

The Aftermath of Mountain Pine Beetle: Addressing the Mid-Term Timber Supply Challenge in the British Columbia Interior

Intermountain Forest Tree Nutrition Cooperative
Annual Meeting, Moscow ID, April 1, 2014



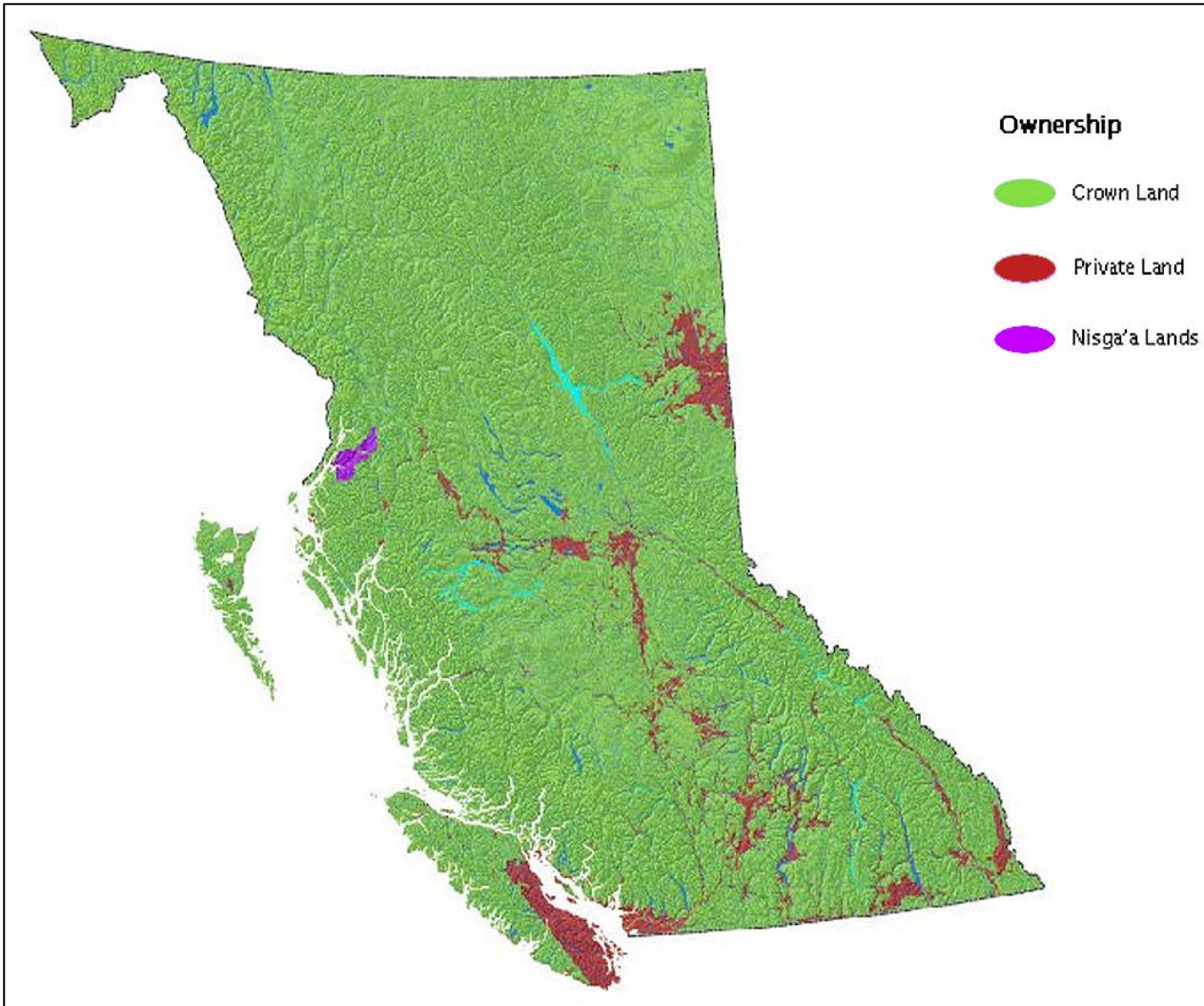
Ministry of
Forests, Lands and
Natural Resource Operations

Outline

1. British Columbia jurisdictional and geographic context for forest management
2. Mountain pine beetle infestation
3. Provincial timber supply forecasts
4. Timber supply mitigation strategies
 - i. Inventory and stand modelling innovations
 - ii. Rehabilitation of uneconomic dead stands
 - iii. Silviculture strategies to improve mid-term timber supply
5. Forest research program
6. Conclusions: cross-border research opportunities

