TYPE 4 SILVICULTURE STRATEGY IN THE OKANAGAN TSA

SITUATION ANALYSIS

Prepared for:

Paul Rehsler, RPF
Harvesting and Silviculture Practices
Ministry of Forests, Lands, and Natural Resource Operations
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September 2012
Contract number: 1070-20/OT13FHQ175

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September, 2012

Attention Paul Rehsler:

Subject: Type 4 Silviculture Strategy in the Okanagan TSA - Situation Analysis

Please find enclosed the report in support of the above-mentioned analysis. Please do not hesitate to call with any questions.

Yours Truly,

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1.0 INTRODUCTION

1.1 Context

The Okanagan TSA has been selected as one of five similar Type 4 silviculture strategy projects being completed in the interior of British Columbia (BC), to provide tactical level direction for steering silviculture investment to help mitigate mid-term timber supply impacts created from the mountain pine beetle (MPB) epidemic. Ecora Natural Resource Group Ltd (Ecora) has been contracted by the MFLNRO to undertake the Type 4 silviculture strategy on the Okanagan TSA.

The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO), Resource Practices Branch (RPB) has recognized the value in strategically investing in the land base at this pivotal point in the outbreak cycle. The need to define clear timber objectives in the Okanagan TSA and ensure silviculture activities are consistent with objectives for all forest values has also been identified.

The project plan of action is to:

- Identify present and emerging issues;
- Identify objectives and create targets;
- Create vision for timber and habitat supply;
- Create and implement silviculture plan to translate the vision into operational reality; and
- Allow for monitoring and iterative updates in the process.

This will be achieved by holding an inclusive kick-off meeting with a wide range of local and regional participants and utilizing expert's input to facilitate the inclusion of specific values. Ecora will facilitate this discussion and tie it all together in an optimization modelling environment that allows for the inclusion of the many complex and overlapping timber and non-timber resource values in the Okanagan TSA.

The main outcomes from this process are:

- **5-year silviculture investment plan** - spatial and at the tactical level to link strategic level planning to management level actions;
- Identify, model and monitor the performance of important indicators on the landbase.

This 'situational analysis' document is the first of four documents to make up this type 4 Silviculture Strategy for the Okanagan TSA:

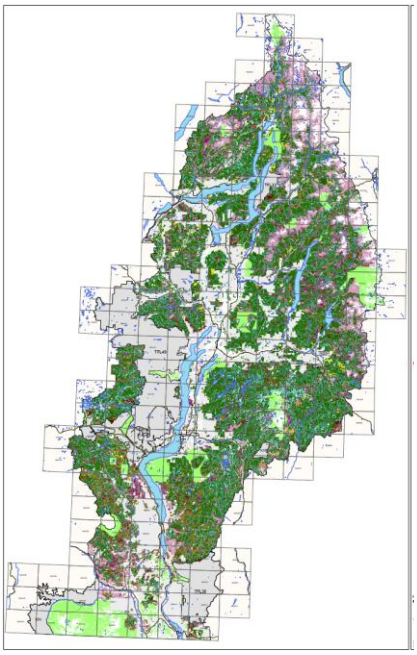
1. **Situational analysis:** describing the general situation for the TSA. PowerPoint slides that were presented at the initial meeting are included at the end of the document;
2. **Data Package:** describing the input data, information and assumptions;
3. **Analysis Report:** describing the modeling output and rationale; and
4. **Silviculture Strategy:** providing treatment options, targets and benefits.

2.0 SUMMARY OF CURRENT PLANS AND STRATEGIES

2.1 The Okanagan TSA

Area

The Okanagan TSA is located in southern interior BC covering a total area of 2.25 million hectares extending from the US border in the south near Osoyoos approximately 300km north. Of this area, approximately 1.5 million hectares (or 68%) is classified as productive forest with just under 1 million hectares (~950,000 ha or 62% or productive forest) designated as available for timber harvesting (THLB).



Community

Within the boundaries of the TSA, there are significant areas in private land, Indian reserves, community forests (CF), woodlots and controlled recreation areas (CRA). There are many communities of considerable size throughout the TSA, generally located around the lower elevation lakes and rivers. There are multiple First Nations communities throughout the TSA. Kelowna and Vernon are the larger population hubs located in the center of the TSA, with Penticton and Osoyoos in the south and Sicamous and Salmon Arm north.

