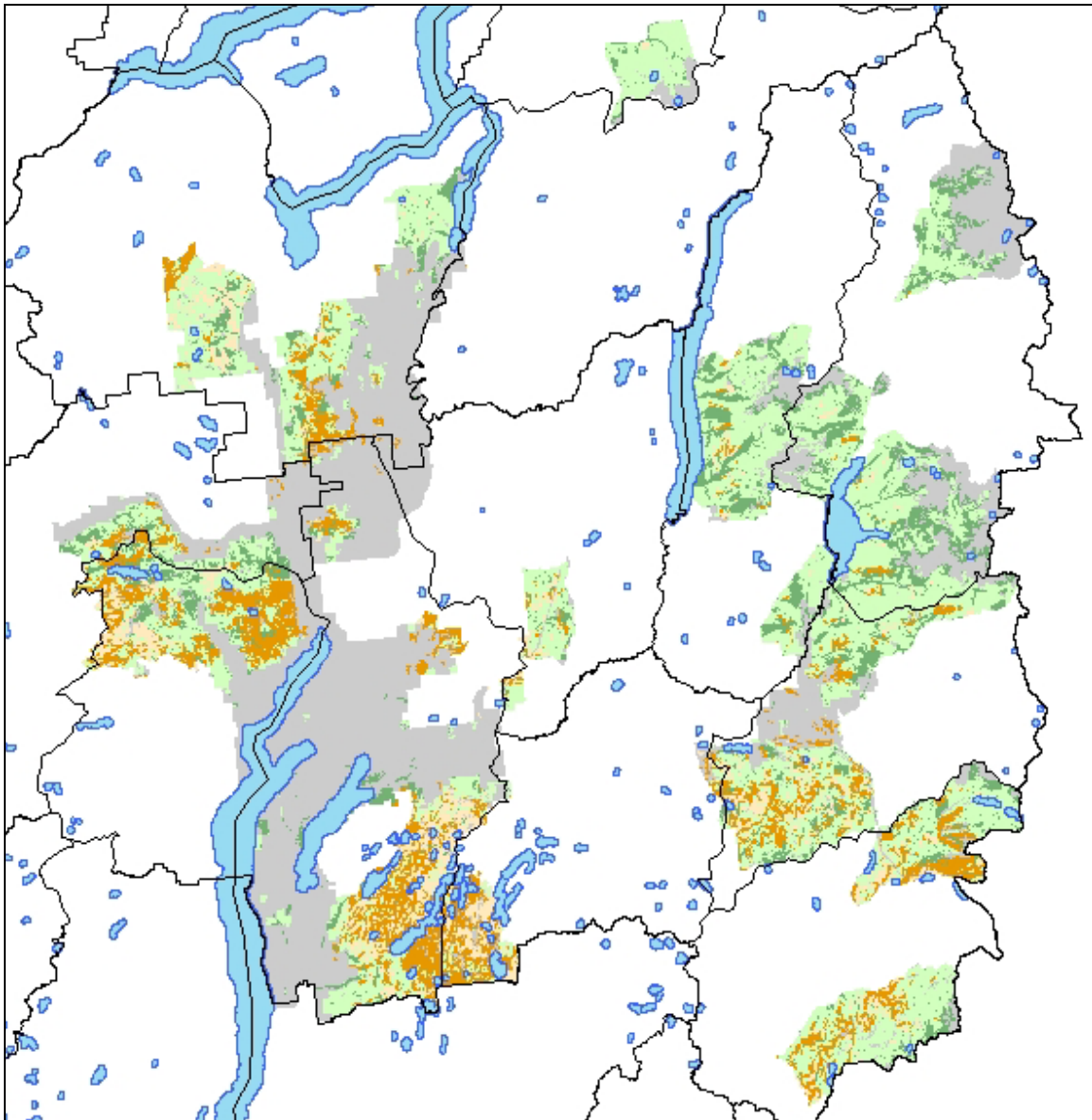
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- ECA's will modeled in three ways for watersheds: above H40 (30% ECA), below (40%) and total (40%). The gross area of the watershed is used in the calculation.
- ECA's also modeled at subbasin level where they are available. See table below for detail.