B.C. Context

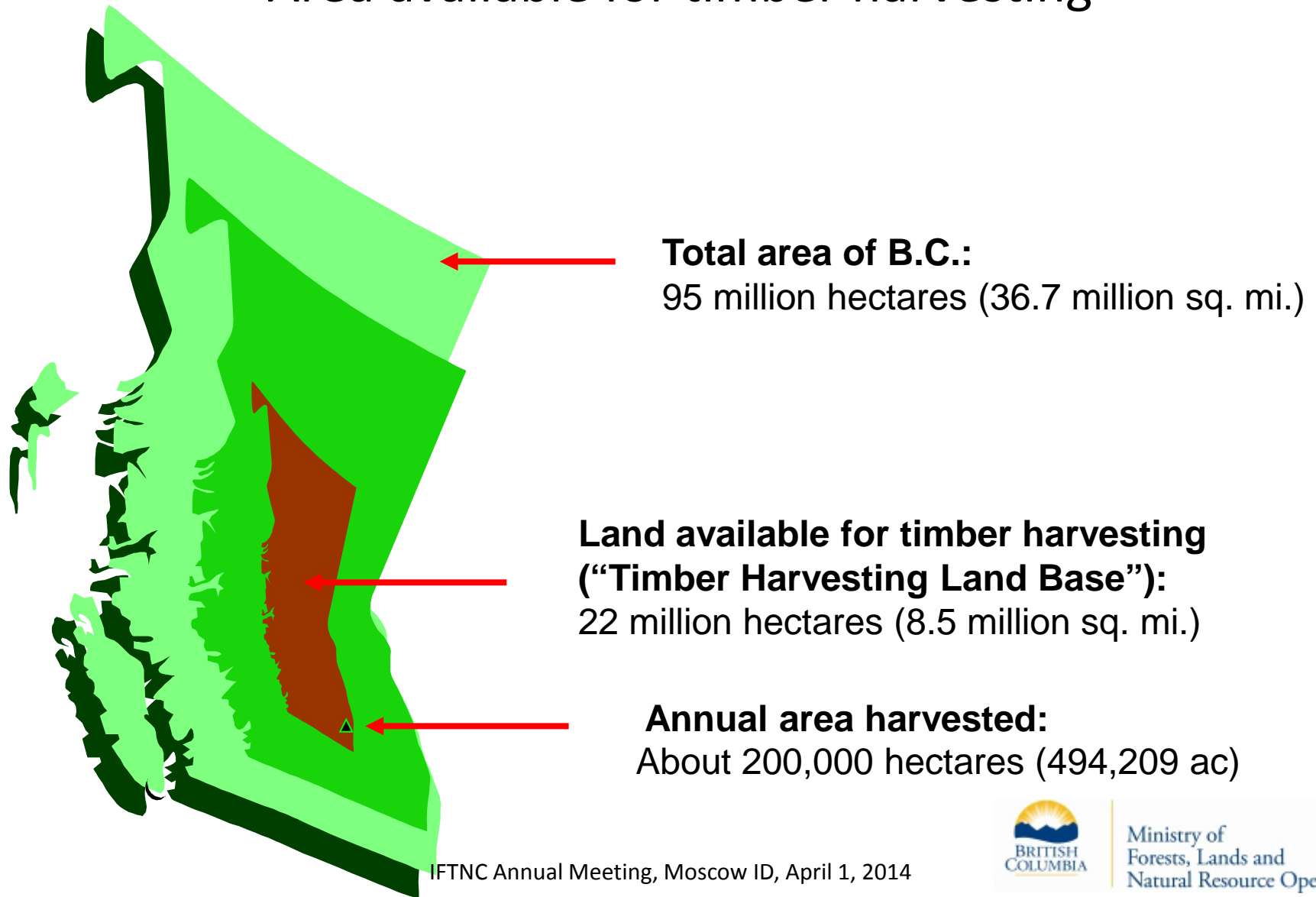
B.C. Forest Lands - Ownership



➤ 95 %
Public ownership

B.C. Context

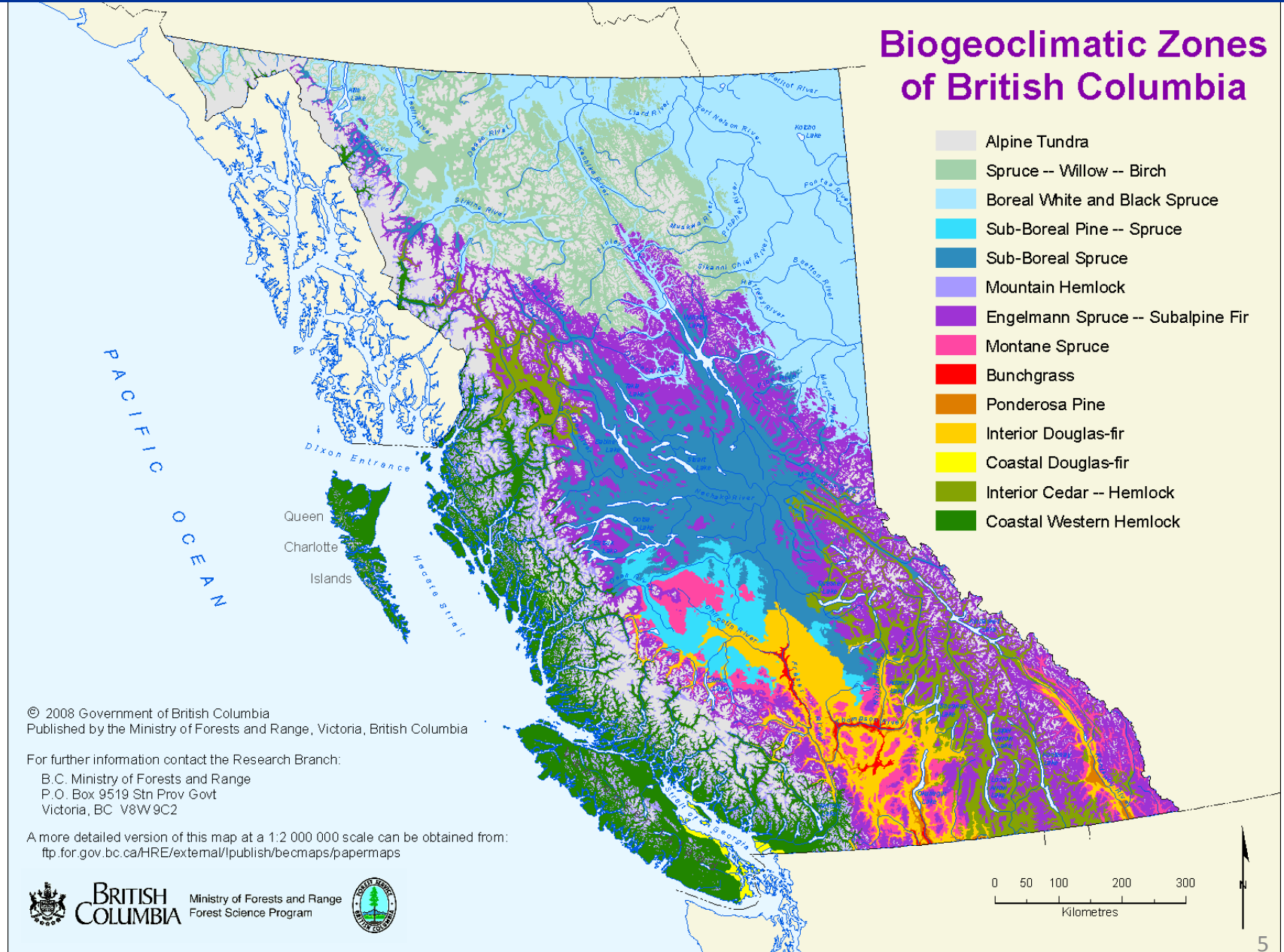
Area available for timber harvesting



B.C. Context

Biogeoclimatic Zones of British Columbia

- Alpine Tundra
- Spruce -- Willow -- Birch
- Boreal White and Black Spruce
- Sub-Boreal Pine -- Spruce
- Sub-Boreal Spruce
- Mountain Hemlock
- Engelmann Spruce -- Subalpine Fir
- Montane Spruce
- Bunchgrass
- Ponderosa Pine
- Interior Douglas-fir
- Coastal Douglas-fir
- Interior Cedar -- Hemlock
- Coastal Western Hemlock



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A more detailed version of this map at a 1:2 000 000 scale can be obtained from:
ftp.for.gov.bc.ca/HRE/external/publish/becmaps/papermaps



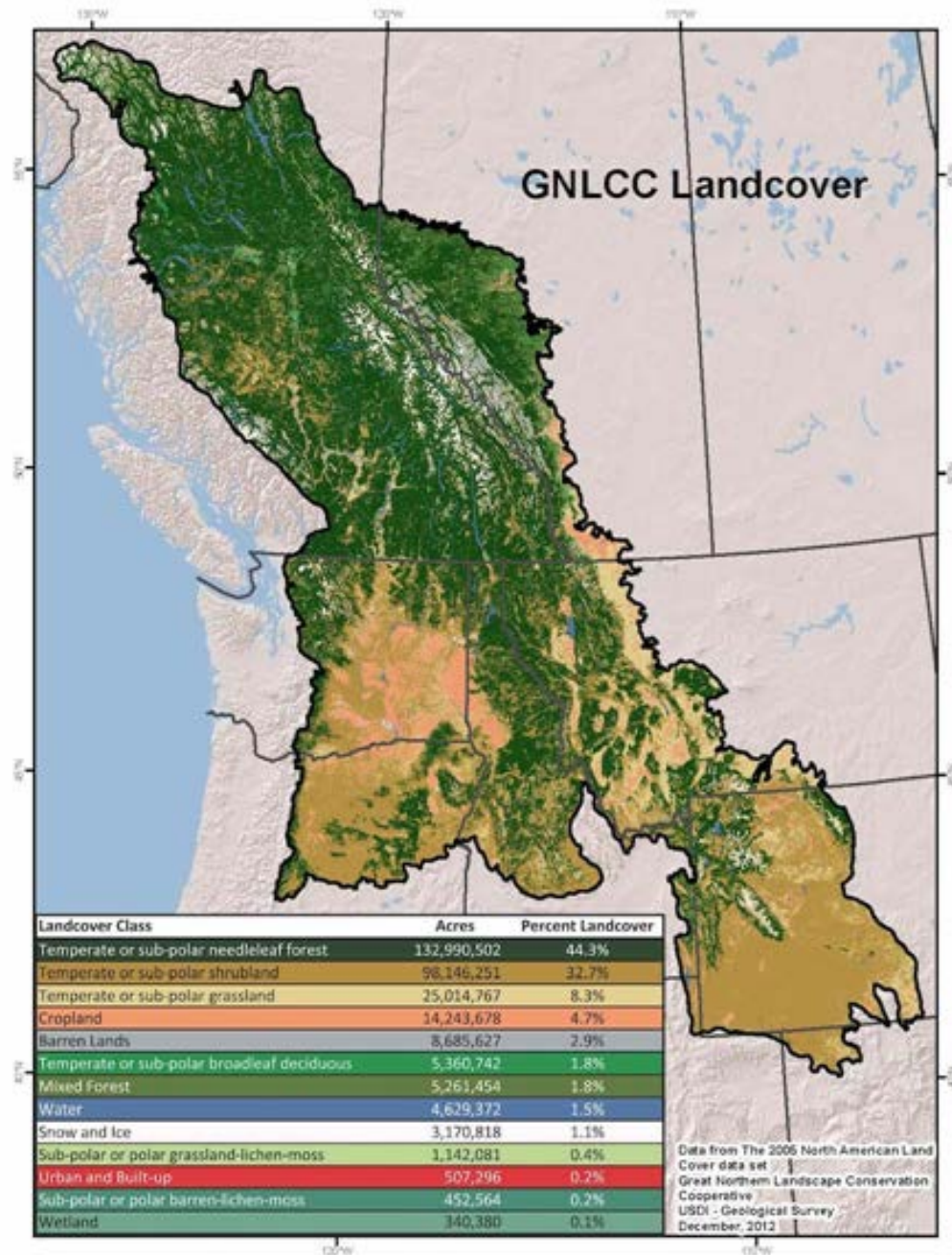
Ministry of Forests and Range
Forest Science Program



Great Northern Landscape Conservation Cooperative

A good example of cross-border partnership that is:

- Aligning and enacting a regional response to landscape conservation in the face of climate change
- Sharing data, science, and capacity
- Working across boundaries and jurisdictions



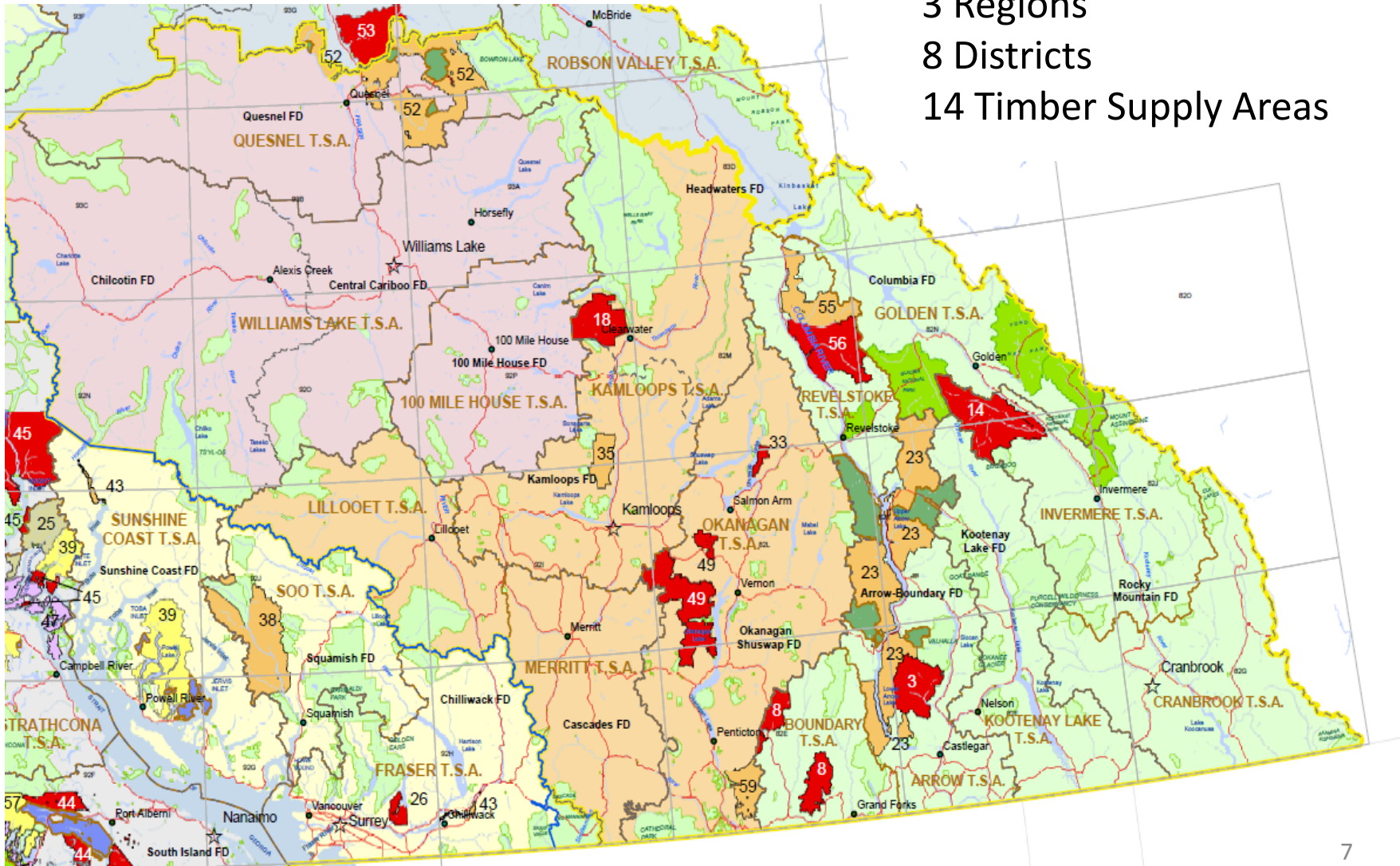
B.C. Context

South Area consists of:

3 Regions

8 Districts

14 Timber Supply Areas



Mountain Pine Beetle Infestation



- Ministry annually updates current and projected mortality estimates using provincial overview flight data and modelling.
- Most recent update (2013 analysis):
 - 54% of merchantable pine on the timber harvesting land base has been killed.
 - Worst year of infestation was 2004 - 140 million m³ (59.3 billion bd. ft.) killed that year alone.
 - A steady decline since then to a current mortality rate of about 5 million m³/yr.
- Outbreak is tapering off. Final loss is expected to be about 770 million m³ or 327.5 billion bd. ft., 56% of the merchantable pine on the timber harvesting land base.

