2005
Fertilizing Program

Some Operational Considerations

Forest Fertilization Meeting

February 2, 2006

Prince George Civic Centre

Planning

- Best opportunity to grow more wood for the shortfall expected
- Government has provided funding
- Updated the Type II Silviculture Analysis

Planning

- Targeting spruce and Douglas-fir on our better growing sites
- Our analysis indicates that the best value is to fertilize stands that can be harvested in 10 years (60-90 years old)
- Next best is to fertilize 25-40 year-old stands

Planning

Table 6: Fertilized Area (ha)

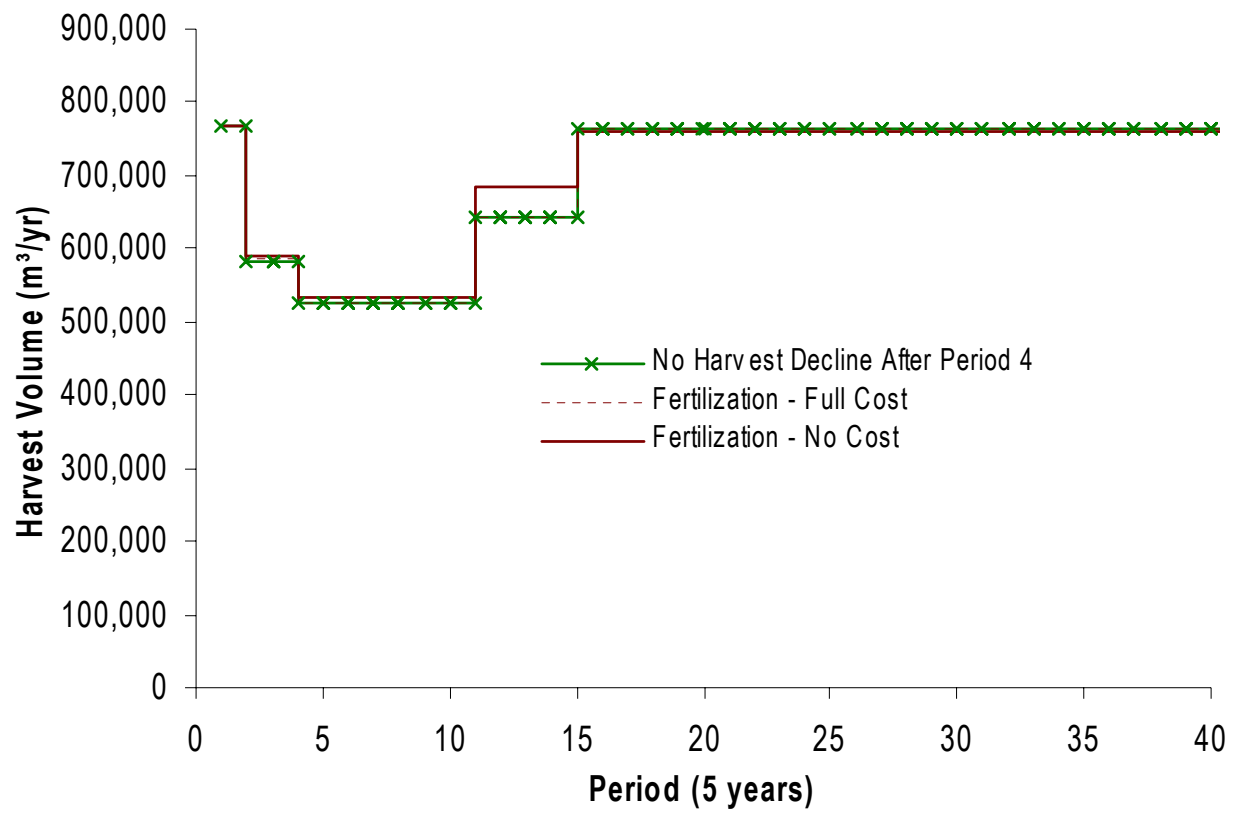
Period (5-year)	Total Area Scheduled for Fertilization in Woodstock (ha)	Area Fertilized With 20 ha Minimum Treatment Unit (ha)		
		Early Fertilization of Managed Stands	Late Fertilization of Natural Stands	Late Fertilization of Natural Stands less than 60 years of age
1	16,636	8,648	6,067	1,919
2	20,598	11,855	4,000	487
3	14,540	10,949	1,915	51
4	9,118	3,394	2,662	51
5	4,909	1,337	562	0
6	2,759	1,213	265	0
7	658	99	149	0
TOTAL	69,218	37,493	15,620	2,508

Planning

- The analysis shows:
  - small, but valuable mitigation of 1.3% (7,500$m^{3)}$ of AAC in the short term (10-50 years)
  - Substantial mitigation of 6.6% (41,800m^3) in the mid-term (50-70 years)