Watershed	CWS	Subbasins	ECA Constrained	ECA Tracked	Area In Tolko Op Area (Gross ha)
Bonneau		5	30%		3353
Brewer - Craster			35%		3688
Bx	Y	5	30%		4539
Cascade				Y	3059
Chase		2	30%		2795
Cherry				Y	10951
Clarke				Y	2773
Coldstream	Y	4	30%		1251
Creighton		2	30%		870
Deer Community Watershed	Y		20%		1816
Duteau	Y	4	30%		4613
East Canoe CWS	Y		30%		22
Equesis		3	30%		20186
Ferry		3	30%		7505
Finlayson				Y	1605
Half-Mile				Y	1064
Heckman				Y	5790
Holstein				Y	1101
Irish CWS	Y		30%		864
Kate				Y	4471
Keefer				Y	10130
Kelowna	Y	3	30%		3761
Larch Hills			30%		3516
Latewhos				Y	5033
Mission	Y	1	30%		3638
Mohr				Y	1075
Monashee Pass				Y	1510
Outlet				Y	6193
Oyama CWS	Y		30%		2272
Putnam		2	25%		788
Reiter				Y	1733
Salmon River	Y	7	30%		29015
Smyth				Y	1917
Specht				Y	2163
Starr				Y	4437
Sugar				Y	2502
Torrent				Y	2827
Vance		4	30%		3300
Vernon	Y		30%		9151
Waterloo				Y	2030
White Cliff CWS	Y		30%		177
Winnifred				Y	10936
Yard				Y	6577
Grand Total					196994

## 6 Mountain Pine Beetle Modeling Assumptions

1. Susceptible stands are those with >30% PI and greater than 60 yrs old. Based on polygon specific forest cover data. Susceptible stands are shown in orange below.



2. MPB impacts implemented on all susceptible CFLB stands (private lands and WL's remain as they are currently for ECA calcs).
3. All constraints are turned off and outcomes are tracked (VQOs, MDWR, ECA's, etc). All impacts will be tracked as discussed below in 5.
4. Kill all MPB susceptible stands in yr 1 and regenerate as per TSR2 regeneration assumptions. Age the model for 20 years using one year periods to show recovery over that time. No harvest would be



implemented during this time but Pine stands that became >60yrs old would continue to be killed. Entire stands will be 'killed' - not just the PI.

5. Volume/Species Reporting: Volume killed on the THLB will be tallied as potential harvest volume by LU. Volume killed on the NonTHLB will be tallied as unsalvaged volume by LU. Volumes will be characterized by PL %.
6. NonTimber Values Reporting: Impacts on specific segments of the landbase will be tracked and reported on (ie. ha's of OGMA or Park killed) and will be broken down by %PI. Constraint levels will also be tracked over the 20 year period (current status, post kill, next 20 yrs of recovery). Reporting would be done at the watershed level for ECA and the LU level for all other issues. Each constraint type would be modeled as currently represented in the 20yr plan model (ie VQO polygons for VQOs) but then rolled up to the LU level for presentation. The 'killed' area in these constraint groups will also be provided and characterized by %PI.

## 7 Results

- Volume "Killed" = ~8,900,000 m<sup>3</sup>
  - Includes species other than PI in stands (76% is PI volume)
  - THLB Volume Only - 7.8 million m<sup>3</sup> (77% PI)
- Area Killed = ~35,800 ha
  - 87% falls within the THLB (i.e. salvageable)
  - The rest falls in the NCLB (i.e. unsalvageable)
- Main Landscape Units Impacted (Tolko):
  - Vernon
  - Okanagan West Side
  - Upper Kettle
  - Cherryville
  - Harris
  - Salmon Arm