Estimate of Area Impacted by Catastrophic Disturbance



Mature >60 Years



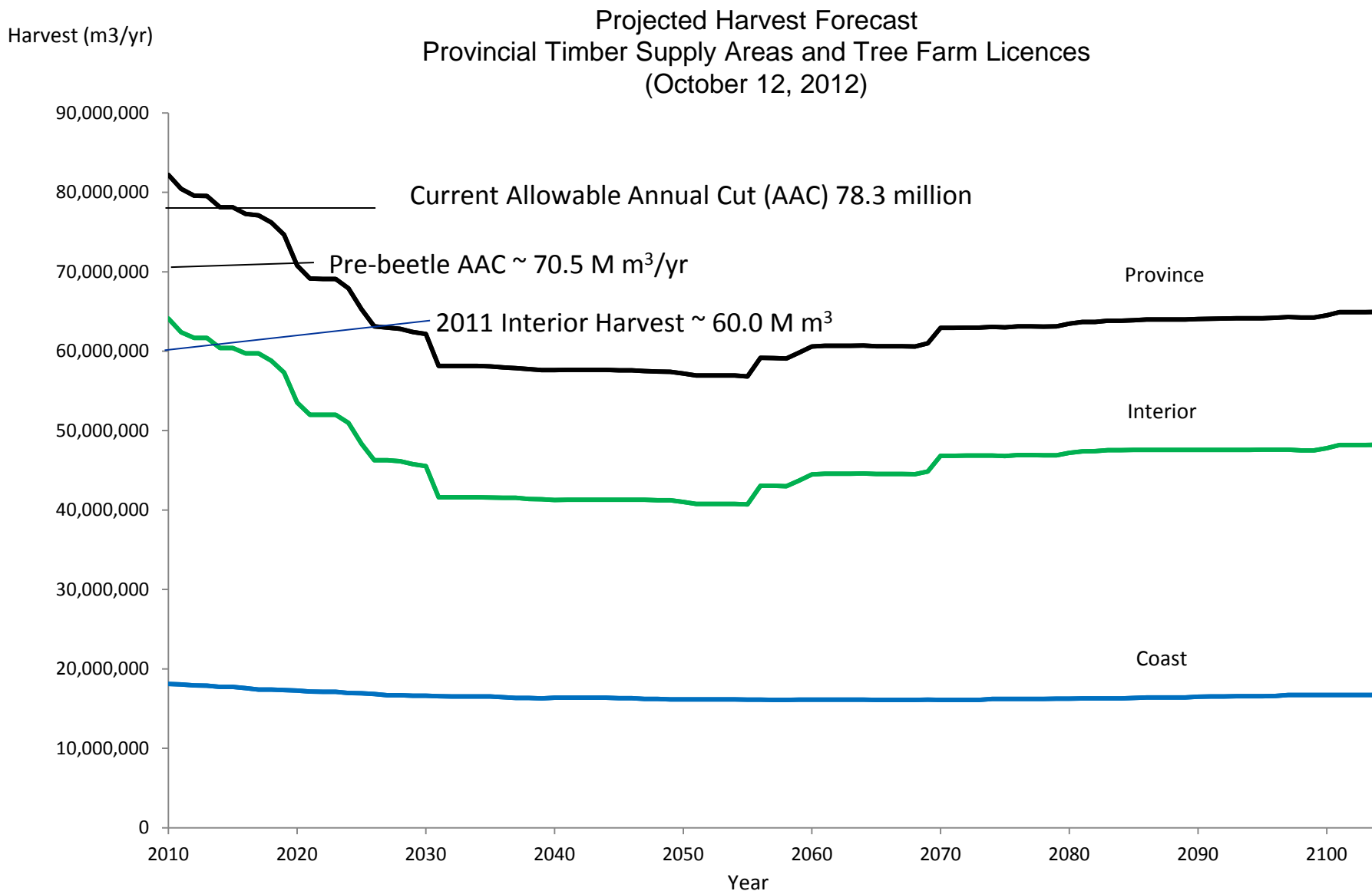
Immature <60



Wildfire

Management assumptions (ha)								
	Mature >60		Immature <60		Wildfire		Total	
Net impacted area ²⁴	3,435,073		186,112		212,783		3,833,968	
Projected harvest ²⁵ within MPB impacted areas generating legal reforestation obligations	Limited ²⁶	Optimistic ²⁶	Limited	Optimistic	Limited	Optimistic	Limited	Optimistic
	305,151	812,984	-	-	-	-	305,151	812,984
Natural recovery expected ²⁷	2,234,622	2,169,120	-	-	-	-	2,234,622	2,169,120
Not Sufficiently Stocked	895,300	452,969	186,112		212,783		1,294,195	851,864

Provincial Timber Supply Forecasts



Provincial Timber Supply Forecasts

Effects of Catastrophic Disturbance on Mid-Term Harvest in Southern B.C.

South Area: Region	Timber Supply Area	Allowable Annual Cut (MM m3)				Mid/ Pre
		Pre-beetle	Post-beetle	Mid-Term	Long-term	
Cariboo	Quesnel	3.25	4.00	1.10	2.20	0.34
	Williams Lake	3.77	5.77	1.84	1.90	0.49
	100 Mile House	1.33	2.00	0.86	1.30	0.64
Thompson	Kamloops	2.68	4.00	2.17	2.30	0.81
	Okanagan	2.86	3.38	2.14	3.00	0.75
	Merritt	1.51	2.40	1.60	1.70	1.06
Kootenay/ Boundary	Arrow	0.55	0.54	0.45	0.70	0.82
	Cranbrook	0.90	0.82	0.53	0.90	0.59
	Invermere	0.58	0.60	0.37	0.40	0.64
Total		17.42	23.50	11.06	14.40	0.63

Timber Supply Mitigation Strategies

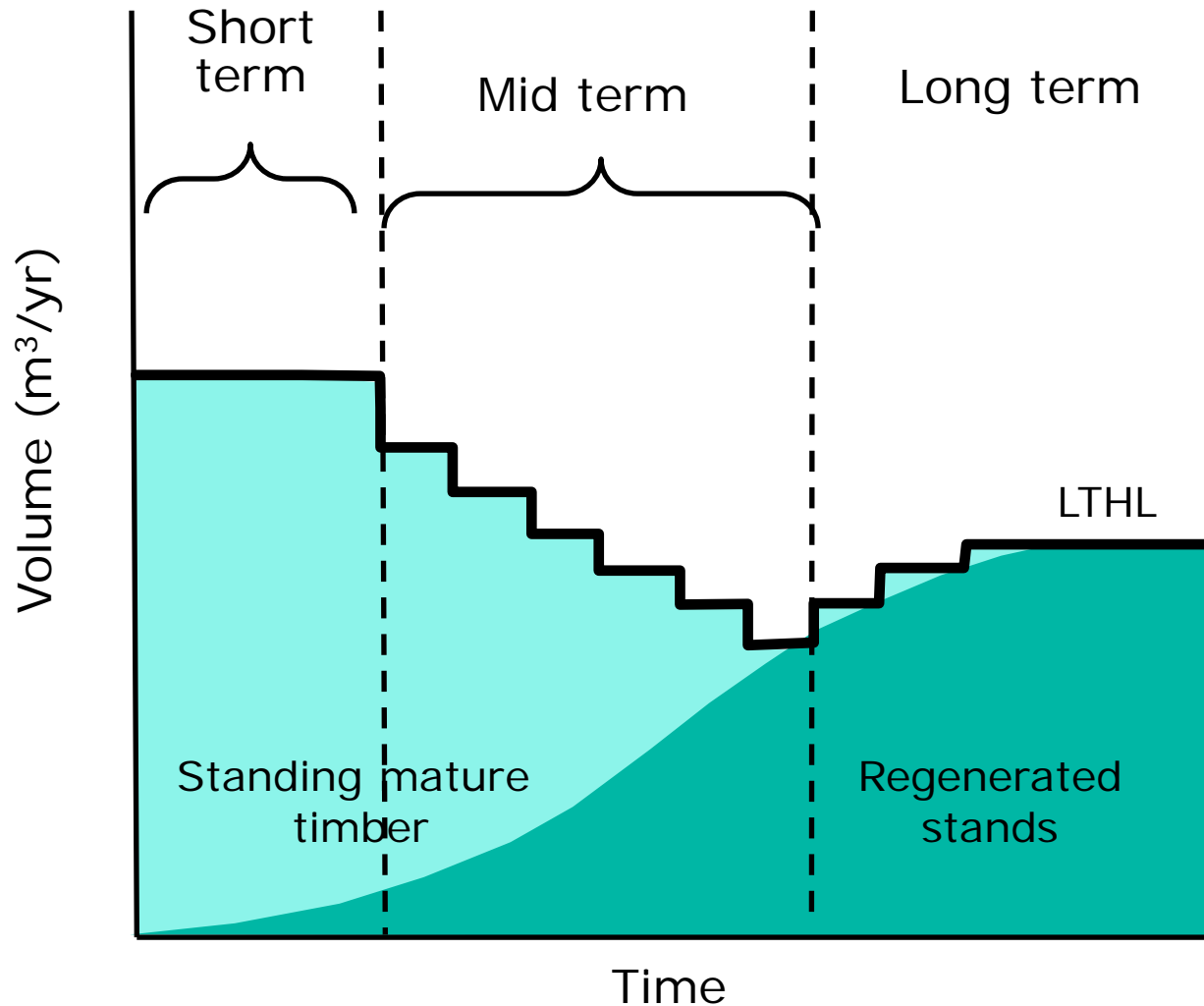
Ministry Goal:

Improve mid- and long-term timber supply and establish resilient forest ecosystems.