Tree Species

The species composition and ecology of the TSA is varied and diverse with large differences between north and south and also sharp altitudinal variations. The northern half of the TSA is often referred to as the 'wet-belt' and is dominated by Douglas-fir, Balsam and Hemlock forests. The southern portion of the TSA, the 'dry-belt' is dominated by Lodgepole pine and Ponderosa pine and Douglas-fir at lower elevations.

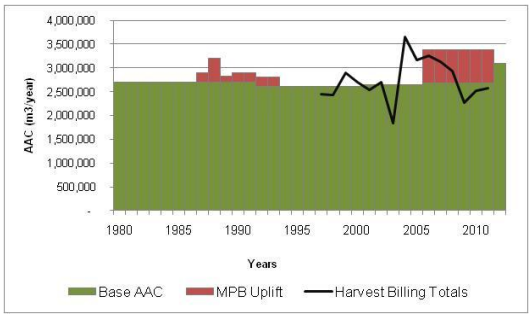
Land Use

The Okanagan - Shuswap Land and Resource Management Plan (OSLRMP) was approved in 2001, providing direction for the management of Crown land and resources in a strategic land use strategy. Forest planning and practices are guided by this plan in addition to other provincial level plans and legislation (FRPA-FPPR, GAR, FSPs). Between 2004 and 2007, draft spatial old growth management areas (OGMAs) were identified to help meet biodiversity requirements operationally.

2.2 Timber Supply Situation

Annual Allowable Cut

The annual allowable cut (AAC) has been regulated in the Okanagan TSA since 1980, ranging from just over 2.6 million m^3/year to a high of 3.375 million m^3/year in 2006 - 2011 to address the current MPB epidemic. In February 2012, the AAC was set at 3.1 million m^3/year, a level set to "begin the transition to the lower mid-term harvest levels while continuing to provide for the salvage of MPB-damaged timber" (Snetsinger, 2012). The black line in the figure shows volume summaries from harvest billing by year.



Mountain Pine Beetle

The current mountain pine beetle (MPB) epidemic has affected an estimated 710 million m^3 or 53% of the merchantable pine volume province wide (Walton, 2012). In the Okanagan TSA, an estimated 9.4 million m^3 has been affected (Walton, 2012). Figure 2.1 a) shows the MPB projections on the Okanagan TSA (from Figure 5 Walton, 2011), where the green line shows actual and projected estimates of mature pine mortality from the 2011 model. The pink line shows the old estimates from 2010 and highlights the uncertainty associated with using these projections. Figure 2.1 b) shows a map of the latest MPB projections on the Okanagan TSA using cumulative severity to 2011 (BCMPB model, Walton, 2012).

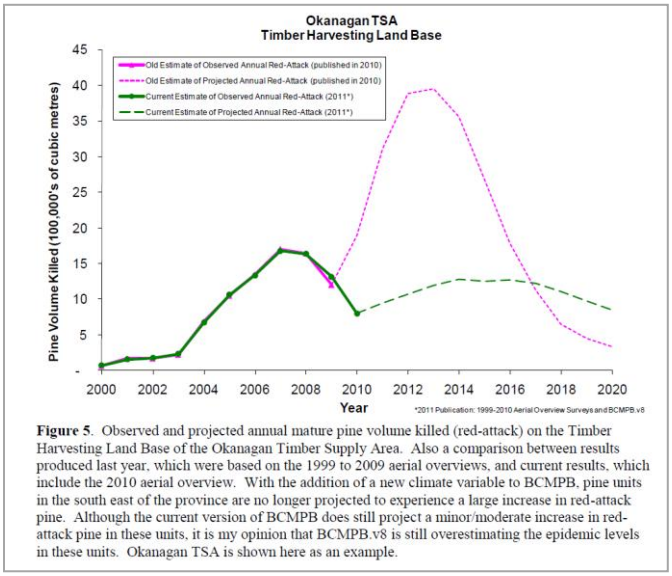


Figure 5. Observed and projected annual mature pine volume killed (red-attack) on the Timber Harvesting Land Base of the Okanagan Timber Supply Area. Also a comparison between results produced last year, which were based on the 1999 to 2009 aerial overviews, and current results, which include the 2010 aerial overview. With the addition of a new climate variable to BCMPB, pine units in the south east of the province are no longer projected to experience a large increase in red-attack pine. Although the current version of BCMPB does still project a minor/moderate increase in red-attack pine in these units, it is my opinion that BCMPB.v8 is still overestimating the epidemic levels in these units. Okanagan TSA is shown here as an example.