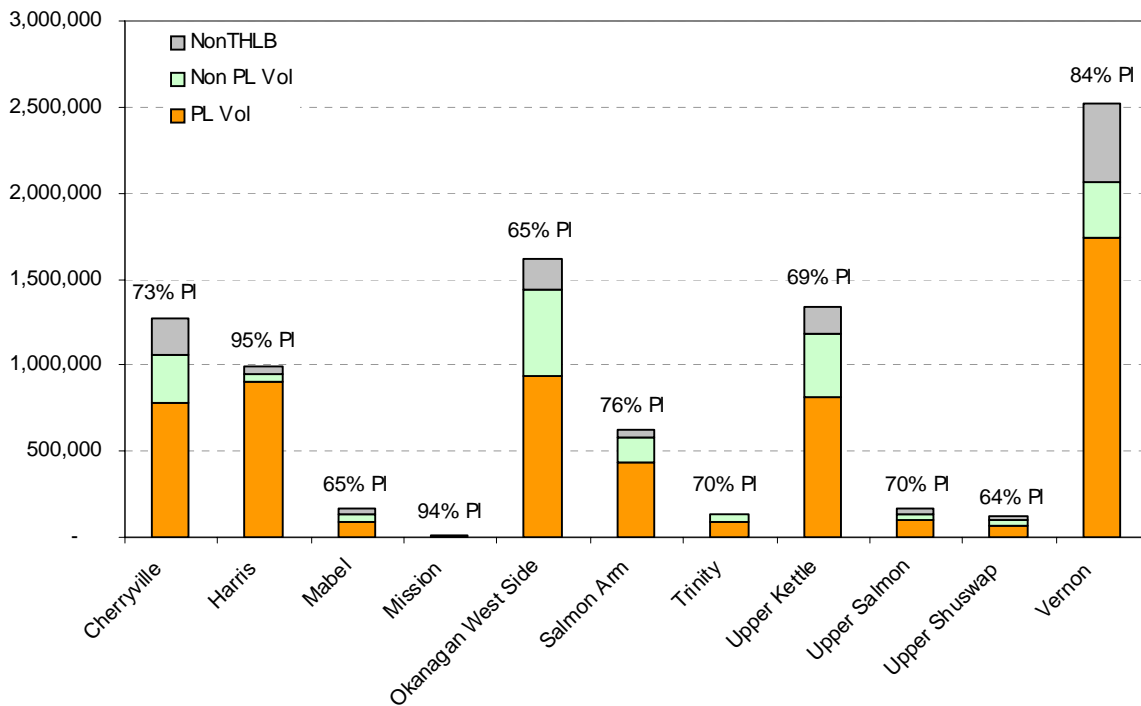


Figure 1. Impacted volume by landscape unit and species.

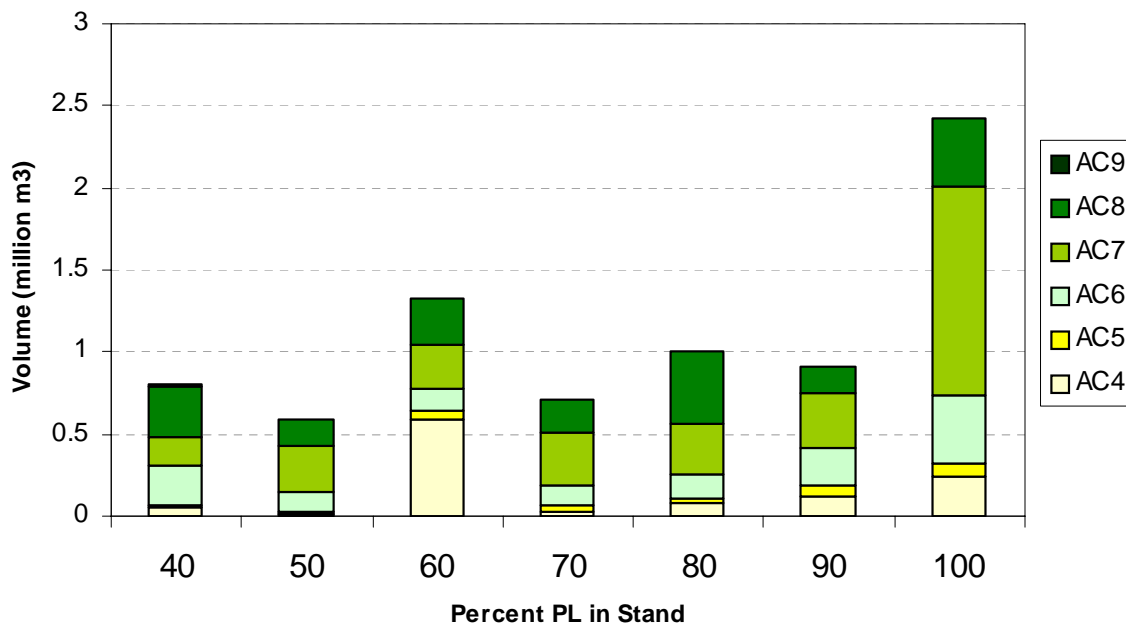


Figure 2. Impacted volume on the THLB by % PI and age class.

## **Non Timber Resource Impacts:**

- IRM impacts tend to be low-moderate when viewed over the entire land base, but there are many cases where specific units are heavily impacted:
  - Visuals in southern LU's
  - ECA's in several southern watersheds
  - OGMAs in some southern LU's
  - Moose MMU's
- The IRM values with little impacts were those without significant pine components.
  - MDWR favoured Fd stands whenever possible.
  - Low incidence of PI in Mtn Goat

Detailed impacts on non timber resources can be seen in the presentation found in Appendix A.

## **Appendix A**

March 23, 2005 Presentation to Technical Committee