Objectives:

1. Improve strategies for **salvage harvesting** and **management of both salvaged and unsalvaged stands** to speed return to productive growth.
2. Determine which activities on the forest land base provide the best return on investment, considering both timber and non-timber values.

Timber Supply Mitigation Strategies



1. Strategic planning, surveys, forest inventory updates, mapping
2. Increase dead tree harvest and postpone live tree harvest
3. Re-establish fast growing plantations and rehabilitate where needed
4. Treatments such as brushing, spacing and fertilization to target young stand harvests
5. Ensure diversity
6. Capitalize on new information, opportunities and technology

Timber Supply Mitigation Strategies

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Requirements:

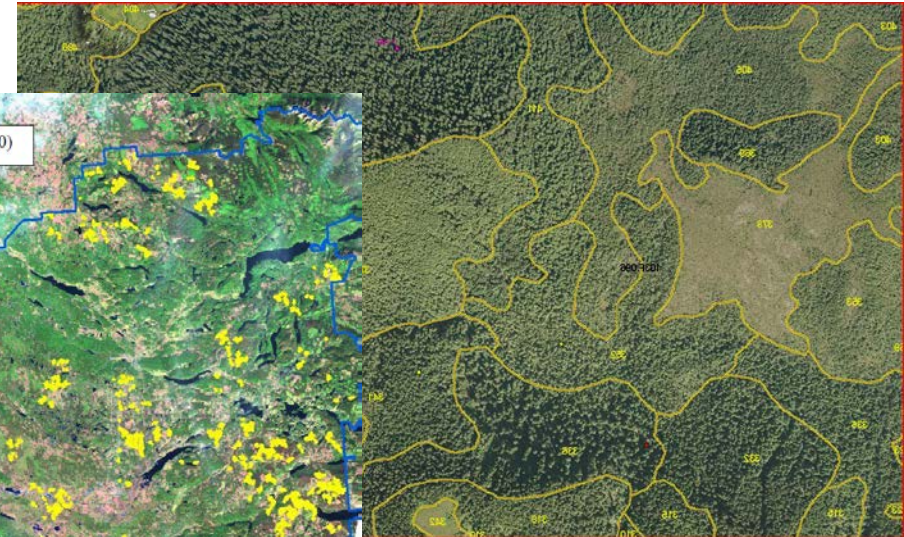
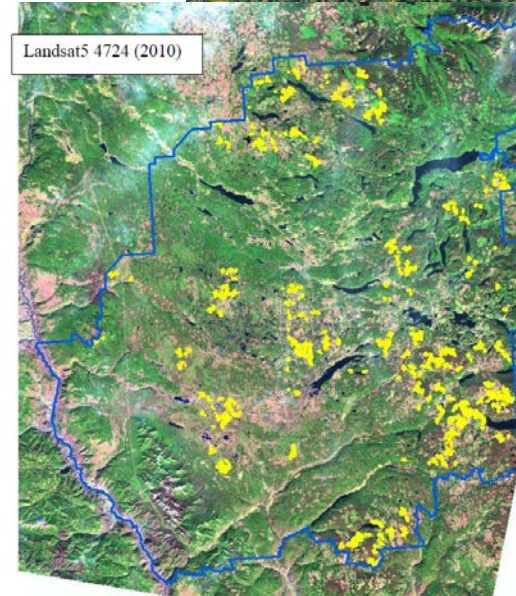
1. Inventory: more and better information on what we have
2. More and better understanding of how disturbed stands will grow
3. Rehabilitation of uneconomic dead stands
4. Silviculture strategies to improve mid-term timber supply

1. Improving Information on What We Have

Improved and enhanced inventory: 10-year strategic plan to invest \$8 million per year

Highlights:

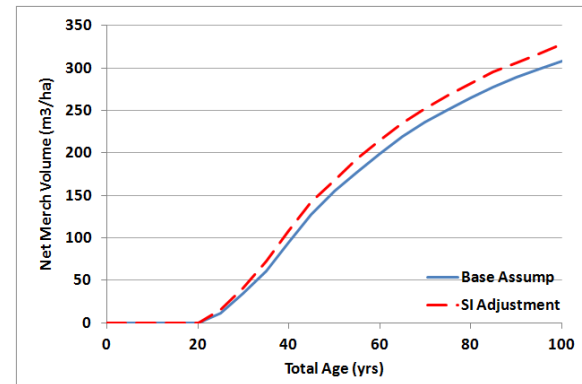
- More photo acquisition
- Adopting innovations in remote sensing: more use of LIDAR, LANDSAT imagery, automated image analyses
- More ground sampling and monitoring of young stands, residual structure and understorey trees
- Revisiting beetle-affected PSPs
- Faster harvest and mortality updates



2. Improving Understanding of How Disturbed Stands Will Grow

Improved and enhanced analyses and stand modelling tools:

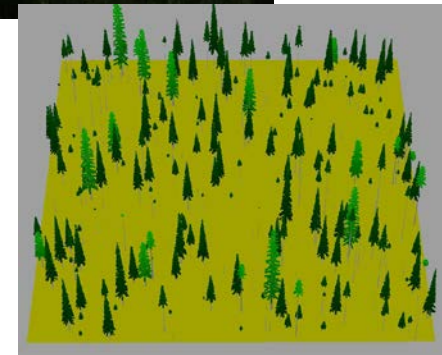
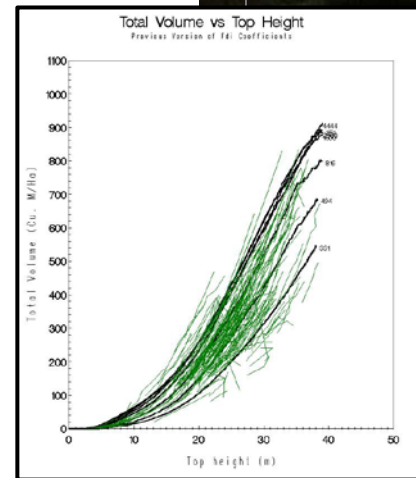
- Variable Density Yield Projection (VDYP) whole stand model projections will improve with better inventory information.
- TASS development to continue to extend the model to more diverse species mixes, stand structures and applications.



2. Improving Understanding of How Disturbed Stands Will Grow

Tree and Stand Simulator (TASS)

- Advances the prediction of stand growth and yield by focusing on the spatial dynamics of individual tree crowns, the biological engine of tree growth.
- Is a framework for synthesis of world-wide research on tree growth and stand development, with a focus on treatment response.

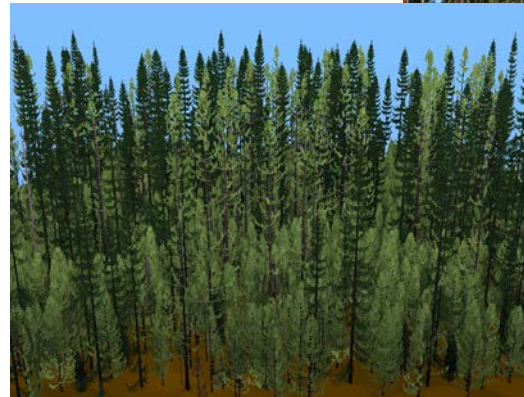


2. Improving Understanding of How Disturbed Stands Will Grow

TASS III: The Next Generation

Update:

- Current emphasis is on developing capability to model mixed stands of lodgepole pine and white spruce.
- Interior Douglas-fir multi-cohort stand modelling also continues to be a priority because the pine losses have increased pressure to log these stands sooner.