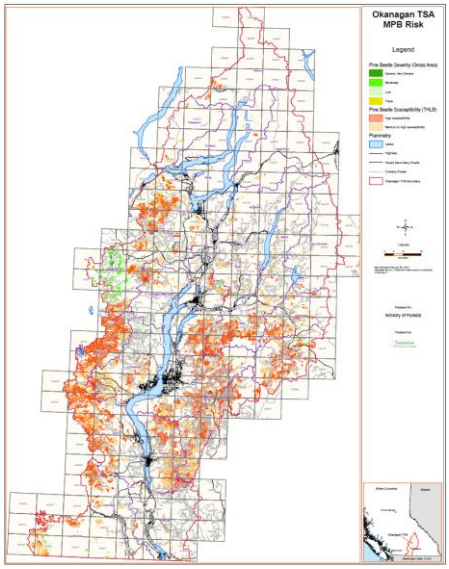


Figure 2.1: a) Observed and Projected Annual Pine Volume Killed, b) 2011 Projection Map

Mid-Term Timber Supply

The most recent timber supply analyses done on the Okanagan TSA include:

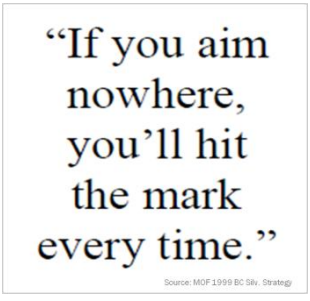
- TSR 4 2011 (MOFR 2010, MFLNRO 2011, Snetsinger 2012);
- Okanagan Innovative Forestry Society (OIFS) Uplift Analysis (Ecora, 2012); and
- Okanagan TSA Enhanced Type II Silviculture Analysis (Timberline, 2009 – Ecora's analysis team).

Mid-term basecase timber supply forecasts in these 3 analyses are generally around 2.3 - 2.5 million m^3/year, but drop as low as 1.87 million m^3/year in the Type II Silviculture Analysis simulation model (Figure 2.2).

Figure 2.2: Mid-term Timber Supply Forecasts

2.3 Timber Quality Situation

The overarching timber quality target is for at least 10% premium logs[1] (MOF, 1999). However, Okanagan specific premium definitions and timber targets need to be defined as part of this process. As was alluded to in the 1999 BC Silviculture Strategy and again in the 2012 Auditor Generals Audit of MFLNRO's timber management (Auditor General, 2012), it is imperative to have objectives in order to have something to work towards and monitor effectiveness against.



[1] Premium quality logs have one or more of the qualities of: larger dimension, narrow ring width, high specific gravity, low taper, few or no knots, such that they are suitable for the production of high value forest products and therefore command higher than normal prices in a free market. Specifications will vary by tree species, demand and location (Incremental Silviculture Strategy For British Columbia, MOF 1999).

At the initial meeting, Ministry representatives, silviculture experts and licensee representatives will all participate in a discussion on defining these very important definitions, and targets.

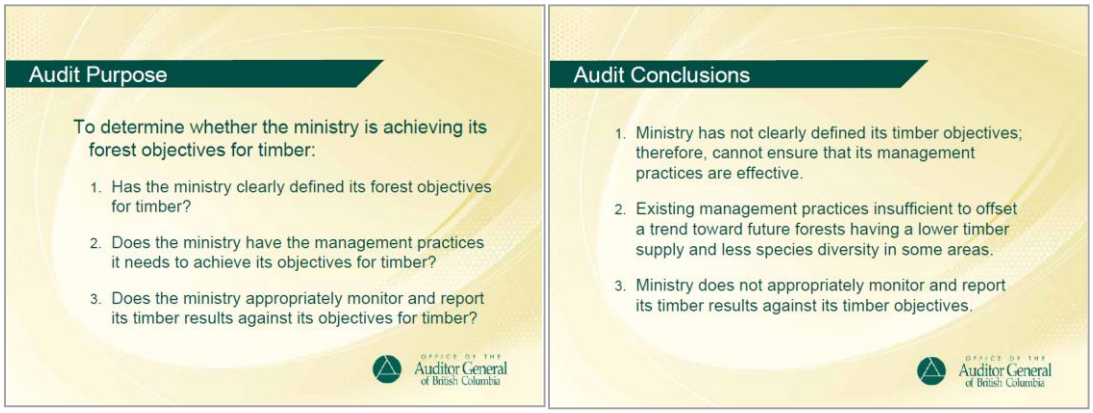


Figure 2.3: Audit Purpose and Conclusions (Auditor General, 2012)

Historic levels of silviculture activities in the Okanagan TSA from 2002 - 2011 are shown in Figure 2.4. The left hand graph shows silviculture carried out by government and shows that the bulk of activity since 2005 has been planting (over 6,000ha). The right hand graph shows area treated after harvest by licensees under silviculture obligation- note the overlap between site preparation and planting. Just under 89,000 ha have been planted under silviculture obligations in the Okanagan TSA between 2002-2011.