Planning

- Fertilizing Analysis



Planning

- Using straight urea fertilizer (46-0-0), which is 46% nitrogen
- Applying at 435 kg/ha (200kg N/ha)

Application

- Applied in late September through November in this area
- Temperatures below 10 C
- Ground is not frozen

Application

- Transported in bulk by rail or truck to Quesnel
- Hauled to the site by truck
- Applied by helicopters

Application

Application

- Fertilizer is drawn by augers out of the truck or railcar

Application

Application

- The hopper is set up to weigh each load
- Weight is adjusted to match the fuel burn of the helicopter
- After re-fueling, the loads are light, as fuel is burned, loads are increased.
- The weight of each load is recorded

Application

Application

Calibration

- Known weight of fertilizer loaded
- Known distance flown
- Known swath width
- Simple calculation of weight and area

Equipment

- Western Aerial Applicators uses these:
  - Llama – lifts 800 kg; target is 300 ha./day
  - Hiller (turbine conversion) – lifts 400 kg.; target is 100-120 ha./day
- 206-B has been used; has lower lift capacity in the range of 375-400kg.

Operating Considerations

- Preferred maximum flight distance is 2 km
- Maximum distance for small treatment areas is 4km, but ferry time drastically cuts into productivity
- Vertical lift affects productivity

Operational Considerations

- Getting trucks from the supplier to the site can result in delays – breakdowns, driver fatigue or other problems result in downtime
- Delivery by rail seems to be more consistent if there is enough lead time
- Committed trucks hauling from a rail spur to the bush are effective

Operating Considerations

- Access has to be suitable to get a Super B-train truck to the site
- Need a staging area for the truck, hopper, and helicopter maneuvering and landing.
- Staging areas can be surprisingly small; an old landing is ideal; a road junction can work

Preparations

- Provided a digital shape file of the units to be treated – includes no treatment areas
- Digital file downloaded into the helicopter GPS unit to provide live visual reference of treated/untreated areas.

Preparations

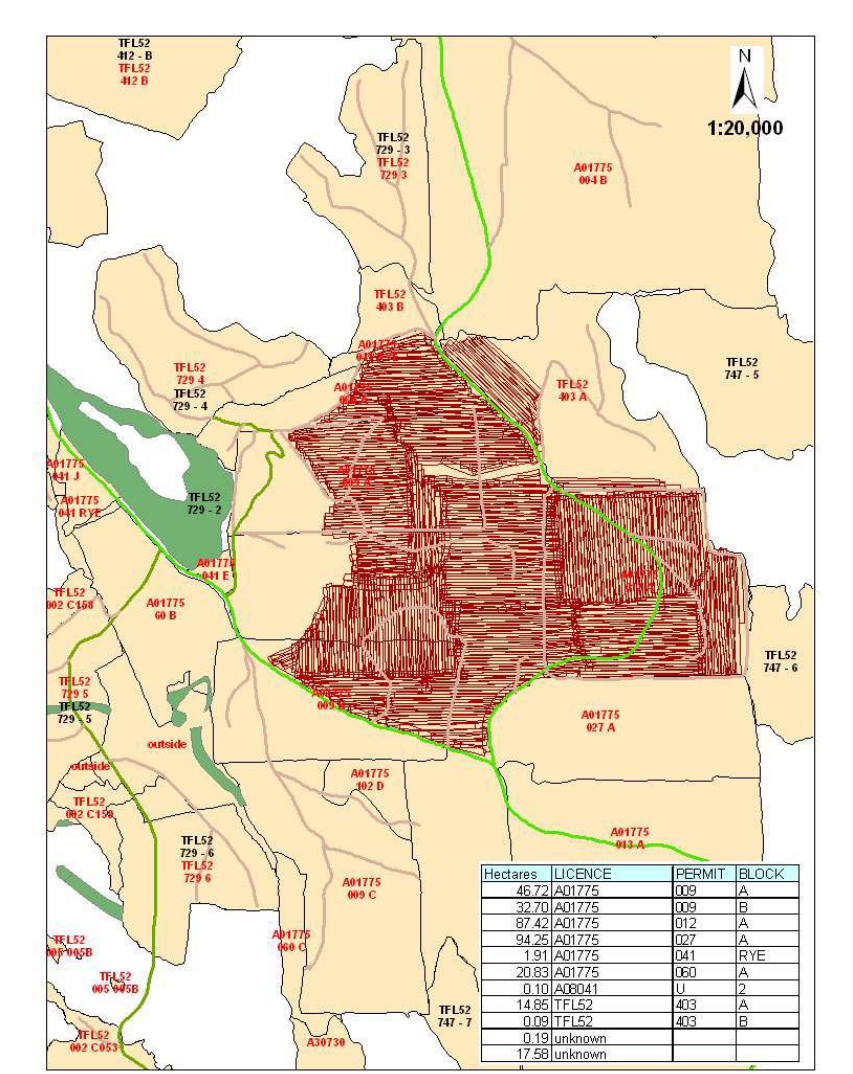
Preparations

- Provided a 1:20,000 orthophoto with treatment units and streams shown
- Provided a copy of emergency contacts
- Contractor has own spill and emergency contingency plans