3. Rehabilitation of Uneconomic Dead Stands



3. Rehabilitation of Uneconomic Dead Stands



Planting: 95,000 ha



Brushing: 2500 ha/yr

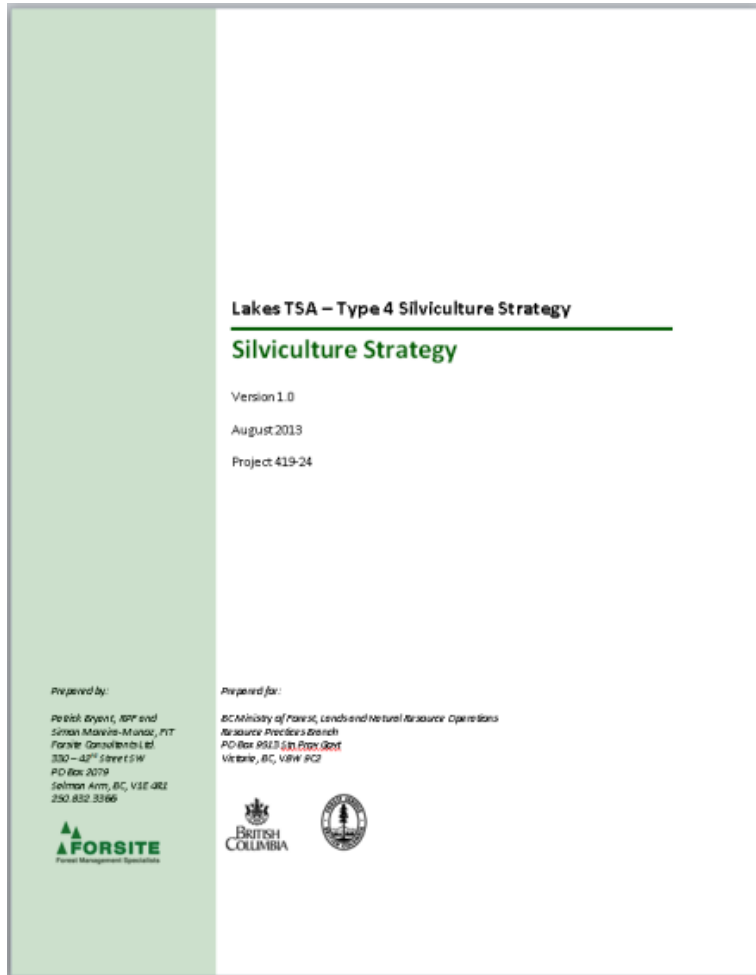


Spacing: 3500 ha



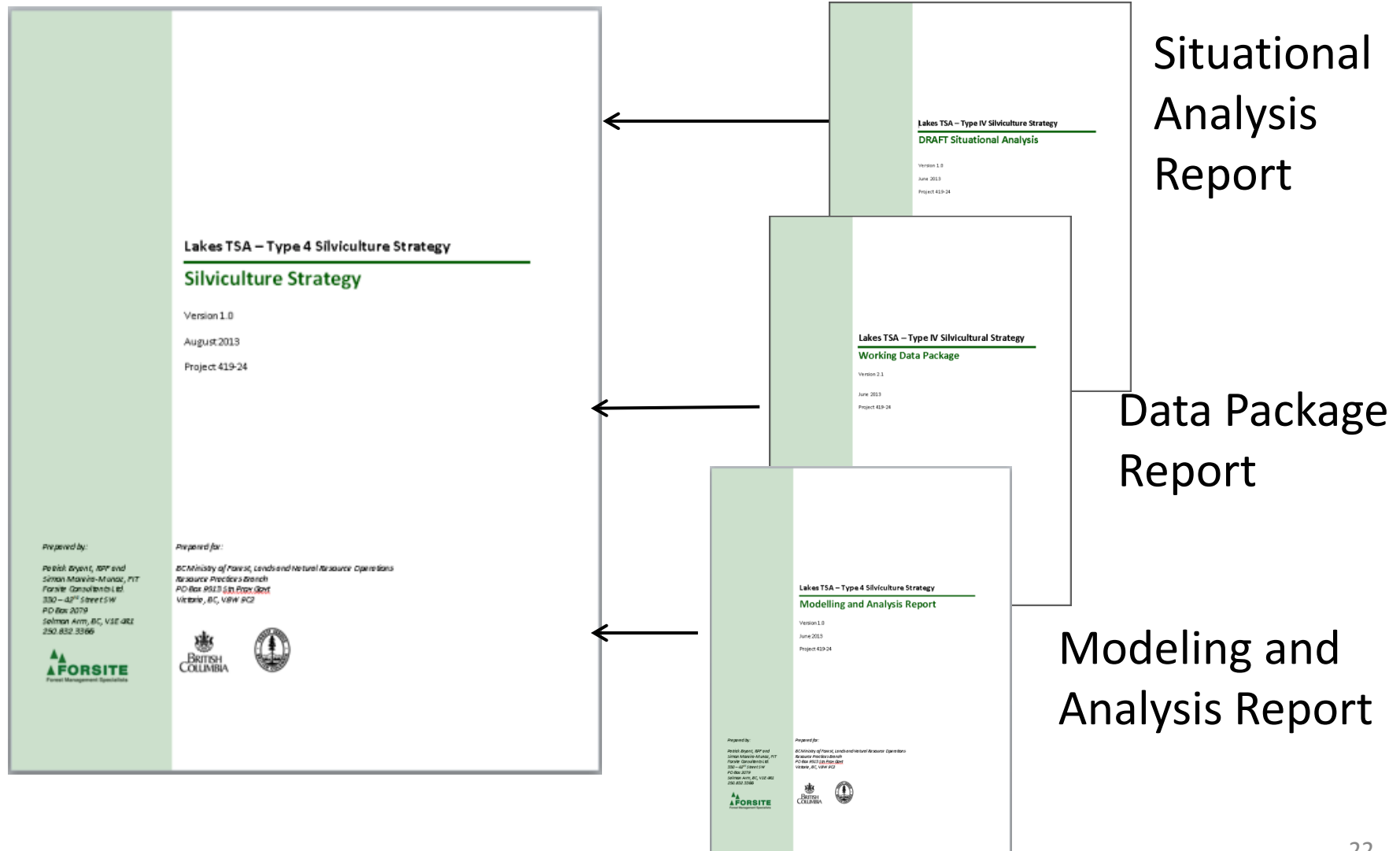
Fertilizing: 68,000 ha

4. Silviculture Strategies to Improve Mid-term Timber Supply



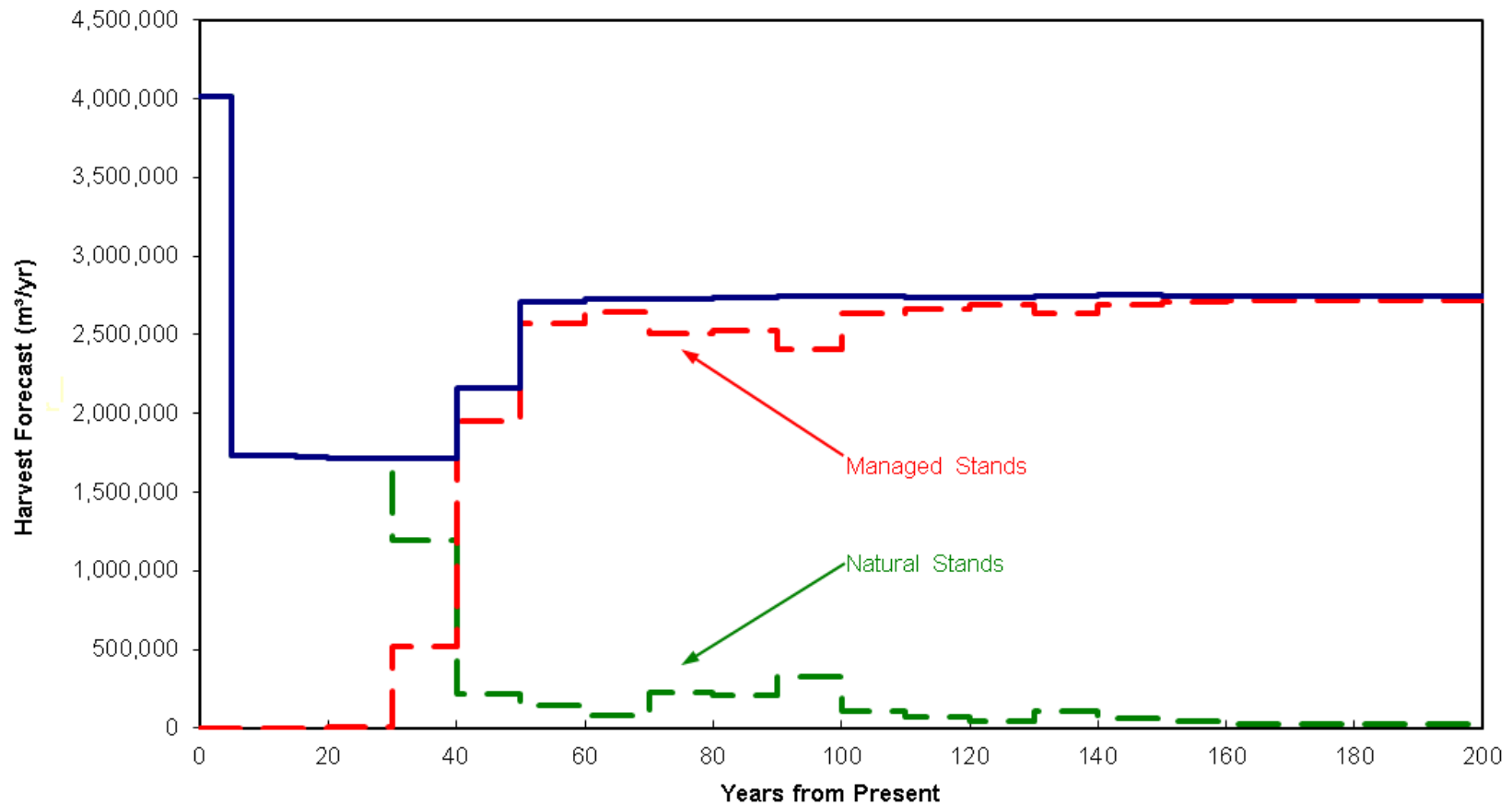
- Provides Timber Supply Area-level options for improving mid-term timber and habitat supply
- Assesses the impacts on range/forage, hydrology, wildlife and fire risk.