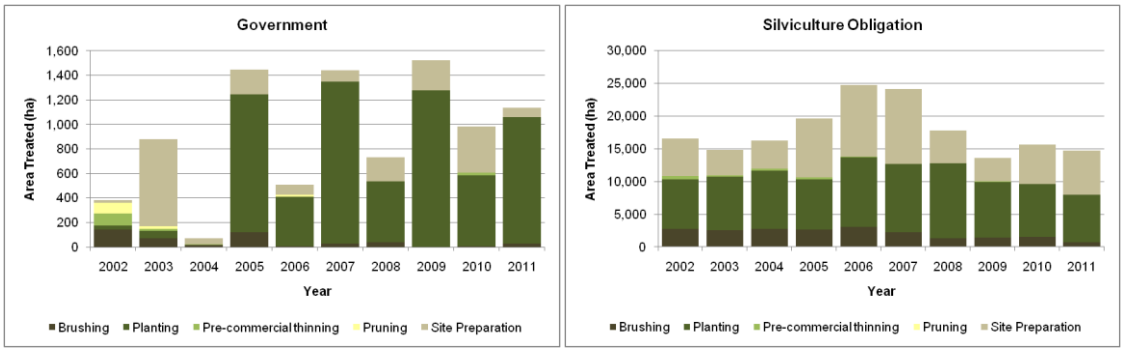


Figure 2.4: Historic Silviculture Program

2.4 Biodiversity and Habitat Issues

The Okanagan TSA has many biodiversity and habitat resources that are directly managed and affected by the MPB epidemic and forestry operations. In timber supply, traditionally modeled resource management zones (RMZs) include:

- Caribou habitat;
- Community watersheds (CWS);
- Elk habitat;
- Goat habitat;
- Grizzly bear habitat;
- Integrated resource management zones (IRM);
- Lake management zones (LMZs);
- Marten habitat;
- Moose winter range (MWR);
- Mule deer winter range (MDWR);
- Old growth management areas (OGMAs);
- Sheep (Bighorn and Derenzy) habitat;
- Visual quality objectives (VQOs); and
- Wildlife habitat areas (WHAs).

For this project, modelling methodology, indicators and targets will be discussed and if necessary, augmented from the TSR modelling. As well, additional non-TSR resources will be discussed and implemented if needed. Some initially identified issues are listed below; however more may be identified at the initial meeting:

- Hydrology:
  - better modelling (EDA/ECA);
  - over an extended landbase (third order watersheds - not just CWS).
- Dry-belt Douglas-fir partial harvesting;
- Tree species trajectory over time: species mix
- Harvesting the profile:
  - terrain- cable logging
  - economics
  - visually constrained areas
  - Douglas-fir leading partial harvest
- Range supply and natural barriers to riparian areas;
- Ecosystem restoration;
- Forest health;
- Climate change;
- Patchsize;
- Wildfire risk;
- Timber objectives, including timber value/cost;
- First Nation values- riparian, fish-bearing streams, cultural heritage;
- Road modelling: road density, in grizzly habitat;
- Concept of risk;
  - fire risk
  - bark beetle risk (MPB / spruce / Douglas-fir);
- Carbon;
- Retention strategy- connectivity, treatment areas.

2.5 Opportunities for Silviculture

Treatments that may be modeled on the landbase include:

- Clear-cut harvesting (MPB salvage/non-MPB);
- Partial-cut harvesting;
- Fertilization;
- Reforestation planting (rehab);
- Spacing;
- Range cut-blocks; and
- Ecosystem restoration activities.