Results

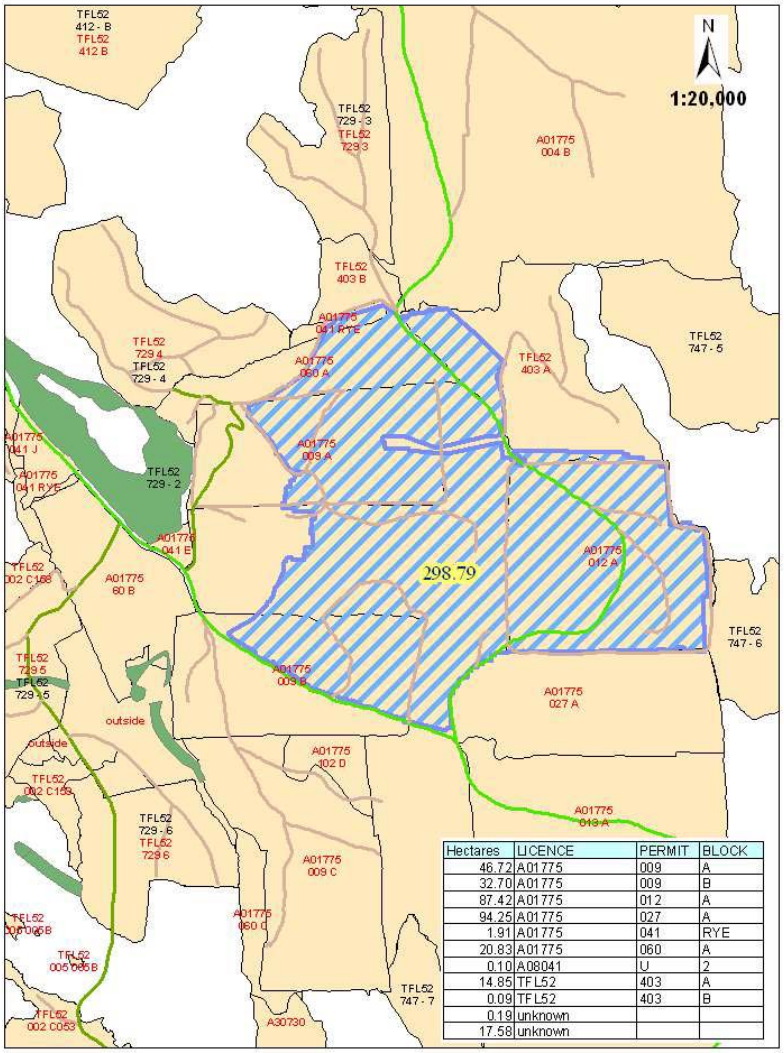
- Fertilized approx 400 ha on TFL 52 and approx 400 ha on Quesnel TSA
- GPS map showing actual coverage

GPS'd Treatment Area



Hectares	LICENCE	PERMIT	BLOCK
46.72	A01775	009	A
32.70	A01775	009	B
87.42	A01775	012	A
94.25	A01775	027	A
1.91	A01775	041	RYE
20.83	A01775	060	A
0.10	A08041	U	2
14.85	TFL52	403	A
0.09	TFL52	403	B
0.19	unknown		
17.58	unknown		

‘Smoothed’ Treatment from GPS



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Costs

- Aerial application cost of $0.34/kg, or $147.90/ha.
- Fertilizer cost of $512/T, or $204.80/ha. This included $20/T for trucking
- Application cost of $352.70

Plans for the Future

- Fertilize 2000-3000 ha on TFL 5 and 52
- Fertilize 2000-3000 ha on Quesnel TSA in cooperation with MOF and other licencees
- Establish monitoring system to determine gains

Issues

- Few helicopter companies set up for fertilizing
  - GPS installations not set up for live mapping
  - Do not have the augers or hoppers
  - Do not have ground personnel
  - Do not have the experience

Issues

- Availability of a convenient rail siding
- Demurrage payment on non-contract rail cars
- Rail cars with low hoppers

Issues

- RESULTS does not handle forest cover polygon treatment units
  - Has resulted in non-payment of holdback, which may result in higher costs in 2006
- Potential water quality issues if fertilizing occurs on a large scale