4. Silviculture Strategies to Improve Mid-term Timber Supply



4. Silviculture Strategies to Improve Mid-term Timber Supply

Base Case Harvest Flow: Quesnel Timber Supply Area

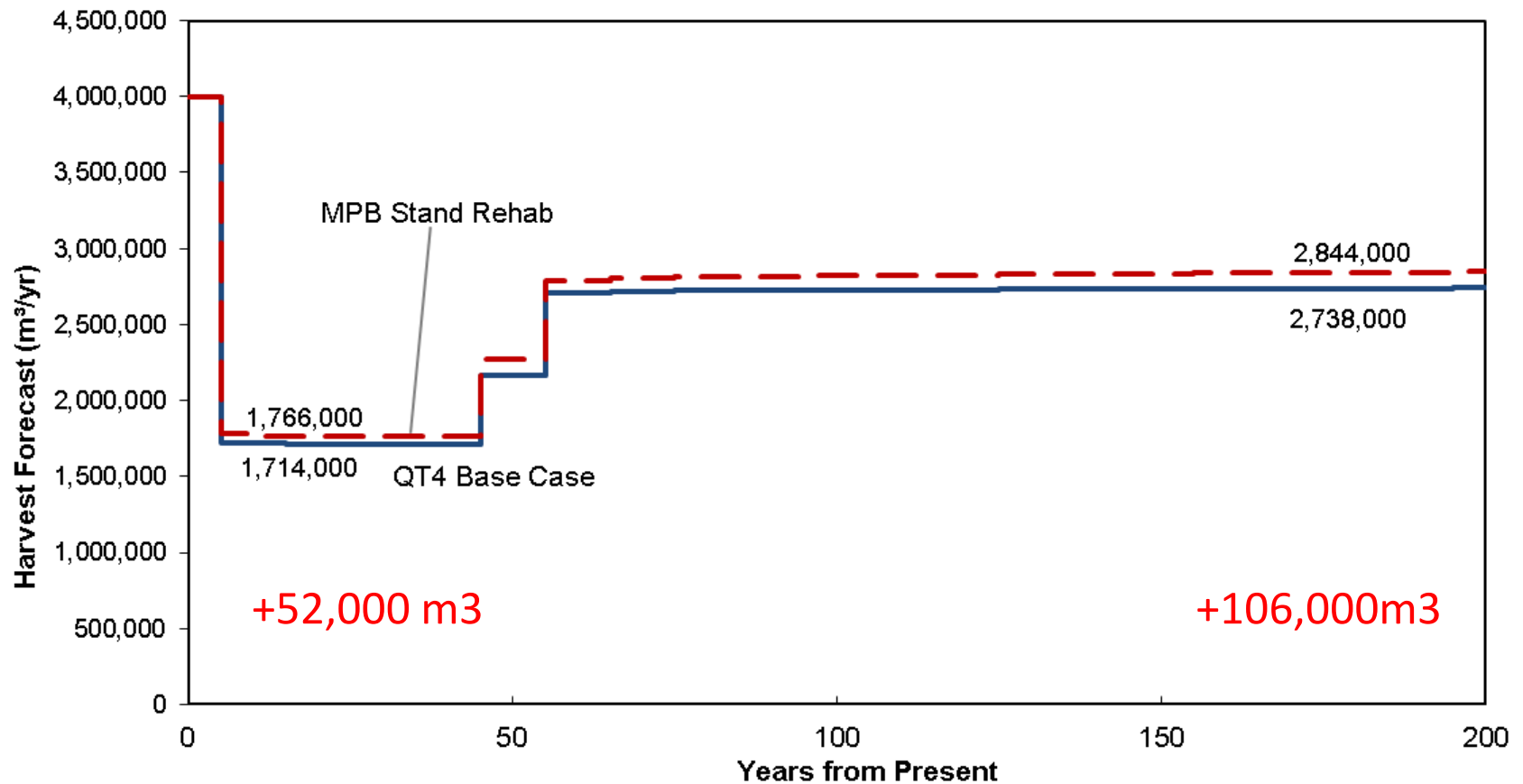


4. Silviculture Strategies to Improve Mid-term Timber Supply

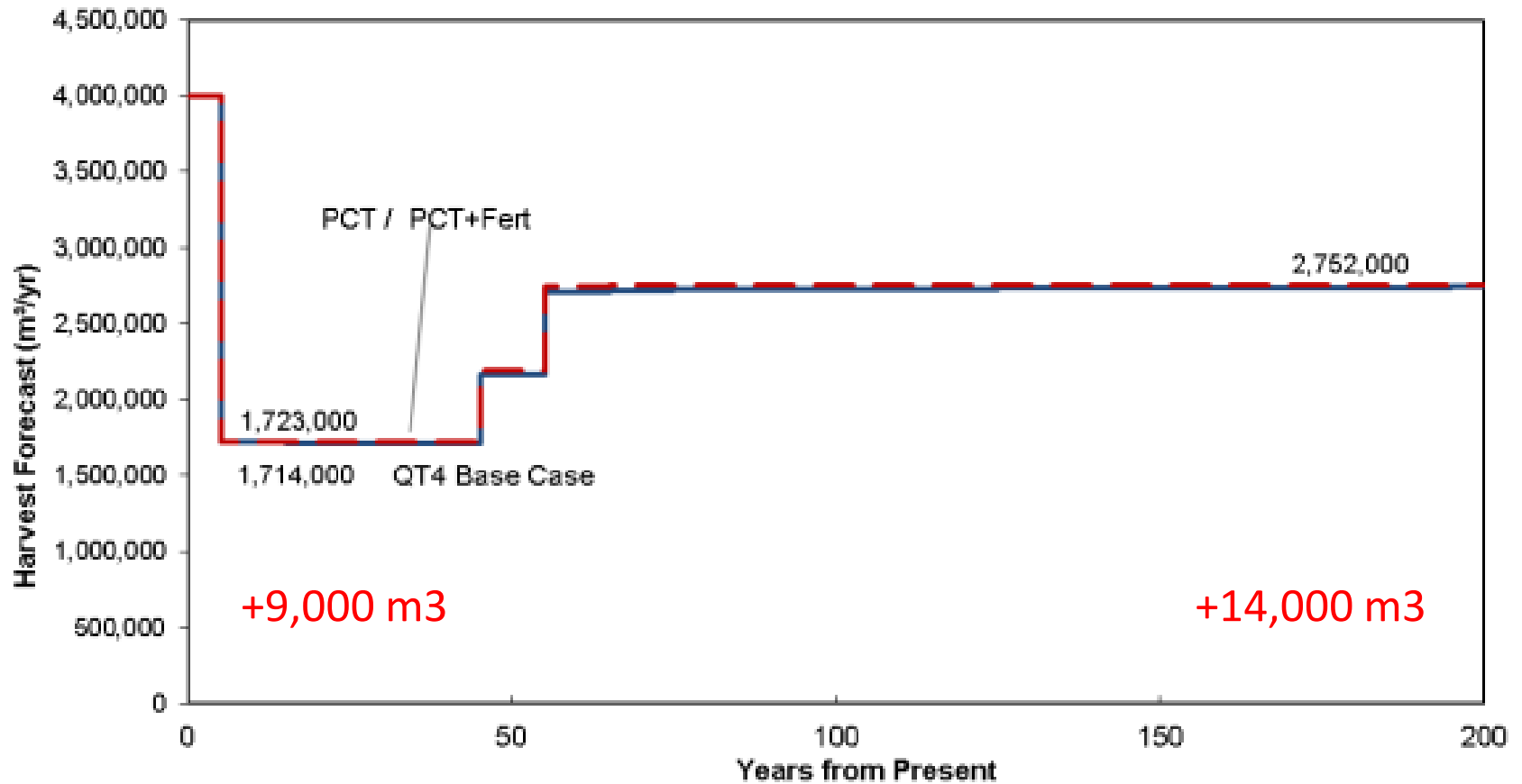
Quesnel Silviculture Scenarios

- Rehabilitation of uneconomic dead stands;
- Pre-commercial thin (PCT) plus fertilization;
- Single fertilization of eligible stands;
- Multiple fertilization of eligible stands;
- Enhanced basic silviculture
- Partial cutting in constrained areas
- Optimized mix of the various scenarios