3.0 SITUATION ANALYSIS POWERPOINT PRESENTATION

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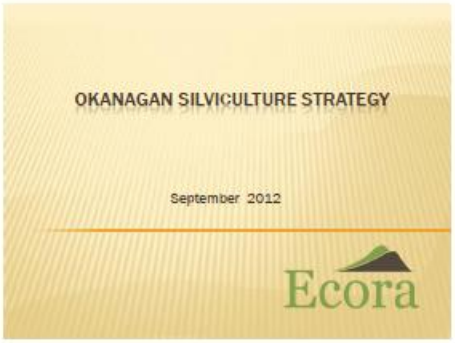

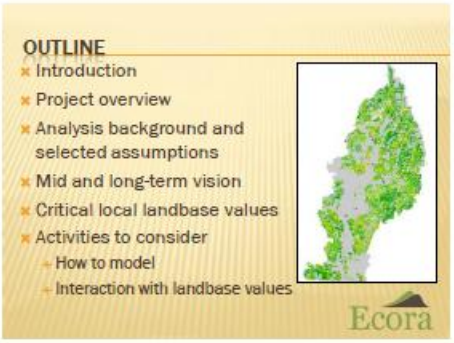

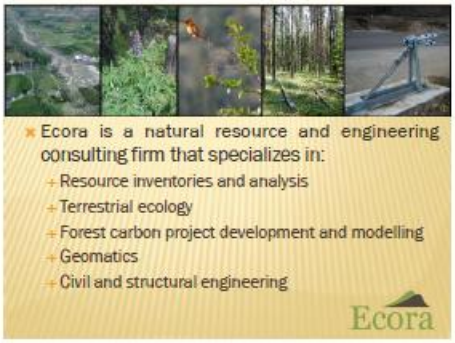

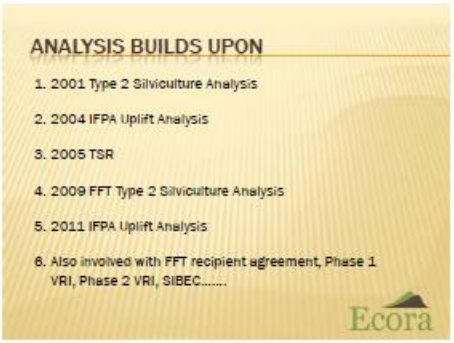

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IFPA PROJECTS

Vegetation resource inventories (Phase I and II)

Predicative ecosystem mapping:

SIBEC and SIA

Operational Adjustment Factor (OAF) Study:

Roads, Trails and Landings (RTL):

Backlog and Impeded Stands:

Caribou Study:

Deer Study:

Environmentally Sensitive Areas (ESAs):

Martin Study:

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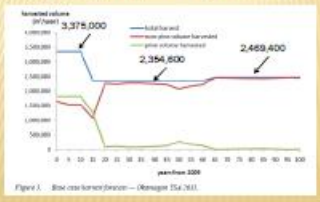
2011 – TSR 4

- February 2012 the Okanagan AAC was set at 3.1 million m^3/year (previously 3.375 million m^3/year)



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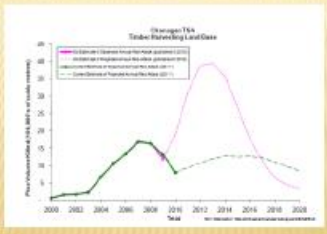
MPB PROJECTIONS - OKANAGAN



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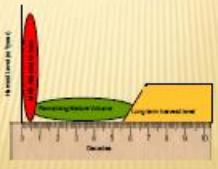
IMPACT OF MANAGEMENT REGIME

- Since 2004 harvest targeted MPB
- Did this influence the course of MPB?



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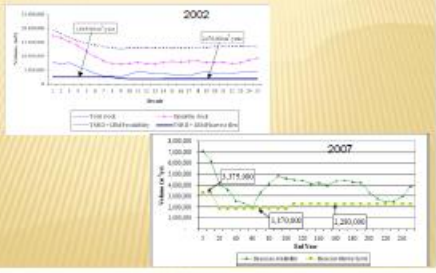
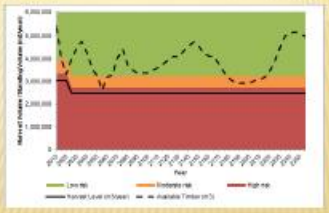
TIMBER AVAILABILITY – PAST



TIMBER AVAILABILITY NOW



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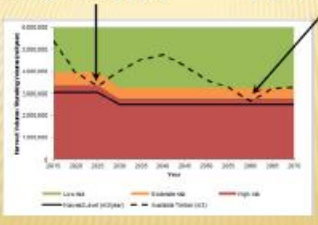
OKANAGAN TSA TIMBER AVAILABILITY

How to get through this?

What will be left ?