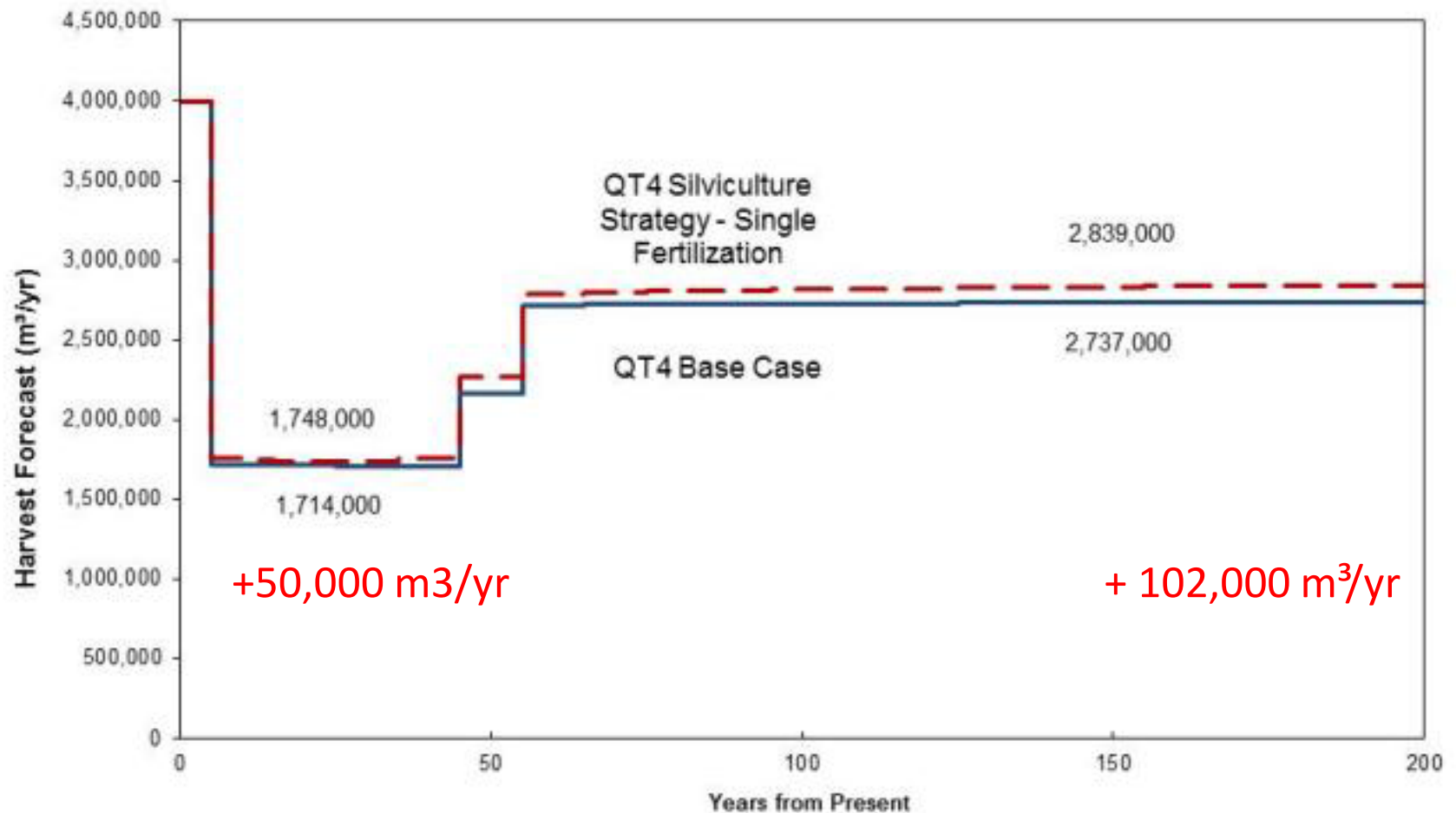
REHAB OF UNECONOMIC DEAD STANDS



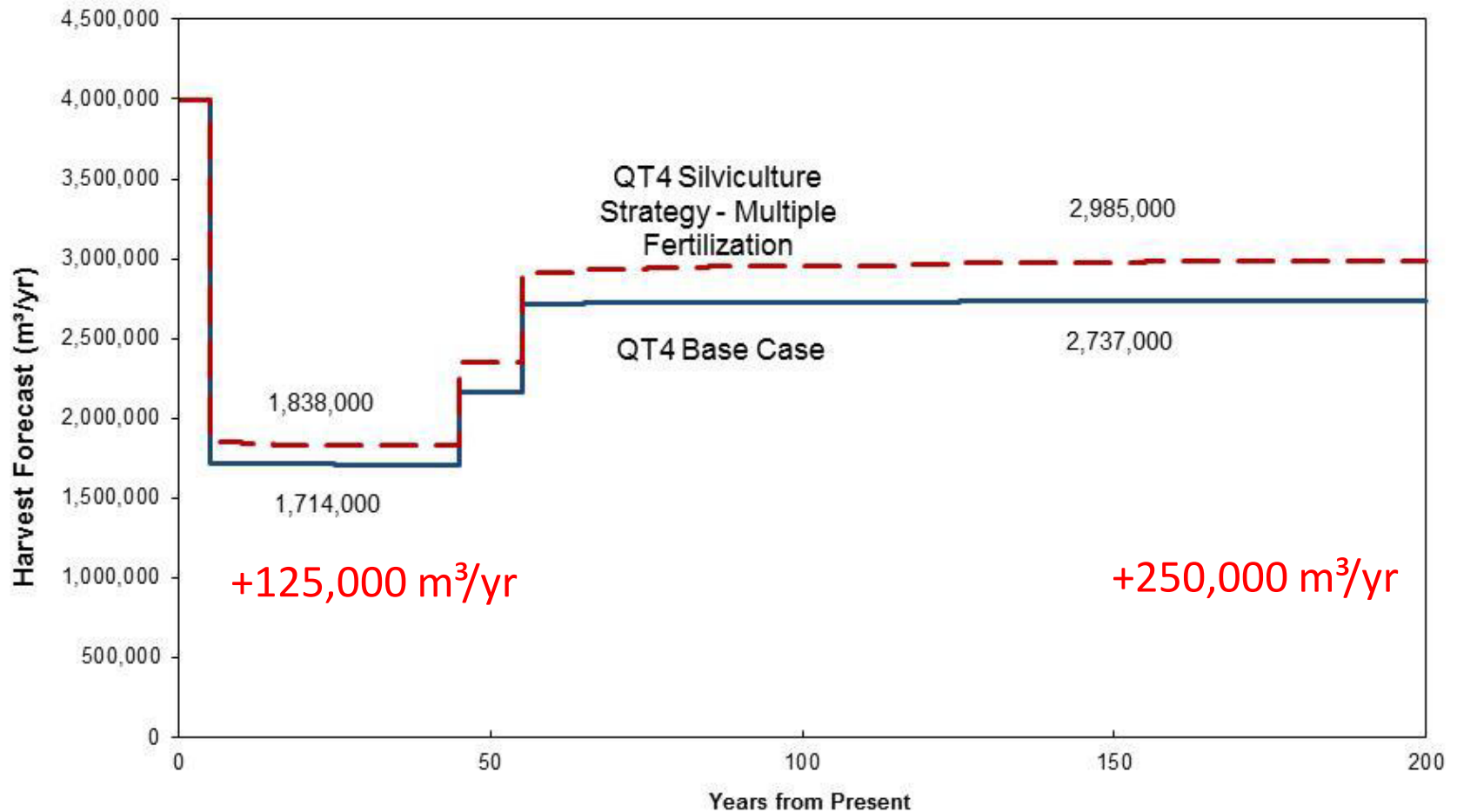
THINNING W/WO FERTILIZATION



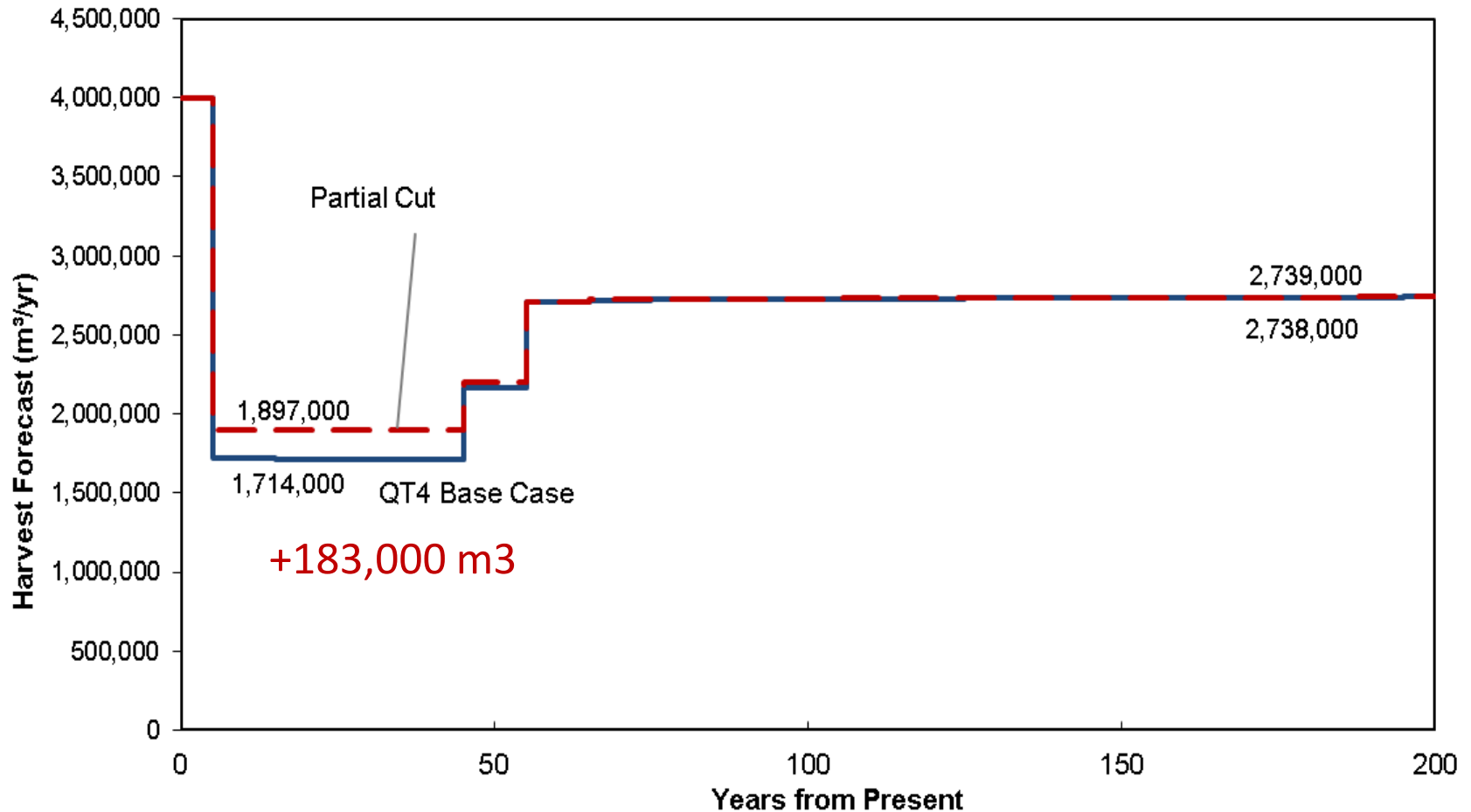
SINGLE FERTILIZATION OF ELIGIBLE STANDS



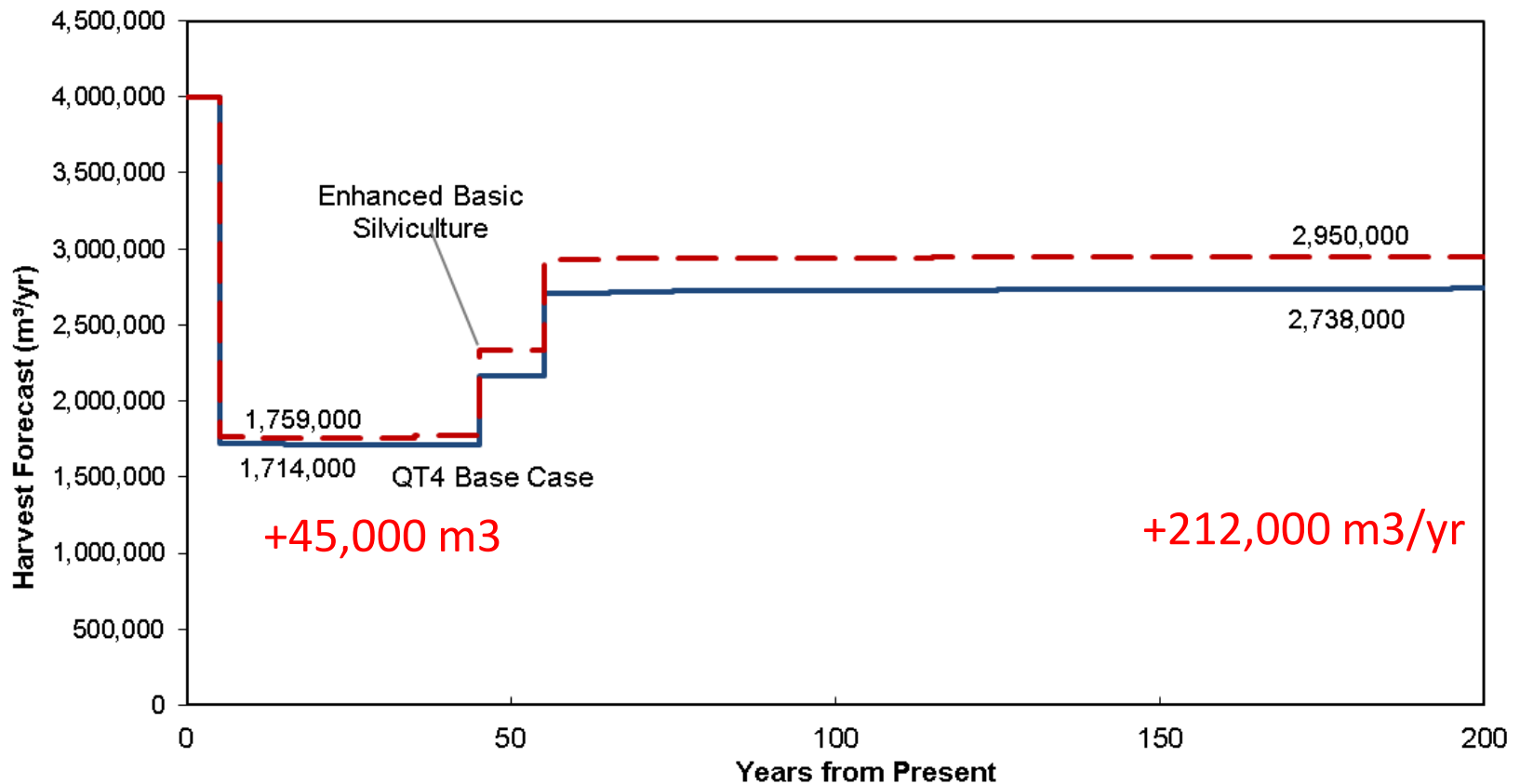
MULTIPLE FERTILIZATION OF ELIGIBLE STANDS



PARTIAL HARVEST IN CONSTRAINED AREAS



ENHANCED BASIC SILVICULTURE



4. Silviculture Strategies to Improve Mid-term Timber Supply

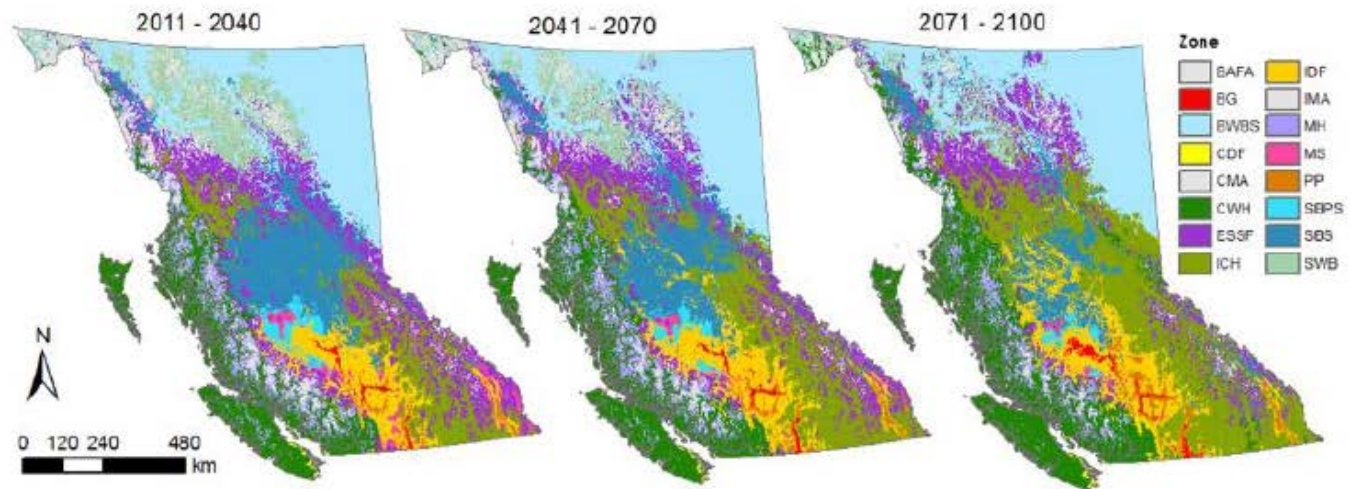
What has the Quesnel analysis shown?

Silviculture investments can improve the mid term timber supply:

- Rehabilitation is worthwhile
- Thinning has limited opportunity
- Multiple fertilization treatments are more beneficial than a single application
- Partial cutting in constrained areas will help
- Enhanced basic silviculture (planting with genetic improved stock) and fertilization dominant the optimized scenario

4. Silviculture Strategies to Improve Mid-term Timber Supply

Adding the climate change lens



We know changes are coming, how can we adapt our management practices?

4. Silviculture Strategies to Improve Mid-term Timber Supply

Tree Species Deployment at the Landscape Level with consideration for Climate Change

BGC Zone U.S.Habitat Type	Desired Trend by Species								Comments
	PI	Sx	Fd	Lw	Cw	Hw	Pw	Py	
ICHwk Thpl/Opho	◇	↓	◇	◇	◇		◇	n/a	Maintain the trends for PI and Fd, may wish to limit Sx use - monitor. Maintain present trends, note the use of Pw and replacement of Cw.
IDFmw Psme/Syal	↓	◇	↑	◇	◇	n/a	n/a	◇	Reduce level of PI use below harvest proportion. Maintain trend for Sx, promote Fd. Maintain present trend of increased use of Lw and reduced use of Cw. Promote Py where suited.
MSdm Psme/Caru Abla/Vasc	◇	◇	↑	n/a	n/a	n/a	n/a	n/a	Maintain trends for PI and Sx, but do not increase Sx above the present proportion used. Promote use of Fd where suited. Use Lw where suited in a limited capacity.
IDFdk Psme/Caru	↓	↓	↑	↓	n/a	n/a	n/a	↑	Reduce reliance on PI except on sites unsuitable for other species. Avoid planting Sx on zonal sites due to increased drought potential. Promote the use of Fd. Decrease or do not increase use of Lw, promote Py where suited.

B.C. Forest Research Program

1. **Ecosystem Stewardship** - Improved ecological knowledge for sustainable resource stewardship
2. **Ecosystem Health and Disturbances** - Improved ecosystem health and reduced risk from landscape-level disturbance
3. **Water** - Reduced hydrogeologic risk to infrastructure, communities and natural resource values and uninterrupted water quality, quantity and timing
4. **Species and Habitats** - Improved terrestrial and aquatic species conservation and management
5. **Timber Supply** - Increased volume and value of timber
6. **Bioeconomy** - Advancing bio-economic and other natural resource opportunities

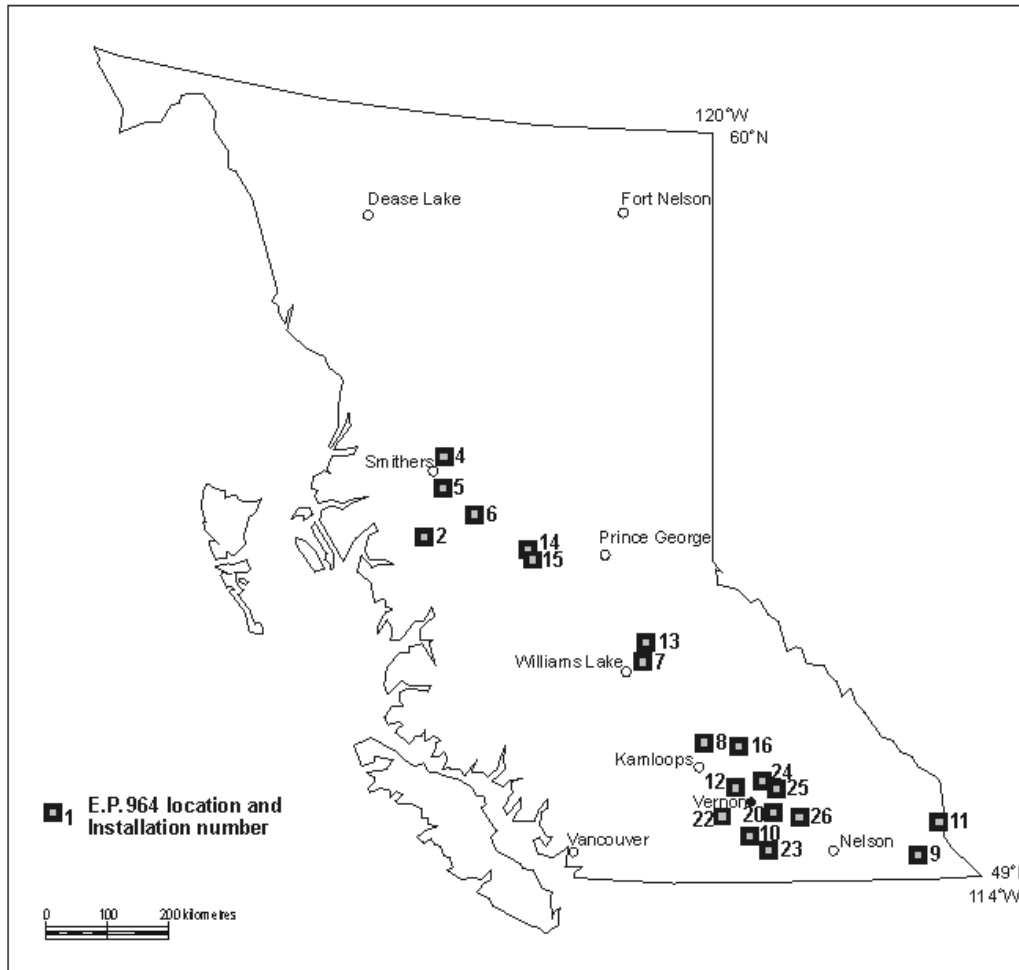
B.C. Forest Research Program

Silviculture Experiments in Southern B.C.

Silvicultural Treatment	Species Tested	BEC Zone					Total
		ESSF	ICH	IDF	MS	PP	
Espacement	Pl, Py, Fd, Sx, Lw, Ep+Fd/Cw/Lw	4	13	4	4	4	29
Site Preparation	Pl, Fd, Lw, Sx	6	8	14	4	0	32
Species Trials	Pl, Pw, Fd, Sx, Cw, Ssib, Lw, Act, Ep	9	41	11	0	0	61
Realized Gains	Pl	1	3	1	2	0	7
Vegetation Management	Pl, Pw, Sx, Sw, Fd, Lw, Py, Ep/Fd, At/Pl, Pl/Ds	2	7	2	4	0	15
PreCommercial Thinning	Pl, Fd, Ep, Lw, Ep/Fd, Pl/Fd	0	8	4	5	1	18
Fertilization	Pl, Fd, Sx, Ep/At	3	15	2	8	0	28
Silviculture Systems	Pl, Fd, Fd/Pl, Hw/Cw, Se/Bl	4	1	5	6	0	16
Mixedwood Management	Pl, Py, Fd, Sx, Lw, Cw, Hw, Pw, Bl + mixes	0	8	3	2	0	13
Total		29	104	46	35	5	219

B.C. Forest Research Program

Example - Espacement Trials of Interior Species



- 21 installations
- About 25 years old
- Planting densities 500 - 2500 sph
- Distributed among four BEC zones (ESSF, ICH, MS, SBS)
- Five species (Pl, Sx, Fd, Lw, Py) and species mixes

Cross-Border Research Opportunities

- More data for model testing
- Greater confidence in assumptions of modelled scenarios and associated risks
- Better prediction of silviculture treatment responses at the site level
- Best practices for adapting forest ecosystems for resilience to catastrophic disturbance
- Understanding how to manage for greater ecosystem diversity and complexity

Thank You!



Ministry of
Forests, Lands and
Natural Resource Operations

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 - Resource Practices Branch
- Catherine Bealle Statland, MFS, RPF
 - Forest Analysis and Inventory Branch