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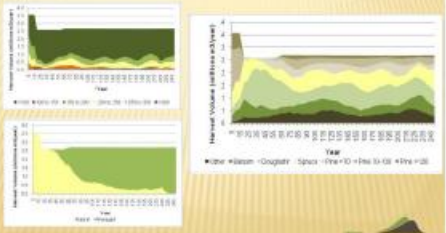
SPECIES, VPH, NATURAL TO MANAGED



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LANDBASE VALUES AND GOAL SETTING

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PATCHWORKS

- Spatially Explicit Optimization Model
- Ideal for balancing multiple objectives across extended time horizons
- Spatial capability creates a link between strategic objectives and operational reality
- Well-suited for examining trade-offs between multiple competing objectives (i.e. pine salvage versus retention).

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STRATEGIC FOREST MANAGEMENT PLANNING

- Identify objectives
- Create targets

"If you don't know where you are going any road will get you there" Lewis Carroll (born 1832)

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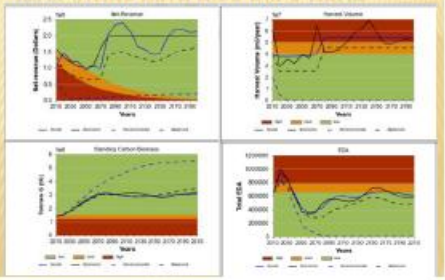
INDICATORS WITH RISK BACK DROP



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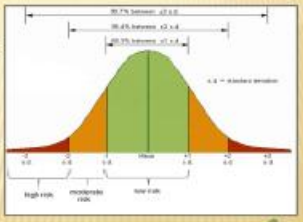
RISK RATINGS- SD APPROACH

Close to ideal is low risk

Risk increases as difference from ideal increases



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INDICATORS

- Timber- volume and other
- Value and cost
- TSR RMZs
- Hydrology- EDA
- Tree species
- Harvesting the profile (terrain, economics, visuals)
- Forest health factors and wildfire- hazard
- Road density
- First Nations values

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TIMBER VALUE

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TIMBER – HARVEST AND LANDBASE

- Timber volume – targets?
- Species diversity – targets?
- Value – piece size
- Cost
- Harvest profile:
  - Terrain
  - Economics
  - Visuals
- Premium logs?

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TSR/OSLRMP RMZS

- Caribou habitat;
- Community watersheds (CWS);
- Elk habitat;
- Goat habitat;
- Grizzly bear habitat;
- Integrated resource management zones (IRM);
- Lake management zones (LMZs);
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- Visual quality objectives (VQOs); and
- Wildlife habitat areas (WHAs).

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FOREST HEALTH

- Hazard/risk ratings:
  - Mountain pine beetle
    - Hazard rating = Pine per * Age F * Density F * Location F
  - Douglas-fir beetle
    - Hazard Rating = Fd per * Age F* Diam F * Growth F
  - Spruce beetle
    - Hazard Rating = 10 * ((Spruce per * Quality F * Age F * Location F * Stand density equation) ^ 0.5

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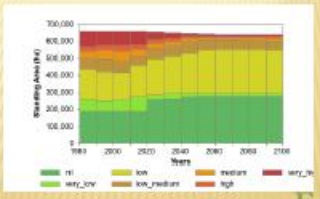
FOREST HEALTH

- Model hazard over time



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WILDFIRE HAZARD & ECOSYSTEM RESTORATION

- Wildfire risk / fuel hazard
- Ecosystem restoration
- Vaseaux Lake fire?
- Community Wildfire Interface

City of Penticton, web mapping 2012

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WILDFIRE

- Fuel Hazard Assessment/Abatement Mapping

WILDFIRE

- Many applicable docs (from top down):
  - BC wildland fire management strategy (Sept 2010)
  - Ecosystem restoration provincial strategic plan (2009)
  - Ecosystem restoration: planning and prioritizing (for OSFD, update 2010)
  - Okanagan Shuswap Ecosystem Restoration Strategy (ER steering committee, DOS, MFLNRO, 2012)
  - Southern Interior Strategic Regional Restoration Plan (MOE, 2006)

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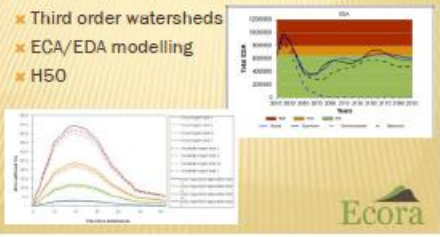
HYDROLOGY

- Lots of community watersheds in the TSA
- Third order watersheds
- ECA/EDA modelling
- H50



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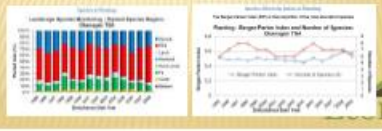
TREE SPECIES INDICATORS

- species targets by BEC subzone level
- monitor species diversity
- pre-/post harvest species mixes
- Berger-parker index?
- Reporting could follow "Species Monitoring Report May 2012"
- Ken Zielke to present on species diversity monitoring



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ROAD DENSITY

- Patchworks can incorporate road networks
- Apply costs associated with roads dynamically
  - construction
  - maintenance
  - hauling costs
- Send volume to explicit mills
- Calculate and control road density e.g. by watershed or in grizzly bear habitat

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RANGE

- Range use planning

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ACTIVITIES TO CONSIDER

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ACTIVITIES BEING CONSIDERED

- Clear-cut harvesting
- Partial-cut harvesting
- MPB salvage
- Planting non-harvested MPB stands
- Fertilization
- Ecosystem restoration
- Brushing impeded stands

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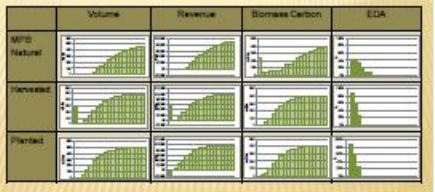
HOW ACTIVITIES ARE MODELLED



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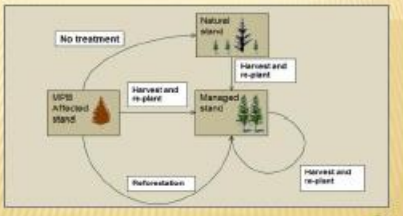
SAMPLE ACTIVITIES ON MPB STAND



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MPB AFFECTED STAND

A MPB affected stand can be harvested if it is:
- on the THLB; and
- > 150 m3/ha.

A MPB affected stand can be planted if it is:
- on the THLB; and
- not harvested.

- cost of planting is BGC-based (av. $1300/ha);
- the value and cost of harvesting is calculated;
- planting can only be carried out for 10 years;

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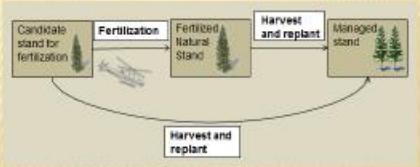
FERTILIZATION



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FERTILIZATION

A stand is suitable to be a candidate for fertilization if it is:
- Douglas-fir or spruce leading;
- Non-MPB affected;
- Site index >= 15; and
- On the THLB.

- cost of fertilization is $425 /ha;
- fertilization can only be carried out for 10 years;
- no harvesting for 10 years after treatment;
- growth response realised from fertilization was 10 m^3/ha for spruce and 12 m^3/ha for Douglas-fir

Ecora

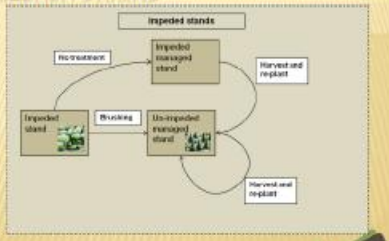
IMPEDED STANDS

- Impeded stand are: "*satisfactorily restocked stands on areas harvested pre-October 1, 1987 that are not currently under a silviculture prescription and require treatment to reduce brush competition.*"

Source: http://www.for.gov.bc.ca/hco/fia/landbase/ffl/activities/impeded_stands.htm
Source: http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh83.htm

Ecora

IMPEDED STANDS



Ecora

IMPEDED STANDS

- How to identify impeded stands in the analysis?
  - VRI?
  - OIFS has done some impeded stand work
- What is the volume gain from treating?

Ecora

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ECOSYSTEM RESTORATION

Ecosystem Restoration (ER) is:

"... assisting with the recovery of an ecosystem that has been degraded, damaged, or destroyed by re-establishing its structural characteristics, species composition, and ecological processes ..."

"In the fire-maintained ecosystems of British Columbia's Interior, a lack of wildfire due to decades of suppression, the absence of prescribed fire, and the application of no other intervention or disturbance processes as an adequate surrogate for the role of fire have contributed to trees encroaching onto historic grasslands, as well as excessive in-growth of trees in previously open forests".

- Risk to communities
- Impact on CWS / water values

Source: Ecosystem Restoration Provincial Strategic Plan, MOFR

Ecora

PARTIAL HARVESTING

- On the IDF due to extreme temperatures
  From TSR:
  - Dry-belt
  - BECs: PPxh1, PPxh2, IDFxh1, IDFxh2, IDFdk1, BGxh1
  - Douglas-fir leading
  - 33% removed with return interval of 30 yrs

Ecora

DRY-BELT DOUGLAS-FIR PARTIAL HARVESTING

- Very little harvesting presently as focus on MPB
- Mid-term heavily dependent on these stands
- Wildfire interaction- reduce risk and improve ecosystem health
- Not well modelled in TSR/analysis presently
- FORECAST?

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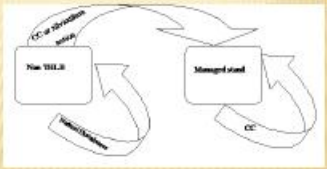
SPACING/THINNING

- Should we consider a spacing treatment?



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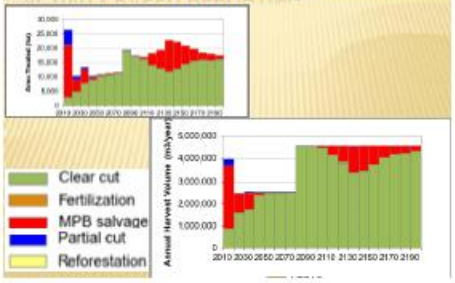
ACTIVITY BASED REPORTING



Thank you

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Ecora

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Walton, A. 2012. Provincial-Level Projection of the Current Mountain Pine Beetle Outbreak: Update of the infestation projection based on the Provincial Aerial Overview Surveys of Forest Health conducted from 1999 through 2011 and the BCMPB model (year 9). Adrian Walton, BC Forest Service. 12 pp.

4.1 Applicable GAR Orders

British Columbia Ministry of Environment.2006a. Order – Ungulate Winter Range # U-8-001 – Okanagan TSA. Signed by Chris Trumpy, Deputy Minister. 4pp.

British Columbia Ministry of Environment.2006b. Order – Ungulate Winter Range # U-8-006 – Okanagan TSA. Signed by Chris Trumpy, Deputy Minister. 3pp.

British Columbia Ministry of Environment. 2006c. Order – Grizzly Bear Specified Area # 8-232. Signed by Chris Trumpy, Deputy Minister. 4pp.

5.0 ACRONYM LIST

AAC: Annual Allowable Cut.

BC: The province of British Columbia.

BCMPB: Provincial-Level Projection of the Current Mountain Pine Beetle Outbreak.

CF: Community Forest.

CRA: Controlled Recreation Area.

CWD: Coarse Woody Debris.

CWS: Community Watershed.

ECA: Equivalent Clear-cut Area.

EDA: Equivalent Disturbance Area.

FHO: Forest Health Overview.

FPPR: Forest Planning and Practices Regulation.

FRPA: Forest Range and Practices Act.

FSP: Forest Stewardship Plan.

GAR: Government Actions Regulation.

IFPA: Innovative Forest Practices Agreement.

IRM: Integrated Resource Management.

LMZ: Lakeshore Management Zone.

LU: Landscape Unit.

MDWR: Mule Deer Winter Range.

MPB: Mountain Pine Beetle.

MFLNRO: Ministry of Forests, Lands and Natural Resource Operations.

MHA: Minimum Harvest Age.

MWR: Moose Winter Range.

MOF: Ministry of Forests.

MOFR: Ministry of Forests and Range.

MPB: Mountain Pine Beetle.

OIFS: Okanagan Innovative Forestry Society.

OGMA: Old Growth Management Area.

OSFD: Okanagan Shuswap Forest District.

OSLRMP: Okanagan-Shuswap Land and Resource Management Plan.

US: United States of America.

RESULTS: Reporting Silviculture Updates and Land status Tracking System.

RMZ: Resource Management Zone.

RPF: Registered Professional Forester.

SELES: Spatially Explicit Landscape Event Simulator.

SI: Site Index.

SIA: Site Index Adjustment.

SIBEC: Site Index estimates by Site Series.

THLB: Timber Harvestable Landbase.

TSA: Timber Supply Area.

TSR: Timber Supply Review.

VRI: Vegetation Resource Inventory;

VAC: Visual Absorption Capacity.

VLI: Visual Landscape Inventory.

VQO: Visual Quality Objective.

WHA: Wildlife Habitat Area.

WTP: Wildlife Tree Patch.